Evidence to support safe return to clinical practice by oral health professionals in Canada during the COVID-19 pandemic: A report prepared for the Office of the Chief Dental Officer of Canada.

March 2021 update

This evidence synthesis was prepared for the Office of the Chief Dental Officer, based on a comprehensive review under contract by the following:

Raphael Freitas de Souza, Faculty of Dentistry, McGill University
Paul Allison, Faculty of Dentistry, McGill University
Lilian Aboud, Faculty of Dentistry, McGill University
Martin Morris, Library, McGill University

March 31, 2021

Contents

Foreword to the second update

by Dr James Taylor, Chief Dental Officer of Canada

March 31, 2021

Following the successful completion of the original document on 31 July 2020, the Office of the Chief Dental Officer of Canada (OCDOC) commissioned McGill University to produce three updates during the year following the first report. This is the second of those update reports, covering relevant literature published between November 20, 2020 and February 28, 2021. It is intended as an addendum to the original document and its first update, and should thus be used in conjunction with the original document. The results of the first update are also found in this document and are identified as such. This document will reside alongside the original document in the public domain, to be accessible to decision makers as they carry out their respective responsibilities.

As with the original document and its first update, McGill University drafted a comprehensive knowledge update concerning key issues that inform the provision of oral health care by relevant providers in Canada during the COVID-19 pandemic. The OCDOC then reconvened the representative multidisciplinary knowledge-based group from the national oral health professional and federal government health domains. The group's role was to work collaboratively to contribute to the generation of a single high-level national evidence update document by the team from McGill.

The organizations participating in this collaboration included:

Federal Health Portfolio

- Public Health Agency of Canada
- Health Canada, COVID-19 Task Force

National oral health regulatory federations

- Federation of Dental Hygiene Regulators of Canada
- Canadian Dental Regulatory Authorities Federation
- Canadian Dental Assisting Regulatory Authorities
- Canadian Alliance of Dental Technology Regulators

National oral health professional associations

- Canadian Dental Association
- Denturist Association of Canada
- Canadian Dental Assistants Association
- Canadian Dental Hygienists Association
- Canadian Dental Therapists Association

National oral health academic association

- Association of Canadian Faculties of Dentistry

OCDOC Mandate: to advance population-level oral health through health promotion, disease prevention and professional/technical guidance with an emphasis on vulnerable populations.

Introduction

During May and June 2020, a research team completed a rapid review of the literature to support the safe practice of Canadian dental professionals during the COVID-19 pandemic. Following input from stakeholders on the draft report in mid-July, the report was finalized and submitted July 31 and then published on the Canada.ca website in both official languages in September 2020. The review covered literature published from January 1, 2000 to June 30, 2020. With the rapid pace of new publications linked to the COVID-19 pandemic, the Chief Dental Officer of Canada determined that updates to the report are needed three times during the year following the first report. These updates are to cover scientific literature published between July 1 and October 31, 2020, between November 1, 2020 and February 28, 2021 and finally between March 1, and June 30, 2021. This is the second update adding relevant literature published during the period covering November 1, 2020 and February 28, 2021. The results of the first update are found in this document and are identified as such.

This update document will use the same structure as the original report, addressing the same nine questions. In response to each question, we include: the rationale for the question (the same as the previous report); the summary response provided in the previous report; and then a summary of the new literature. The references are only those identified for the relevant update periods (July 1 to October 31, 2020 and November 1, 2020 to February 28, 2021, respectively) and appended tables contain only material from newly identified references. Readers should return to the original report for relevant lists of references and other material. The original report can be found at: https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/health-professionals/evidence-safe-return-clinical-practice-oral-health.html?utm_source=Emailblast&utm_medium=Email&utm_campaign=McGill_report_covid_ENG

Project goal

To create a knowledge product around which the Office of the Chief Dental Officer of Canada can convene a representative knowledge-based group of the national oral health professional domain, in order to generate a single high-level national expert document which Canada's oral health regulatory authorities may then choose to consult in developing consistent guidance for their respective registrants at the Provincial/Territorial level. Further, educators, program officials and policy makers may also choose to consult this document as they carry out their respective responsibilities.

When reading this report it is important to recognize three essential points:

- With the exception of the first two topics, which are related to the disease COVID-19 itself, the remaining topic concerning interventions in oral health care and the literature searches reflect reference to oral health care. The report therefore focuses on evidence directly related to oral health care. However, where relevant, we also refer the reader to Health Canada websites for pertinent information.

- This document does not provide guidelines or recommendations. This is the role of the relevant federal, provincial, and territorial authorities. The role of this document is to highlight high quality evidence that such authorities and others in leadership roles can use as they decide what guidance to give oral health professionals in Canada.

This document focuses on evidence that is categorized as high quality using internationally recognized hierarchies of evidence [1] [2] [3]. These are in descending order:

1. Systematic reviews and meta-analyses
2. Randomised controlled trials with definitive results (confidence intervals that do not overlap the threshold clinically significant effect)
3. Randomised controlled trials with non-definitive results (a point estimate that suggests a clinically significant effect but with confidence intervals overlapping the threshold for this effect)
4. Cohort studies
5. Case-control studies
6. Cross sectional surveys
7. Case reports
8. Expert opinion

Specific objectives

1. To update the previously published comprehensive review of the literature concerning key issues that inform the provision of oral health care by relevant providers in Canada during the COVID-19 pandemic. Those key areas are:

a) Which patients are at greater risk of the consequences of COVID-19 and so consideration should be given to delaying elective in-person oral health care?
b) What are the signs and symptoms of COVID-19 that oral heal professionals should screen for prior to providing in-person health care?
c) What evidence exists to support patient scheduling, waiting and other non-treatment management measures for in-person oral health care?
d) What evidence exists to support the use of various forms of personal protective equipment (PPE) while providing in-person oral health care?
e) What evidence exists to support the decontamination and re-use of PPE?
f) What evidence exists concerning the provision of aerosol-generating procedures (AGP) as part of in-person oral health care?
g) What evidence exists to support transmission mitigation strategies during the provision of in-person oral health care?
h) What evidence exists to support space ventilation strategies that reduce the risk of transmission?
i) What evidence exists to support the disinfection of surfaces in spaces in which oral health care is provided?

2. To prepare a written report documenting the updated findings of the aforementioned literature searches. The report is prepared in a manner that provides clear and concise information to decision-makers (individuals providers or organizational) highlighting where strong to no levels of scientific evidence exist to support different approaches.

Methods used to identify and include relevant literature

The same methodological approach was used for this update as was used in the original report and first update. A more detailed methodological description is available in Appendix J. In summary, search words and phrases were identified for each of the above topic areas a) to i), and searches were performed for English language articles, in standard scientific literature databases for the period July 1 to October 31, 2020 (first update) and the period November 1, 2020 and February 28, 2021 (second update). Two steps were then used to include publications in this report/process: i) step 1 was a review of abstracts to decide on the relevance of publication content for the topic areas; and ii) step 2 was to include only those publications reporting the results of prospective cohort studies, randomized controlled trials, systematic reviews and/or meta-analyses. Steps 1 and 2 were done by one author and a random number of publications were reviewed in the same way by a second author so as to ensure reliability of the findings. An additional, separate search was performed of the bibliography supporting relevant national, provincial and state guidelines concerning oral health care provision during the COVID-19 pandemic in Canada and the USA. Any publications identified in this bibliography that were not in our aforementioned search, but which fulfilled the quality criteria in step 2 and were published during the relevant period were also included in this update report.

With respect to step 1, concerning relevant subject areas, as well as searching for COVID-19 and SARS-CoV-2, we also searched for similar respiratory tract viruses such as SARS, MERS, H1N1 and influenza. In reporting the results of our work, we have made clear whether the evidence concerns COVID-19, SARS-CoV-2, SARS, MERS, H1N1, influenza and sometimes other pathogens. In reality, much of the work reported is in the form of systematic reviews that cover a range of relevant pathogens and diseases. In the second update, for questions with a robust body of evidence about COVID-19, we did not update evidence about other respiratory diseases or viruses (indicated for a topic when applicable).

With respect to step 2, concerning the inclusion of only that evidence fulfilling certain levels of quality, this was taken to enable this review to focus only on strong evidence in support of various approaches and concepts. This means that any evidence we highlight is of high quality. However, where we state that there is no evidence using our quality criteria, it does not mean there is no evidence at all, rather it means that evidence that exists is not of high enough quality to be included in our review. This is particularly important to note in the context of the current pandemic wherein there are a very high number of publications emerging from rapidly performed research, which for good reasons, may not be of the quality ideally desired. There are also many documents containing the opinions of experts, which are valuable in the circumstances, but which are recognized to be low in the hierarchy of quality of evidence.

Report structure

This report will address each of topics a) to i) in turn. For each topic, we provide the rationale for the question (the same as the previous report); the summary response provided in the previous report; and then a summary of the new literature, stating how strong the evidence is. The main body of the report contains only these summaries; however, each topic has an appendix containing a tabular summary of included papers, with summary data where appropriate. Readers of this report who are interested in more detailed information will need to access the relevant papers themselves. We also make clear where evidence is related to COVID-19/SARS-CoV-2 or related to similar respiratory tract viruses such as SARS, MERS, H1N1 and influenza. Finally, where pertinent, we refer readers to relevant Health Canada websites.

Summary of update reports

1st update

This section provides an overview of the findings reported in the different sections. For more detailed information and for the references, see the relevant sections.

We identified a large number of new systematic reviews and meta-analyses concerning the symptoms of people diagnosed with COVID-19 and the risk factors for serious consequences such as hospitalization, ventilation and death among those patients. Many of these reviews and analyses confirmed data presented in the previous report. The evidence is strong that the most common signs and symptoms experienced by people diagnosed with COVID-19 are fever, cough, fatigue and muscle aches, shortness of breath, sputum, headache, sore throat and gastrointestinal symptoms, including diarrhea. New strong evidence has emerged reporting loss of sense of smell and altered sense of taste as common symptoms. With respect to risk factors for serious consequences of COVID-19, the evidence is strong for increased risk among people with cardiovascular diseases, hypertension, diabetes, chronic respiratory diseases, liver and kidney diseases, obesity and smokers. Newly added risk factors are people with cancer and cerebrovascular conditions. In terms of sociodemographic factors, the evidence is strong that increased age augments the risk of serious consequences, with this increased risk beginning to emerge particularly for those 60 years and older. There is now good evidence in the international literature indicating men being at increased risk for COVID-19 and its consequences, although it is not clear why – is it biological or because of their work, socializing habits and/or smoking and alcohol consumption? However, it is important to note that in Canada, the incidence of COVID-19 is higher in women. There is also some evidence to indicate that when studies control for socioeconomic factors, there are no racial differences in serious consequences for COVID-19.

While the evidence concerning the disease itself is increasingly strong, the evidence supporting different interventions pertinent to oral health care remains minimal and weak and relatively little work has been published in the period since the first report. In terms of clarifying guidance for oral health professionals, one systematic review highlights the categories of actions in pre-treatment,

during treatment and post-treatment phases of care that organizations around the world have concentrated on, although this does not mean the relevant actions are based on evidence, rather that these are common areas to consider. Another review of guidelines for dental care during the pandemic noticed an increasing focus on preventive and non-Aerosol Generating Procedures (AGPs) and another highlighted the need to develop an evidence-based classification of AGPs and non-AGPs in dentistry rather than the theoretical approaches used thus far.

In terms of PPE, the picture remains unclear in terms of evidence directly related to oral health care, although the evidence does suggest using combined forms of facial covering (e.g. face visor and N95 mask) is better than just one, as no single interventions are fully effective in preventing transmission. There is emerging evidence that N95 masks can be microwaved and re-used at least once without loss of function but there remains no evidence supporting various mitigating approaches such as use of pre-treatment mouthwash, rubber dam and high-volume evacuation. There is evidence that chlorhexidine mouthwash reduces bacterial colony-forming units but none on this or other mouthwashes concerning viruses or disease transmission.

There is emerging evidence concerning the risk factors for Health Care Workers (HCWs) contracting COVID-19, plus the impacts of the disease on them, which are both relevant in terms of considering how to mitigate risks and impacts. Suggestions have been made for HCWs concerning reducing hours and increasing mental support services.

2nd Update

This section provides an overview of the findings reported in the different sections. For more detailed information and for the references, see the relevant sections.

Our second update identified another large collection of systematic reviews and meta-analyses documenting comorbidities that increase the risk of severe complications in case of infection by SARS-Cov-2. Most results are similar and/or complementary to previous versions of this report (e.g., higher risk for severe COVID-19 in individuals with hypertension, cardiac lesions and diabetes mellitus), but we have also highlighted reports that clarify risk related to pregnant women (the authors recognize that use of the term *pregnant women* is not gender inclusive. However, the systematic reviews on pregnant women referenced in this evidence synthesis did not include gender diverse people who are pregnant, limiting findings referenced to pregnant women only), who are at higher risk of the same complications for other individuals, including severe COVID-19 and ICU admission. Neonates can be affected negatively if born to mothers who are COVID-19-positive, including lower weight at birth and more frequent admission to a neonatal unit. Many reviews reinforce well-established evidence concerning COVID-19 signs and symptoms, but some reviews introduce a new concept of major relevance in our field: oral mucosal lesions associated to COVID-19.

Newer systematic reviews highlight the effective use of telehealth approaches to reduce in-person dental appointments, provide patient information and train professionals. They also reinforce the

need for specific COVID-19 questionnaires before dental care, ventilated waiting rooms/common spaces, social distancing and regular disinfection of non-treatment and operatory areas, but evidence does not support the use of laboratory screening tests for SARS-Cov-2 in dental care settings.

Other reviews compared different masks and respirators and suggested that FFP3 and FFP2 may be comparable to N95 to protect professionals from COVID-19. Again, face shields with lateral protection seem essential for dental care providers, combined with at least type 3 medical masks or respirators. However, there is little evidence to support different methods to reuse PPEs, with recommended use only in cases of shortage.

A hierarchy of risk for contamination was suggested by evidence identified in this update, with higher risk associated with the use of ultrasonic scalers, highspeed handpieces, air-water syringe, air polishers, as well as handpieces and lasers for oral surgery (including extractions and osteotomy). Reviews have recommdended the use of alternative techniques to minimise aerosols (e.g., atraumatic restorative treatment with hand instruments and silver diamine fluoride instead of conventional restorative treatment), and pre-appointment use of several types of mouthwashes to minimize risks of transmission.

Little evidence was gathered to support the use of air cleaning systems as a means to mitigate the transmission of COVID-19 in dental operatory rooms, although their use is reasonable. More studies are still needed to determine disinfection methods for surfaces and objects in an oral healthcare facility, although a novel finding, however, is the efficacy of sodium hypochlorite as a disinfecting medium for impressions and dental prostheses.

Report results

a. Which patients are at greater risk of the consequences of covid-19 so consideration should be given to delaying elective in-person oral health care?

a.1. Findings from the 1st update

We identified multiple systematic reviews, meta-analyses and a few cohort studies adding to the knowledge and understanding of which patient groups are at greater risk of severe consequences of having COVID-19. The large majority of these studies confirmed findings we described in the previous report. Nevertheless, there have been some important additional findings with strong evidence supporting them. Recently published reviews and meta-analyses confirmed the increased risk for serious consequences of COVID-19 including hospitalization, ventilation and death for people with cardiovascular diseases [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17], hypertension [4] [5] [6] [7] [8] [9] [10] [11] [12] [17] [18] [19] [20], respiratory diseases [5] [7] [10] [11] [12] [18] [21] [22] [23], diabetes [4] [5] [7] [8] [10] [11] [19] [20] [21] [24] [25] [26] [27] [28], liver [12] [29] [30] [31] and kidney diseases [5] [8] [11] [12] [14] [22] [32] [33] [34] [35] [36] [37] [38] [39] plus for smokers [18]. New information adds to the list of at-risk people who are obese [20] [40] [41] [42] [43], have cancer [11] [44] [45] [46] [47] and cerebrovascular conditions [10] [11] [12] [13] [17] [48] [49] [50] [51].

Concerning age and sex, again there has been additional high-quality evidence published. It is clear that increased age increases the risk of serious consequences [20] [49] [52] [53] with one review clarifying that the peak increase in risk is for serious consequences starts to occur for those 50-59 years of age but the largest risk increase is for the 60-69 year olds compared to those in their 50s, although the risk keeps increasing with older age [52]. With respect to sex, it is now clear from the international literature that the incidence of COVID-19 is greater in men than women [10] [19] [54] [55]. However, it is important to note, as shown on the webpage Covid-19 epidemiological and economic research data, that in Canada, the incidence of COVID-19 is higher in females compared to males, although this varies by age group. In terms of disease outcomes, again the international literature shows men are at increased risk for serious consequences of COVID-19 including death [20] [54] [56] [57] [58]. However, these studies also pointed out that it is not clear why men are at greater risk for worse outcomes. They could be at increased risk because of the nature of their work, their socializing habits, their smoking, alcohol consumption and/or levels of comorbidities [20] [58]. In Canada, there have been more hospitalizations and deaths among women but more men admitted to intensive care units (again see COVID-19 epidemiological and economic research data. It is also important to recognize that certain groups in the population face greater risk due to social, economic and occupational vulnerabilities (see Vulnerable populations and COVID-19 I). Further research needs to be performed to better understand the different levels of risk experienced by various groups in the population.

Canada covid-19 weekly epidemiology report. Further research needs to be performed to better understand this phenomenon.

With respect to COVID-19 in pregnancy, the evidence remains relatively limited because the numbers are considerably smaller than in the broader population studies. Nevertheless, there is limited, emerging evidence that pregnant women with COVID-19 are at increased risk for complications with their pregnancy [59] [60] [61] [62]. There is also emerging limited evidence concerning the problems suffered by neonates who are COVID-19 positive [59] [60] [63] [64] [65]. With respect to the possibility of vertical transmission from mother to foetus, one systematic review reported zero such cases [64] while two others reported rates of 2-3.2% of neonates testing positive for SARS-Cov-2 among babies born to mothers who were also SARS-Cov-2 positive [61] [66].

a.2. Findings from the 2nd update

This second update returned several systematic reviews (SRs) within this topic. As for the November 2021 update, most of those SRs confirm previous strong evidence regarding the risk for complications of COVID-19 associated with now well-known comorbidities. Probably the most studied comorbidity linked to higher risk of severe COVID-19, ICU admission and death is hypertension, which was identified by 49 new SRs [67] [68] [69] [70] [71] [72] [73] [74] [75] [76] [77] [78] [79] [80] [81] [82] [83] [84] [85] [86] [87] [88] [89] [90] [91] [92] [93] [94] [95] [96] [97] [98] [99] [100] [101] [102] [103] [104] [105] [106] [107] [108] [109] [110] [111] [112] [113] [114] [115]. Twenty-six SRs further confirm the higher rates of severe COVID-19 among CVD patients, with a higher risk for ICU admission and death [67] [68] [69] [71] [72] [74] [76] [77] [78] [81] [82] [84] [86] [87] [88] [91] [92] [98] [99] [101] [107] [113] [114] [115] [116] [117]. Specific CVD and conditions tackled by recent SRs include congestive heart failure [10] [75] [107] [118] [119] [120] [121], cardiac arrythmia [75] [119] [120] [122], myocardial injury [119] [123], history of heart transplant [124], general [89] [125] [126] and acute cardiac injury [67] [75] [97] [110] [120] [123] [127] [128] [129] [130], and coronary heart disease [93] [103] [105] [115] [131]. In all cases, the risk of severe COVID-19 and subsequent death raises considerably.

As found in previous versions of this report, a history of respiratory diseases raises the risk for severe COVID-19 and death (six SRs) [69] [105] [114] [132] [133] [134] . Specific conditions associated with increased risk for poor outcomes of COVID-19 were asthma (11 SRs) [72] [85] [88] [91] [94] [100] [133] [135] [136] [137] [138] [139], COPD (15 SRs) [67] [77] [84] [86] [90] [98] [113] [114] [116] [140] [141] [142] [143] [144] [145] and ARDS (12 SRs) [67] [71] [72] [108] [110] [120] [130] [146] [147] [148] [149] [150]. Three SRs suggest higher risk for severe COVID-19 in patients with a history of pneumonia [73] [112] [133]. This update also reinforces findings for diverse types of cancer [67] [69] [72] [84] [86] [88] [94] [100] [101] [103] [107] [113] [114] [116] [151] [152] [153] [154] [155] [156] [156] [157] [158] [159] [160] [161] [162] [163], cerebrovascular diseases [67] [69] [72] [77] [84] [86] [88] [113] [114] [115] [164] [165] [166] [167], acute [67] [86] [120] [123] [130] [168] [169] [170] [171] [172] [173] [174] [175] [176] [177] [178] [179] and chronic kidney diseases (including patients who received transplants and hemodialysis) [67] [69] [82] [86] [88] [94] [100] [103] [105] [107] [113] [116] [140] [142] [169] [174] [175] [178] [179] [180] [181] [182] [183], being linked to severe COVID-

19 and higher odds for death. A history of diabetes mellitus has been associated with a higher risk of severe COVID-19 and consequences like cerebrovascular accidents, ICU admission, invasive ventilation and mortality [67] [68] [69] [70] [71] [72] [73] [74] [76] [77] [78] [80] [81] [82] [84] [86] [87] [88] [90] [91] [92] [93] [94] [95] [96] [97] [98] [99] [100] [101] [102] [103] [104] [105] [106] [107] [108] [110] [112] [113] [114] [115] [116] [132] [142] [184] [185] [186] [187] [188] [189] [190].

More specific findings of this update include a higher severity of and mortality through COVID-19 among individuals affected by dementia [191] [192] [193] [194] and other nervous system diseases [164] [195]; liver disease (mostly chronic) [67] [69] [113] [114] [196] [197] [198] [199] [200] [201] [202] [203]; and thromboembolism, both arterial [204] [205] [206] [207] [208] [209] and venous [210] [211] [212] [213] [214] [215] [216] [217] [218] [219] [220] [221]. Evidence seems less consensual regarding autoimmune disease, with conflicting results [88] [100] [222].

Important factors linked to severe COVID-19 outcomes include advanced age [69] [71] [72] [78] [79] [90] [101] [105] [106] [109] [134] [141] [180] [206] [223] [224] [225] [226] [227], obesity [94] [96] [100] [101] [114] [142] [190] [228] [229] [230] [231] [232] [233] [234] [235] [236] and smoking (current or previous) [67] [77] [78] [81] [86] [94] [103] [104] [145] [237] [238] [239] [240] [241] [242] [243] [244] [245] [246], all of which were mentioned in our previous reports. Interestingly, a history of bariatric surgery seems protective against COVID-19-related death and hospital admission [247]. In this update, we found no evidence for the role of a specific sex/gender as a risk factor for complications of COVID-19 [67] [69] [71] [72] [73] [77] [78] [79] [87] [90] [92] [101] [103] [104] [105] [130] [141] [223] [226] [248] [249] [250] [251] [252]. Regarding the role of race in COVID-19 outcomes, some SRs suggest modest differences in the risk for severe disease and mortality with higher risk among Asians compared to other groups [71] [253] [254] [255]. Interestingly, newer SRs suggest different risks to acquire COVID-19 in people with different blood types, the highest risk being for those with blood type A and Rh-positive; however, the odds for severe COVID-19 and death are the highest among blood type AB individuals [256] [257] [258].

Stronger evidence is now emerging concerning pregnant women, neonates and children. Pregnant women are at higher risk for hospital admission (including ICU and invasive ventilation) if affected by COVID-19, compared to non-pregnant women [259] [260] [261] [262]. The risk is further increased if some of the abovementioned conditions are present, e.g., women who are obese, increased maternal age, pre-existing hypertension and diabetes [259] [263]. Neonates are at higher risk for complications if their mothers are COVID-19-positive, including admission to a neonatal unit, low birth weight and fetal distress, besides the possibility of acquiring the disease from their mothers (vertical transmission) [259] [260] [261] [263] [264] [265] [266] [267] [268]. Regarding children, although they are less prone to complications from COVID-19 [148] [269] [270] [271] [272] [273] [274], a history of cancer [275] or obesity [276] increases the risk for severe disease in this age group. We found no evidence fulfilling our inclusion criteria concerning the association between congenital and genetic syndromes (e.g., Down syndrome, intellectual disabilities) with the outcomes of COVID-19. This as a major knowledge gap that should be explored in future prospective studies.

We found moderate evidence suggesting more complications with COVID-19 among individuals who have tuberculosis, influenza, chronic hepatitis, HIV, rheumatic diseases, intestinal diseases,

dyslipidemia, secondary infections and vitamin D insufficiency. Also, individuals who underwent surgical procedures while affected by COVID-19 seem to face higher mortality rates [277].

A good document summarizing the key risk factors for severe COVID-19 disease can be found at: People who are at high risk for severe illness from COVID-19.

b. What are the signs and symptoms of covid-19 that oral health professionals should screen for prior to providing in-person health care?

b.1. Findings from the 1st update

We identified multiple systematic reviews and meta-analyses plus prospective cohort studies adding to the now strong literature on the signs and symptoms of COVID-19. The additional literature we identified largely confirmed the summary and list of symptoms provided in the earlier report (fever, cough, shortness of breath, fatigue and muscle weakness and aches, headache and digestive symptoms such as diarrhea [5] [9] [10] [19] [278] [279] [280] [281] [282] [283]), although notable new information has been added. This includes new signs and symptoms now recognized as among those often shown by people with COVID-19, including anosmia (lost sense of smell; 39-88%) [280] [281] [284] [285] and dysgesia (altered sense of taste; 81%) [285]. There were also important additions to the previous list of signs and symptoms, including loss of appetite (34%) [5], myocardial injury (16%) [286], dizziness (6%) [19] and confusion/agitation (5%) [281]. On top of this, there has been additional literature concerning symptoms experienced by children with COVID-19, including fever (53%), cough (39%) and sore throat (14%) [287]. The evidence concerning the symptoms experienced by pregnant women with COVID-19 remains relatively limited compared to the general population but new information now available includes estimates of the proportion of pregnant women with viral pneumonia (71-89%) [60], fever (44-63%) [60] [65] [288], cough (36-71%) [60] [65] [288], dyspnea (13-34%) [65] [288] and myalgia or fatigue (11%) [60].

b.2. Findings from the 2nd update

This second update found a large body of evidence confirming previously described signs and symptoms of COVID-19, including fever, cough, dyspnea, sore throat, muscle pain, headache, abdominal pain, diarrhea, agitation/confusion, dizziness, loss of appetite, as well as olfactory and gustatory impairment. Ischemic strokes also seem more frequent among COVID-19 patients [115] [164] [289] [290] [291] [292] [293].

Newly described findings include expectoration with blood (hemoptysis), chest pain and tightness [67] [69] [130] [294], and ocular manifestations (conjunctival symptoms) [295]. Specific laboratory and imaging findings can be seen in COVID-19 patients (please refer to **Appendix B for more information**).

Of special interest for oral healthcare providers, a single SR describes oral mucosal lesions associated with COVID-19 [296]. Patients may present irregular ulcers, small blisters and petechiae affecting palate, tongue, lips, gingiva or buccal mucosa. Desquamative gingivitis was also observed. Whereas mild cases seem to develop oral mucosal lesions before or at the onset of respiratory symptoms, patients who required medication and hospital admission may have those lesions between 7 and 24 days after symptoms started.

A good document concerning signs and symptoms of COVID-19 can be found at the following link: COVID-19 signs, symptoms and severity of disease: A clinician guide.

c. What evidence exists to support patient scheduling, waiting and other non-treatment management measures for in-person oral health care?

c.1. Findings from the 1st update

Again, several relevant systematic reviews were identified. One relevant publication reviewed COVID-19 transmission risk and protection protocols published by organizations in countries throughout the world and in academic journals [297]. They categorized the approaches they found common to all protocols in these publications into pre-, during and post-dental treatment measures as per Table 1 below. It is important to note that this summary of factors common to all reviewed dental COVID-19 protocols does not necessarily reflect any evidence to support their inclusion, or exactly what the advice for each factor is, rather it is a list of factors in dental COVID-19 dental protocols that were common to all review publications.

Table 1. Measures recommended in dental protocols identified in systematic review by Banakar et al. [297].

Stage of care	Measures recommended
Pre-dental treatment	
Before entering a dental office	Patient triage, identification potential COVID-19 cases, delay of non-urgent dental care, management of dental appointments, active and culturally safe screening of dental staff.
At the dental office	Active and culturally safe screening of patients, physical distancing in the dental office, cleaning and disinfection measures for patients, use of facemasks by everyone entering the dental office, patient education, use of personal protective equipment (PPE) by the dental team and management of the dental operatory room.

During dental treatment	Maintaining hand hygiene, offering preoperative anti-microbial mouth rinse to patients, using rubber dams, high-volume saliva ejectors, and extraoral dental radiographs, using 4-handed dentistry, avoiding aerosol-generating procedures, one-visit treatment and environmental cleaning and disinfection procedures.
Post-dental treatment	Cleaning and disinfecting reusable facial protective equipment, as well as management of laundry and medical waste.

This list of factors to consider and the categorization of the stages of pre-, during and post-dental treatment was very similar to those documented in two other systematic reviews on the subject [298] [299]. A review of guidelines for pediatric dentistry during the COVID-19 pandemic published throughout the world made similar observations but in addition, focused on the need for preventive and non-AGPs [300]. The authors mentioned focusing on using approaches including telehealth, using fluoride varnish and resin or sealing non-cavitated caries, using atraumatic restorative technique (ART), interim therapeutic restorations, indirect pulp capping, the Hall technique and silver diamine fluoride [300].

c.2. Findings from the 2nd update

Some included studies bring new information about telehealth, reaching moderate levels of evidence. The possibility of reducing physical contact and providing continuous care makes telehealth appropriate, with potential to reduce COVID-19-related morbidity and mortality [301]. Oral health-specific approaches were highlighted as useful for the present pandemic by two reviews [302] [303]. Examples of contributions by teledentistry include fewer in-person appointments and remote triage of the elderly, with good cost-effectiveness and acceptability by patients, caregivers, families and care facilities [304]. The use of remote appointments was also highlighted as favorable for evaluating cleft lip and palate patients, including their post-treatment follow-up [305]. Generic telehealth methods have been pointed as a way to guarantee better access to care during a lockdown [306] and to evaluate patients in chronic pain in certain circumstances [307]. One review suggested that the use of mobile apps in health care can increase the effectiveness of tasks such as training personnel and managing patients at risk or with symptoms of COVID-19 [308].

Recommended practices for patient management before entering the dental office include triage of possibly infected patients [309] [310] and restricting dental treatment to urgent care during high levels of infectious disease in the local community [303]. In-office approaches should include active screening with temperature measurement, minimum number of patients in waiting rooms, physical distancing, good ventilation and no shared objects among waiting patients and staff [309] [310] [311] [312]. Emergency treatment of COVID-19 patients should follow high levels of personal protection and be conducted within specifically equipped facilities [310]. A recent review questions the use of laboratory tests (e.g., ELISA and rapid serological assays) for SARS-Cov-2 in an oral

healthcare setting, and recommend simpler approaches instead, including an interview, checking temperature to rule out possible active COVID-19 cases and strict infection control [313].

In terms of disinfection of dental operative settings, disinfecton/cleaning of dental chairs after each patient is recommended, while disinfecton/cleaning of all other surfaces (e.g., operatory light, counters and delivery units) twice a day is also recommended [310]. Personal belongings and jewelry should not be worn by dental professionals during patient management. Another review suggests cleaning and disinfection of waiting and treatment areas between patients, including doorknobs, chairs, floor, desks, restrooms and elevators [309].

d. What evidence exists to support the use of various forms of personal protective equipment (PPE) while providing in-person oral health care?

d.1. Findings from the 1st update

We identified several systematic reviews with relevant information. One investigated the use of powered air-purifying respirators (PAPR) compared to N95 masks and other devices in the prevention of viral infection of health care workers, focusing on SARS-Cov-2, SARS-Cov-1, MERS and Ebola viruses. This review reported no difference in HCW infection rates using PAPR versus other respirator devices. They did note however, increased heat tolerance for HCWs using PARP but more difficulty communicating and with mobility [314]. Another review investigated the benefits for oral and maxillofacial surgeons of using N95 versus surgical masks when performing AGPs [315]. They concluded that most studies comparing the two showed no difference in infection rates of HCWs but there was some evidence suggesting that N95 masks may be better when performing an AGP with a patient known to be COVID-19 positive or whose status is unknown [315]. Another review of N95 and surgical masks and eyewear use in dental care reported that combined use of two or more measures (for example, mask and facial visor) is effective as a barrier to aerolized microbes, although this can be affected by multiple factors such as airflow dynamics, aerolized particle size, prolonged wearing and wetness of masks and poor fit. Importantly, they noted that no intervention on its own has been demonstrated effective at preventing infection [316]. We identified no research evidence that referred specifically to KN95 masks.

Another review investigated the physical and mental health impacts of COVID-19 on HCWs during the pandemic [317] and reported that working in a high-risk setting, having a COVID-19-diagnosed family member, inadequate hand hygiene, improper PPE use, close contact with patients ≥ 12 times daily, extended contact hours (≥15 daily) and unprotected exposure are associated with increased risk of COVID-19-related impacts for HCWs [317]. They also noted that prolonged PPE usage led to cutaneous manifestations and skin damage, that HCWs experienced high levels of depression, anxiety, insomnia and distress, and that female HCWs and nurses are disproportionately affected [317]. All this suggests the need for vigilance with infection control procedures, shorter work hours and mental health support for HCWs [317].

d.2. Findings from the 2nd update

Again, this update identified several relevant new SRs. This update found moderate evidence regarding protection of health care workers against COVID-19. In general, reviews stress the critical role of proper donning and doffing of PPE [318] [319]. Again, reviews highlight the adversities of prolonged use of PPE, with skin damage on the nasal bridge being the most common problem [320].

Several reviews approached specific PPE items, including:

- Face shields and eye protection: Their use should be combined with a mask or respirator [319] [321] and provide lateral facial protection [322].
- Respirators and masks: FFP3 respirators were recommended for treating COVID-19 suspected and confirmed patients in an SR [310]. Both FFP3 and FFP2 are at least equivalent to N95 [104]. An SR [318] found that powered air-purifying respirators (PAPR) may be more protective than N95 masks, although harder to don. Gowns are more protective against respiratory viruses, and risk can be further reduced by using a combination of sealed gown fitted tightly around neck and wrists, plus gloves. According to the same review, gloves lead to lower risk for contamination when worn by different methods: with tabs to facilitate doffing (same with masks), one-step removal with gowns, double gloving, and sanitizing with quaternary ammonium compounds or bleach before and after doffing. Type 3 medical masks are recommended as the standard protocol in a dental operatory, although they may not be very effective to prevent influenza-like illness [319] [323] [324].

Despite the evidence that complex PPEs and procedures (e.g., PAPR, doffing after sanitation) may be more protective in ideal settings, we lack data about their performance in diverse "real life" scenarios. Future studies should clarify whether more complexity may lead to higher risk of inadequate use of PPEs and thus higher risk of contamination in oral healthcare settings.

Several reviews compared N95 to medical masks [309] [310] [319] [321] [323]. General findings show that N95 masks may be superior in moderate- to high-risk clinical settings, with further reduction in the risk of COVID-19 infection and other respiratory viruses. Some reviews recommend that dental professionals, including oral and maxillofacial surgeons, should wear N95 masks when small-sized aerosolized particles are expected [319]. Although face masks (medical or not) may reduce primary respiratory infection risk [325], COVID-19-specific studies are still needed.

The Health Canada website also has information concerning PPE.

e. What evidence exists to support the decontamination and re-use of ppe?

e.1. Findings from the 1st update

We identified one additional systematic review on this subject [326]. The review investigated the use of microwave and heat-based decontamination of N95 masks and found that microwave irradiation may provide safe and effective viral decontamination for N95 masks while conserving function but that autoclaving did not do the latter so is not supported. The authors did however note that more research needs to be performed in "real world settings" to confirm their conclusions [327].

e.2. Findings from the 2nd update

Few included sources of evidence approached possible ways to re-use PPE. One scoping review did not recommend routine decontamination of facemasks, but rather in situations of shortage only [319]. Some specific decontamination methods before re-use of masks include:

- Ultraviolet C radiation (UV-C): able to inactivate SARS-CoV-2 and other respiratory viruses [319] in respirators and masks, without damaging them [321].
- Hydrogen peroxide vapor (H_2O_2): able to decontaminate without reducing the performance of respirators and masks [319] [321].
- Dry heat: as with H_2O_2, dry heat can decontaminate respirators and masks without damaging them [321].

f. What evidence exists concerning the provision of aerosol-generating procedures (AGP) as part of in-person oral health care?

f.1. Findings from the 1st update

We identified two systematic reviews with relevant subject matter published during the period July to October inclusive. One systematic review confirmed that SARS-Cov-2 is present in saliva and as well as sputum and the nasopharynx and concluded that saliva could be used to test for COVID-19 [328]. Another rapid systematic review was performed with the aim of classifying aerosol generating procedures (AGPs) [329]. They identified a list of procedures with strong agreement in the literature that they were AGPs. This list did not include dental procedures and the authors hypothesized that this non-inclusion of dental procedures is because they comprise a wide range of acts some of which are AGPs and others are not [329]. This raises the important point that the dental professions need to identify AGPs versus non-AGPs within dental procedures and this needs to be based on sound principles and science. This is important because it has implications for the use of PPE and other interventions while performing dental procedures.

f.2. Findings from the 2nd update

We identified limited evidence regarding this topic. Three reviews indicate that wastewater can be a source of infection by SARS-Cov-2 [330] [331] [332], although we identified no study fulfilling our inclusion criteria with recommendations for oral healthcare settings. Even with the paucity of direct evidence, it seems reasonable to highlight the importance of the careful management of water processors and sedimentation tanks in dental offices and laboratories, whose interior should be seen as a potential reservoir of the virus.

Regarding transmission by droplets, particles smaller than 5 µm can move beyond 8 meters and stay suspended for more than 2 hours [311]. Environmental conditions may affect the viability of SARS-Cov-2, with longest lifespan at low temperatures and high humidity.

Two SRs recommend a hierarchy of contamination risk for dental procedures, as follows [333]:

- Higher: Ultrasonic scaler, highspeed air-rotor, air-water syringe, air polishing, extractions using motorized handpieces;
- Moderate: slow-speed handpieces, prophylaxis, extractions;
- Lower: air-water syringe (water only) and hand scaling.

High-risk procedures also include laser surgery and osteotomies, commonly used in oral and maxillofacial surgery [315] [334] [335].

g. What evidence exists to support transmission mitigation strategies during the provision of in-person oral health care?

g.1. Findings from the 1st update

As previously mentioned, we identified a systematic review confirming that SARS-Cov-2 is present in saliva and as well as in sputum and the nasopharynx [328]. This is important to consider in the context of this topic concerning mitigating strategies. We also identified several systematic reviews published in the relevant period investigating a number of mitigating strategies during the provision of dental care and other health care procedures. A Cochrane review looked at a range of mitigating strategies including high volume evacuation, dental isolation combination systems, rubber dam and disinfectants, including disinfectant coolants [336]. The authors observed that all the studies included in their review investigated interventions' effects on colony forming units of bacteria, not viruses or respiratory disease transmission. They nevertheless concluded that there was probably benefit in using all the tested interventions but that the evidence to support them was weak [336]. Another Cochrane review investigated the potential protective effect against COVID-19 transmission of health care workers using antimicrobial mouthwashes and/or nasal sprays and identified no studies, although they did note a few relevant on-going randomized trials [337]. Another systematic review investigated the specific question "Does hydrogen peroxide mouthwash (at any

concentration) have a virucidal effect?" and identified no research fulfilling their quality criteria addressing this question, thereby concluding that there is no evidence to support the use of hydrogen peroxide mouthwash to control viral load [338]. A rapid systematic review noted the possible beneficial effect of hypertonic saline nasal washes and mouth washes to mechanically reduce viral load and so potentially reduce risk of transmission from patients with COVID-19 to others [339]. Finally, another systematic review investigated the potential benefits of anti-microbial mouthwashes in managing COVID and found no clinical studies, only in vitro evaluations of chlorhexidine, povidone-iodine and C31G. The review noted that all these mouthwashes demonstrated reduced viral load in in vitro studies but recognized the lack of clinical evidence [340].

In summary, there remains no evidence concerning interventions to mitigate viral or COVID-19 transmission during dental treatments but there is good evidence supporting Chlorhexidine mouthwash reducing bacterial load (this was identified in the previous version of this report). Evidence for other interventions is weak and equivocal.

g.2. Findings from the 2nd update

Newer systematic and scoping reviews indicate different methods to mitigate contamination during dental treatment, although evidence could be classified as limited. Two SRs recommend the use of chemomechanical caries removal, extraoral radiographs and hand scalers whenever possible [309].

High-volume evacuators (HVE) have also been recommended as a valid approach to reduce contamination during AGP, although included reviews gathered data from studies about bacterial contamination [309] [312] [319] [341]. The same has been stated for the use of a rubber dam, which is another effective method to reduce airborne particles and thus microbial contamination [310] [319] [312] [341].

Some of the reviews and clinical studies included in this update approach the use of different antimicrobial mouthrinses to reduce contamination in the mouth and pharynx. In general, the pre-procedural use of those mouthrinses is considered a valid method to reduce contamination by aerosols during dental treatment [309] [319] [341] [342], although the real benefit in COVID-19 patients remains unclear [343]. Povidone- iodine (PVP-I) and essential oils (EO) showed efficacy against SARS-CoV-2 in a small RCT (5 participants/mouthwash), when used as a prophylaxis for viral spread. In that trial, participants recruited from a COVID-19 reference center used either substances for 4-6 days (gargling for 30 sec, 3x/day), reaching negative viral load in most cases at 4 days [344]. There is evidence that reinforces the virucidal effect of PVP-I against other respiratory viruses [345], whereas EO, chlorhexidine (CHX) and cetylpyridinium chloride (CPC) mouthrinses are able to reduce airborne bacteria during AGP [341].

A recent RCT displays promising results for CPC-, dipotassium glycyrrhizinate- and tranexamic acid-based mouthrinses used 3x daily for 7 to 10 days before dental implant placement, as methods to reduce airborne bacterial contamination [346]. Finally, a systematic review states that there is no

evidence to support whether mouthwashes containing chlorine compounds, including chlorine dioxide and sodium chlorite, can prevent or manage COVID-19 [347].

h. What evidence exists to support space ventilation strategies that reduce the risk of transmission?

h.1. Findings from the 1st update

We identified one systematic review published in the relevant period and with pertinent information [336]. This Cochrane systematic review of multiple interventions to reduce aerosols during dental procedures reported one study with only two participants suggesting a stand-alone ventilation system may reduce aerosols during cavity preparation and ultrasonic scaler use [336]. It also reported another study with 50 participants suggesting laminar flow with a HEPA filter may reduce aerosols at 76cm from the floor and 20-30cm from a patient's mouth. However, they stated that no studies reported on viral contamination or disease transmission, rather they concerned bacterial contamination and the evidence was of low certainty [336].

h.2. Findings from the 2nd update

In the period, there were just three SRs and a scoping review about ventilation as a way to reduce COVID-19 transmission. Air purifiers with HEPA filters and room ventilation (30 min) between patients have been recommended as a protocol to reduce the risk of infection, as well as irradiation with UVC [309] [310]. Recommendations for HEPA filters included at least 99.995% retention for particles of 0.01 µm or more [348]. In case of emergency dental treatment of COVID-19-positive patients, the operatory room should be under negative pressure or continuous air exchange [312]. Although the role of air exchange is recommended for any patient [331], the exact degree of protection provided by those approaches is still unclear. Recommended air exchange rates depend on whether the patient is diagnosed with COVID-19, with at least 1.5 and 6.0 air change/hr for negative and positive patients, respectively [348].

i. What evidence exists to support the disinfection of surfaces in spaces in which oral health care is provided?

i.1. Findings from the 1st update

We identified one additional systematic review covering surface disinfection published during this period [349]. This review investigated the use of surface decontamination against SARS-Cov-2 and against airborne pathogens and directly transmitted viral pathogens in dental settings. They found no evidence that fulfilled their quality criteria concerning SARS-Cov-2. However, they reported finding good quality evidence that 70% ethanol and 0.5% sodium hypochlorite used as surface disinfectants reduce the possibility of surface transmission of respiratory viruses. They recommended applying these disinfectants on surfaces for 1 minute to reduce the risk of contamination with SARS-Cov-2 [349].

i.2. Findings from the 2nd update

This second update gathered more SRs about this topic than the previous update. Moderate evidence suggests the disinfection of impressions, trays and dental prostheses with 1% NaOCl for 1 minute as a way to reduce SARS-CoV infectivity [350]. A scoping review reinforces the need for routine disinfection of any dental prosthetic material with intermediate level disinfectants as well as methods to mitigate patients' gag reflex (e.g., proper suction and anaesthesia) [312].

Some reviews gathered limited evidence that certain disinfectants may reduce contamination by bacteria and other respiratory viruses on diverse surfaces, including door handles, chairs, desks and other surfaces that may be touched regularly. The most frequent disinfectants studied were 0.1% sodium hypochlorite, 62-70% isopropyl alcohol, 0.5% hydrogen peroxide [309] [310] [351]. Single SRs indicated successful viral inactivation with glutaraldehyde and iodine-containing detergents [351], whereas 0.05-0.2% benzalkonium chloride and 0.02% chlorhexidine digluconate were less able to inactivate various coronaviruses [331]. Finally, irradiation by ultraviolet-C (UV-C) has been stated as an effective method to inactivate pathogenic bacteria [352] and viruses [351]. Most of those agents may be useful against SARS-Cov-2, although this second update could not gather any direct evidence.

It is important to note that Health Canada has lists of surface disinfectants and hand sanitizers that it states are supported by evidence and likely to be effective against SARS-CoV-2. However, since disinfecting agents may damage dental materials and equipment and other surfaces, it is important to review their compatibility before use.

Glossary of abbreviations

Abbreviation	Explanation
AGP	Aerosol-generating procedures
CDC	Centers for Disease Control and Prevention
CFU	Colony-Forming Unit
CHX	Chlorhexidine
COVID-19	Coronavirus disease 2019
HVE	High-Volume Evacuation
H1N1	Influenza A
ICU	Intensive Care Unit
IgM	Immunoglobulin M
MERS	Middle East Respiratory Syndrome
PPE	Personal Protective Equipment
RCT	Randomized Controlled Trials
SARS	Severe Acute Respiratory Syndrome
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus-2
SR	Systematic Review
TMD	Temporomandibular disorders
UVGI	Ultra-violet Germicidal Irradiation

References

[1] T. Greenhalgh, How to read a paper. Getting your bearings (deciding what the paper is about), BMJ 315(7102) (1997) 243-6.
[2] G.H. Guyatt, D.L. Sackett, J.C. Sinclair, R. Hayward, D.J. Cook, R.J. Cook, Users' guides to the medical literature. IX. A method for grading health care recommendations. Evidence-Based Medicine Working Group, JAMA 274(22) (1995) 1800-4.
[3] Oxford Centre for Evidence-based Medicine, Levels of evidence, 2009.
[4] S.M. Abate, S. Ahmed Ali, B. Mantfardo, B. Basu, Rate of Intensive Care Unit admission and outcomes among patients with coronavirus: A systematic review and Meta-analysis, PLoS One 15(7) (2020) e0235653.
[5] S. Bennett, J. Tafuro, J. Mayer, D. Darlington, C.W. Wong, E.A. Muntean, N. Wong, C. Mallen, C.S. Kwok, Clinical features and outcomes of adults with coronavirus disease 2019: A systematic review and pooled analysis of the literature, Int J Clin Pract (2020) e13725.
[6] A. Hessami, A. Shamshirian, K. Heydari, F. Pourali, R. Alizadeh-Navaei, M. Moosazadeh, S. Abrotan, L. Shojaie, S. Sedighi, D. Shamshirian, N. Rezaei, Cardiovascular diseases burden in COVID-19: Systematic review and meta-analysis, Am J Emerg Med (2020).
[7] H. Liu, S. Chen, M. Liu, H. Nie, H. Lu, Comorbid Chronic Diseases are Strongly Correlated with Disease Severity among COVID-19 Patients: A Systematic Review and Meta-Analysis, Aging Dis 11(3) (2020) 668-678.
[8] K. Nandy, A. Salunke, S.K. Pathak, A. Pandey, C. Doctor, K. Puj, M. Sharma, A. Jain, V. Warikoo, Coronavirus disease (COVID-19): A systematic review and meta-analysis to evaluate the impact of various comorbidities on serious events, Diabetes Metab Syndr 14(5) (2020) 1017-1025.
[9] J. Meena, J. Yadav, L. Saini, A. Yadav, J. Kumar, Clinical Features and Outcome of SARS-CoV-2 Infection in Children: A Systematic Review and Meta-analysis, Indian Pediatr 57(9) (2020) 820-826.
[10] P. Qiu, Y. Zhou, F. Wang, H. Wang, M. Zhang, X. Pan, Q. Zhao, J. Liu, Clinical characteristics, laboratory outcome characteristics, comorbidities, and complications of related COVID-19 deceased: a systematic review and meta-analysis, Aging Clin Exp Res 32(9) (2020) 1869-1878.
[11] A.K. Singh, C.L. Gillies, R. Singh, A. Singh, Y. Chudasama, B. Coles, S. Seidu, F. Zaccardi, M.J. Davies, K. Khunti, Prevalence of co-morbidities and their association with mortality in patients with COVID-19: A systematic review and meta-analysis, Diabetes Obes Metab 22(10) (2020) 1915-1924.
[12] T. Wu, Z. Zuo, S. Kang, L. Jiang, X. Luo, Z. Xia, J. Liu, X. Xiao, M. Ye, M. Deng, Multi-organ Dysfunction in Patients with COVID-19: A Systematic Review and Meta-analysis, Aging Dis 11(4) (2020) 874-894.
[13] J.N. Yu, B.B. Wu, J. Yang, X.L. Lei, W.Q. Shen, Cardio-Cerebrovascular Disease is Associated With Severity and Mortality of COVID-19: A Systematic Review and Meta-Analysis, Biol Res Nurs 23(2) (2021) 258-269.
[14] S. Figliozzi, P.G. Masci, N. Ahmadi, L. Tondi, E. Koutli, A. Aimo, K. Stamatelopoulos, M.A. Dimopoulos, A.L.P. Caforio, G. Georgiopoulos, Predictors of adverse prognosis in COVID-19: A systematic review and meta-analysis, Eur J Clin Invest 50(10) (2020) e13362.
[15] R. Pranata, I. Huang, M.A. Lim, E.J. Wahjoepramono, J. July, Impact of cerebrovascular and cardiovascular diseases on mortality and severity of COVID-19-systematic review, meta-analysis, and meta-regression, J Stroke Cerebrovasc Dis 29(8) (2020) 104949.

[16] R. Pranata, I. Huang, S.B. Raharjo, Incidence and impact of cardiac arrhythmias in coronavirus disease 2019 (COVID-19): A systematic review and meta-analysis, Indian Pacing Electrophysiol J 20(5) (2020) 193-198.
[17] A.M.A. Shafi, S.A. Shaikh, M.M. Shirke, S. Iddawela, A. Harky, Cardiac manifestations in COVID-19 patients-A systematic review, J Card Surg 35(8) (2020) 1988-2008.
[18] J. Li, X. He, Y. Yuan, W. Zhang, X. Li, Y. Zhang, S. Li, C. Guan, Z. Gao, G. Dong, Meta-analysis investigating the relationship between clinical features, outcomes, and severity of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pneumonia, Am J Infect Control 49(1) (2021) 82-89.
[19] D.T. Di Carlo, N. Montemurro, G. Petrella, G. Siciliano, R. Ceravolo, P. Perrini, Exploring the clinical association between neurological symptoms and COVID-19 pandemic outbreak: a systematic review of current literature, J Neurol (2020).
[20] M.J. Cummings, M.R. Baldwin, D. Abrams, S.D. Jacobson, B.J. Meyer, E.M. Balough, J.G. Aaron, J. Claassen, L.E. Rabbani, J. Hastie, B.R. Hochman, J. Salazar-Schicchi, N.H. Yip, D. Brodie, M.R. O'Donnell, Epidemiology, clinical course, and outcomes of critically ill adults with COVID-19 in New York City: a prospective cohort study, Lancet 395(10239) (2020) 1763-1770.
[21] I. Huang, M.A. Lim, R. Pranata, Diabetes mellitus is associated with increased mortality and severity of disease in COVID-19 pneumonia - A systematic review, meta-analysis, and meta-regression, Diabetes Metab Syndr 14(4) (2020) 395-403.
[22] S. Khateri, H. Mohammadi, R. Khateri, Y. Moradi, The Prevalence of Underlying Diseases and Comorbidities in COVID-19 Patients; an Updated Systematic Review and Meta-analysis, Arch Acad Emerg Med 8(1) (2020) e72.
[23] Y. Wang, J. Chen, W. Chen, L. Liu, M. Dong, J. Ji, D. Hu, N. Zhang, Does Asthma Increase the Mortality of Patients with COVID-19?: A Systematic Review and Meta-Analysis, Int Arch Allergy Immunol 182(1) (2021) 76-82.
[24] A. Abdi, M. Jalilian, P.A. Sarbarzeh, Z. Vlaisavljevic, Diabetes and COVID-19: A systematic review on the current evidences, Diabetes Res Clin Pract 166 (2020) 108347.
[25] I. Pinedo-Torres, M. Flores-Fernandez, M. Yovera-Aldana, C. Gutierrez-Ortiz, P. Zegarra-Lizana, C. Intimayta-Escalante, C. Moran-Marinos, C. Alva-Diaz, K. Pacheco-Barrios, Prevalence of Diabetes Mellitus and Its Associated Unfavorable Outcomes in Patients With Acute Respiratory Syndromes Due to Coronaviruses Infection: A Systematic Review and Meta-Analysis, Clin Med Insights Endocrinol Diabetes 13 (2020) 1179551420962495.
[26] L. Guo, Z. Shi, Y. Zhang, C. Wang, N.C. Do Vale Moreira, H. Zuo, A. Hussain, Comorbid diabetes and the risk of disease severity or death among 8807 COVID-19 patients in China: A meta-analysis, Diabetes Res Clin Pract 166 (2020) 108346.
[27] J. Chen, C. Wu, X. Wang, J. Yu, Z. Sun, The Impact of COVID-19 on Blood Glucose: A Systematic Review and Meta-Analysis, Front Endocrinol (Lausanne) 11 (2020) 574541.
[28] A. Mantovani, C.D. Byrne, M.H. Zheng, G. Targher, Diabetes as a risk factor for greater COVID-19 severity and in-hospital death: A meta-analysis of observational studies, Nutr Metab Cardiovasc Dis 30(8) (2020) 1236-1248.
[29] A.V. Kulkarni, P. Kumar, H.V. Tevethia, M. Premkumar, J.P. Arab, R. Candia, R. Talukdar, M. Sharma, X. Qi, P.N. Rao, D.N. Reddy, Systematic review with meta-analysis: liver manifestations and outcomes in COVID-19, Aliment Pharmacol Ther 52(4) (2020) 584-599.

[30] A.J. Kovalic, S.K. Satapathy, P.J. Thuluvath, Prevalence of chronic liver disease in patients with COVID-19 and their clinical outcomes: a systematic review and meta-analysis, Hepatol Int 14(5) (2020) 612-620.
[31] A. Sharma, P. Jaiswal, Y. Kerakhan, L. Saravanan, Z. Murtaza, A. Zergham, N.S. Honganur, A. Akbar, A. Deol, B. Francis, S. Patel, D. Mehta, R. Jaiswal, J. Singh, U. Patel, P. Malik, Liver disease and outcomes among COVID-19 hospitalized patients - A systematic review and meta-analysis, Ann Hepatol 21 (2021) 100273.
[32] S.K. Kunutsor, J.A. Laukkanen, Renal complications in COVID-19: a systematic review and meta-analysis, Ann Med 52(7) (2020) 345-353.
[33] I. Cheruiyot, B. Henry, G. Lippi, V. Kipkorir, B. Ngure, J. Munguti, M. Misiani, Acute Kidney Injury is Associated with Worse Prognosis In COVID-19 Patients: A Systematic Review and Meta-analysis, Acta Biomed 91(3) (2020) e2020029.
[34] D. Huang, X. Lian, F. Song, H. Ma, Z. Lian, Y. Liang, T. Qin, W. Chen, S. Wang, Clinical features of severe patients infected with 2019 novel coronavirus: a systematic review and meta-analysis, Ann Transl Med 8(9) (2020) 576.
[35] N. Potere, E. Valeriani, M. Candeloro, M. Tana, E. Porreca, A. Abbate, S. Spoto, A.W.S. Rutjes, M. Di Nisio, Acute complications and mortality in hospitalized patients with coronavirus disease 2019: a systematic review and meta-analysis, Crit Care 24(1) (2020) 389.
[36] S.Y. Robbins-Juarez, L. Qian, K.L. King, J.S. Stevens, S.A. Husain, J. Radhakrishnan, S. Mohan, Outcomes for Patients With COVID-19 and Acute Kidney Injury: A Systematic Review and Meta-Analysis, Kidney Int Rep 5(8) (2020) 1149-1160.
[37] M. Shao, X. Li, F. Liu, T. Tian, J. Luo, Y. Yang, Acute kidney injury is associated with severe infection and fatality in patients with COVID-19: A systematic review and meta-analysis of 40 studies and 24,527 patients, Pharmacol Res 161 (2020) 105107.
[38] C.B. Oliveira, C.A.D. Lima, G. Vajgel, A.V. Campos Coelho, P. Sandrin-Garcia, High burden of acute kidney injury in COVID-19 pandemic: systematic review and meta-analysis, J Clin Pathol (2020).
[39] L. Ouyang, Y. Gong, Y. Zhu, J. Gong, Association of acute kidney injury with the severity and mortality of SARS-CoV-2 infection: A meta-analysis, Am J Emerg Med (2020).
[40] Y. Du, Y. Lv, W. Zha, N. Zhou, X. Hong, Association of body mass index (BMI) with critical COVID-19 and in-hospital mortality: A dose-response meta-analysis, Metabolism 117 (2021) 154373.
[41] A. Hussain, K. Mahawar, Z. Xia, W. Yang, S. El-Hasani, Obesity and mortality of COVID-19. Meta-analysis, Obes Res Clin Pract 14(4) (2020) 295-300.
[42] P. Malik, U. Patel, K. Patel, M. Martin, C. Shah, D. Mehta, F.A. Malik, A. Sharma, Obesity a predictor of outcomes of COVID-19 hospitalized patients-A systematic review and meta-analysis, J Med Virol 93(2) (2021) 1188-1193.
[43] S.H.C. Sales-Peres, L.J. de Azevedo-Silva, R.C.S. Bonato, M.C. Sales-Peres, A. Pinto, J.F. Santiago Junior, Coronavirus (SARS-CoV-2) and the risk of obesity for critically illness and ICU admitted: Meta-analysis of the epidemiological evidence, Obes Res Clin Pract 14(5) (2020) 389-397.
[44] Y. Tian, X. Qiu, C. Wang, J. Zhao, X. Jiang, W. Niu, J. Huang, F. Zhang, Cancer associates with risk and severe events of COVID-19: A systematic review and meta-analysis, Int J Cancer 148(2) (2021) 363-374.
[45] I. Cheruiyot, V. Kipkorir, B. Ngure, M. Misiani, J. Munguti, Cancer is associated with coronavirus disease (COVID-19) severity and mortality: A pooled analysis, Am J Emerg Med (2020).

[46] A.A. Salunke, K. Nandy, S.K. Pathak, J. Shah, M. Kamani, V. Kottakota, P. Thivari, A. Pandey, K. Patel, P. Rathod, S. Bhatt, P. Dave, S. Pandya, Impact of COVID -19 in cancer patients on severity of disease and fatal outcomes: A systematic review and meta-analysis, Diabetes Metab Syndr 14(5) (2020) 1431-1437.
[47] L.Y.W. Lee, J.B. Cazier, T. Starkey, S.E.W. Briggs, R. Arnold, V. Bisht, S. Booth, N.A. Campton, V.W.T. Cheng, G. Collins, H.M. Curley, P. Earwaker, M.W. Fittall, S. Gennatas, A. Goel, S. Hartley, D.J. Hughes, D. Kerr, A.J.X. Lee, R.J. Lee, S.M. Lee, H. McKenzie, C.P. Middleton, N. Murugaesu, T. Newsom-Davis, A.C. Olsson-Brown, C. Palles, T. Powles, E.A. Protheroe, K. Purshouse, A. Sharma-Oates, S. Sivakumar, A.J. Smith, O. Topping, C.D. Turnbull, C. Varnai, A.D.M. Briggs, G. Middleton, R. Kerr, U.K.C.C.M.P. Team, COVID-19 prevalence and mortality in patients with cancer and the effect of primary tumour subtype and patient demographics: a prospective cohort study, Lancet Oncol 21(10) (2020) 1309-1316.
[48] W.A. Florez-Perdomo, S.A. Serrato-Vargas, P. Bosque-Varela, L.R. Moscote-Salazar, A.F. Joaquim, A. Agrawal, A.R. Soto-Angel, L.T. Tovar-Montenegro, Relationship between the history of cerebrovascular disease and mortality in COVID-19 patients: A systematic review and meta-analysis, Clin Neurol Neurosurg 197 (2020) 106183.
[49] M. Ghannam, Q. Alshaer, M. Al-Chalabi, L. Zakarna, J. Robertson, G. Manousakis, Neurological involvement of coronavirus disease 2019: a systematic review, J Neurol 267(11) (2020) 3135-3153.
[50] A. MadaniNeishaboori, D. Moshrefiaraghi, K. Mohamed Ali, A. Toloui, M. Yousefifard, M. Hosseini, Central Nervous System Complications in COVID-19 Patients; a Systematic Review and Meta-Analysis based on Current Evidence, Arch Acad Emerg Med 8(1) (2020) e62.
[51] U. Patel, P. Malik, D. Shah, A. Patel, M. Dhamoon, V. Jani, Pre-existing cerebrovascular disease and poor outcomes of COVID-19 hospitalized patients: a meta-analysis, J Neurol 268(1) (2021) 240-247.
[52] C. Bonanad, S. Garcia-Blas, F. Tarazona-Santabalbina, J. Sanchis, V. Bertomeu-Gonzalez, L. Facila, A. Ariza, J. Nunez, A. Cordero, The Effect of Age on Mortality in Patients With COVID-19: A Meta-Analysis With 611,583 Subjects, J Am Med Dir Assoc 21(7) (2020) 915-918.
[53] A. Neumann-Podczaska, S.R. Al-Saad, L.M. Karbowski, M. Chojnicki, S. Tobis, K. Wieczorowska-Tobis, COVID 19 - Clinical Picture in the Elderly Population: A Qualitative Systematic Review, Aging Dis 11(4) (2020) 988-1008.
[54] B.B. Abate, A.M. Kassie, M.W. Kassaw, T.G. Aragie, S.A. Masresha, Sex difference in coronavirus disease (COVID-19): a systematic review and meta-analysis, BMJ Open 10(10) (2020) e040129.
[55] M.J. Nasiri, S. Haddadi, A. Tahvildari, Y. Farsi, M. Arbabi, S. Hasanzadeh, P. Jamshidi, M. Murthi, M. Mirsaeidi, COVID-19 Clinical Characteristics, and Sex-Specific Risk of Mortality: Systematic Review and Meta-Analysis, Front Med (Lausanne) 7 (2020) 459.
[56] A. Ortolan, M. Lorenzin, M. Felicetti, A. Doria, R. Ramonda, Does gender influence clinical expression and disease outcomes in COVID-19? A systematic review and meta-analysis, Int J Infect Dis 99 (2020) 496-504.
[57] C.R. Jutzeler, L. Bourguignon, C.V. Weis, B. Tong, C. Wong, B. Rieck, H. Pargger, S. Tschudin-Sutter, A. Egli, K. Borgwardt, M. Walter, Comorbidities, clinical signs and symptoms, laboratory findings, imaging features, treatment strategies, and outcomes in adult and pediatric patients with COVID-19: A systematic review and meta-analysis, Travel Med Infect Dis 37 (2020) 101825.
[58] J. Hewitt, B. Carter, A. Vilches-Moraga, T.J. Quinn, P. Braude, A. Verduri, L. Pearce, M. Stechman, R. Short, A. Price, J.T. Collins, E. Bruce, A. Einarsson, F. Rickard, E. Mitchell, M. Holloway, J. Hesford, F. Barlow-Pay, E. Clini, P.K. Myint, S.J. Moug, K. McCarthy, C.S. Collaborators, The effect of frailty on

survival in patients with COVID-19 (COPE): a multicentre, European, observational cohort study, Lancet Public Health 5(8) (2020) e444-e451.
[59] H. Akhtar, C. Patel, E. Abuelgasim, A. Harky, COVID-19 (SARS-CoV-2) Infection in Pregnancy: A Systematic Review, Gynecol Obstet Invest 85(4) (2020) 295-306.
[60] K. Diriba, E. Awulachew, E. Getu, The effect of coronavirus infection (SARS-CoV-2, MERS-CoV, and SARS-CoV) during pregnancy and the possibility of vertical maternal-fetal transmission: a systematic review and meta-analysis, Eur J Med Res 25(1) (2020) 39.
[61] A.M. Kotlyar, O. Grechukhina, A. Chen, S. Popkhadze, A. Grimshaw, O. Tal, H.S. Taylor, R. Tal, Vertical transmission of coronavirus disease 2019: a systematic review and meta-analysis, Am J Obstet Gynecol 224(1) (2021) 35-53 e3.
[62] A. Tanacan, S.A. Erol, B. Turgay, A.T. Anuk, E.I. Secen, G.F. Yegin, S. Ozyer, F. Kirca, B. Dinc, S. Unlu, E.G. Yapar Eyi, H.L. Keskin, D. Sahin, A.A. Surel, O.M. Tekin, The rate of SARS-CoV-2 positivity in asymptomatic pregnant women admitted to hospital for delivery: Experience of a pandemic center in Turkey, Eur J Obstet Gynecol Reprod Biol 253 (2020) 31-34.
[63] H. Chi, N.C. Chiu, Y.L. Tai, H.Y. Chang, C.H. Lin, Y.H. Sung, C.Y. Tseng, L.Y. Liu, C.Y. Lin, Clinical features of neonates born to mothers with coronavirus disease-2019: A systematic review of 105 neonates, J Microbiol Immunol Infect 54(1) (2021) 69-76.
[64] B.J.F. Huntley, E.S. Huntley, D. Di Mascio, T. Chen, V. Berghella, S.P. Chauhan, Rates of Maternal and Perinatal Mortality and Vertical Transmission in Pregnancies Complicated by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-Co-V-2) Infection: A Systematic Review, Obstet Gynecol 136(2) (2020) 303-312.
[65] A. Khalil, E. Kalafat, C. Benlioglu, P. O'Brien, E. Morris, T. Draycott, S. Thangaratinam, K. Le Doare, P. Heath, S. Ladhani, P. von Dadelszen, L.A. Magee, SARS-CoV-2 infection in pregnancy: A systematic review and meta-analysis of clinical features and pregnancy outcomes, EClinicalMedicine 25 (2020) 100446.
[66] O. Turan, A. Hakim, P. Dashraath, W.J.L. Jeslyn, A. Wright, R. Abdul-Kadir, Clinical characteristics, prognostic factors, and maternal and neonatal outcomes of SARS-CoV-2 infection among hospitalized pregnant women: A systematic review, Int J Gynaecol Obstet 151(1) (2020) 7-16.
[67] T. Zhang, W.S. Huang, W. Guan, Z. Hong, J. Gao, G. Gao, G. Wu, Y.Y. Qin, Risk factors and predictors associated with the severity of COVID-19 in China: a systematic review, meta-analysis, and meta-regression, J Thorac Dis 12(12) (2020) 7429-7441.
[68] J. Sabatino, S. De Rosa, G. Di Salvo, C. Indolfi, Impact of cardiovascular risk profile on COVID-19 outcome. A meta-analysis, PLoS One 15(8) (2020) e0237131.
[69] M.A. Barek, M.A. Aziz, M.S. Islam, Impact of age, sex, comorbidities and clinical symptoms on the severity of COVID-19 cases: A meta-analysis with 55 studies and 10014 cases, Heliyon 6(12) (2020) e05684.
[70] S.S.W.R.M.-P.P.P.O.H.M.A.-V.N.H.J.S.E.E.G. Barrera FJ, “Prevalence of Diabetes and Hypertension and Their Associated Risks for Poor Outcomes in Covid-19 Patients, J Endocr Soc. 4(9) (2020) bvaa102.
[71] A. Bhattacharyya, A. Seth, N. Srivast, M. Imeokparia, S. Rai, Coronavirus (COVID-19): A Systematic Review and Meta-analysis to Evaluate the Significance of Demographics and Comorbidities, Res Sq (2021).
[72] M. Biswas, S. Rahaman, T.K. Biswas, Z. Haque, B. Ibrahim, Association of Sex, Age, and Comorbidities with Mortality in COVID-19 Patients: A Systematic Review and Meta-Analysis, Intervirology (2020) 1-12.

[73] V. Chidambaram, N.L. Tun, W.Z. Haque, M.G. Majella, R.K. Sivakumar, A. Kumar, A.T. Hsu, I.A. Ishak, A.A. Nur, S.K. Ayeh, E.L. Salia, E.A.A. Zil, M.A. Saeed, A.P.B. Sarena, B. Seth, M. Ahmadzada, E.F. Haque, P. Neupane, K.H. Wang, T.M. Pu, S.M.H. Ali, M.A. Arshad, L. Wang, S. Baksh, P.C. Karakousis, P. Galiatsatos, Factors associated with disease severity and mortality among patients with COVID-19: A systematic review and meta-analysis, PLoS One 15(11) (2020) e0241541.
[74] C.S.G.-G. Cordero A., V. Bertomeu-Gonzalez, L. Facila, M. Rodriguez-Manero, D. Escribano, J. M. Castellano, P. Zuazola, J. Nunez, J. J. Badimon and J. R. Gonzalez-Juanatey, , Mortality associated with cardiovascular disease in patients with COVID-19, REC: CardioClinics 56(1) (2020) 30-33.
[75] T. Dalia, S. Lahan, S. Ranka, P. Acharya, A. Gautam, A. Goyal, I. Mastoris, A. Sauer, Z. Shah, Impact of congestive heart failure and role of cardiac biomarkers in COVID-19 patients: A systematic review and meta-analysis, Indian Heart J 73(1) (2021) 91-98.
[76] B.D.P.Z.L.e.a. de Almeida-Pititto, Severity and mortality of COVID 19 in patients with diabetes, hypertension and cardiovascular disease: a meta-analysis, Diabetol Metab Syndr 12(75) (2020).
[77] F. Del Sole, A. Farcomeni, L. Loffredo, R. Carnevale, D. Menichelli, T. Vicario, P. Pignatelli, D. Pastori, Features of severe COVID-19: A systematic review and meta-analysis, Eur J Clin Invest 50(10) (2020) e13378.
[78] K. Dorjee, H. Kim, E. Bonomo, R. Dolma, Prevalence and predictors of death and severe disease in patients hospitalized due to COVID-19: A comprehensive systematic review and meta-analysis of 77 studies and 38,000 patients, PLoS One 15(12) (2020) e0243191.
[79] Y. Du, N. Zhou, W. Zha, Y. Lv, Hypertension is a clinically important risk factor for critical illness and mortality in COVID-19: A meta-analysis, Nutr Metab Cardiovasc Dis 31(3) (2021) 745-755.
[80] M. Ebrahimi, A.S. Malehi, F. Rahim, COVID-19 Patients: A Systematic Review and Meta-Analysis of Laboratory Findings, Comorbidities, and Clinical Outcomes Comparing Medical Staff versus the General Population, Osong Public Health Res Perspect 11(5) (2020) 269-279.
[81] A. Emami, F. Javanmardi, N. Pirbonyeh, A. Akbari, Prevalence of Underlying Diseases in Hospitalized Patients with COVID-19: a Systematic Review and Meta-Analysis, Arch Acad Emerg Med 8(1) (2020) e35.
[82] M. Fathi, K. Vakili, F. Sayehmiri, A. Mohamadkhani, M. Hajiesmaeili, M. Rezaei-Tavirani, O. Eilami, The prognostic value of comorbidity for the severity of COVID-19: A systematic review and meta-analysis study, PLoS One 16(2) (2021) e0246190.
[83] X. Guo, Y. Zhu, Y. Hong, Decreased Mortality of COVID-19 With Renin-Angiotensin-Aldosterone System Inhibitors Therapy in Patients With Hypertension: A Meta-Analysis, Hypertension 76(2) (2020) e13-e14.
[84] J.L. Honardoost M, Aghili R, Emami Z, Khamseh ME. , The Association between Presence of Comorbidities and COVID-19 Severity: A Systematic Review and Meta-Analysis., Cerebrovasc Dis. 2 (2021) 1-9.
[85] F. Javanmardi, A. Keshavarzi, A. Akbari, A. Emami, N. Pirbonyeh, Prevalence of underlying diseases in died cases of COVID-19: A systematic review and meta-analysis, PLoS One 15(10) (2020) e0241265.
[86] Z.A. Katzenschlager S, Gottschalk C, Grafeneder J, Seitel A, Maier-Hein L, Benedetti A, Larmann J, Weigand MA, McGrath S, Denkinger CM. , Can we predict the severe course of COVID-19 - a systematic review and meta-analysis of indicators of clinical outcome?, medRxiv [Preprint]. 12 (2020).
[87] A.H. Khamis, M. Jaber, A. Azar, F. AlQahtani, K. Bishawi, A. Shanably, Clinical and laboratory findings of COVID-19: A systematic review and meta-analysis, J Formos Med Assoc (2020).

[88] M.M.A. Khan, M.N. Khan, M.G. Mustagir, J. Rana, M.S. Islam, M.I. Kabir, Effects of underlying morbidities on the occurrence of deaths in COVID-19 patients: A systematic review and meta-analysis, J Glob Health 10(2) (2020) 020503.
[89] M. Koeppen, P. Rosenberger, H. Magunia, COVID-19 Related Cardiovascular Comorbidities and Complications in Critically Ill Patients: A Systematic Review and Meta-analysis, Clin Med Insights Circ Respir Pulm Med 15 (2021) 1179548421992327.
[90] L. Lu, W. Zhong, Z. Bian, Z. Li, K. Zhang, B. Liang, Y. Zhong, M. Hu, L. Lin, J. Liu, X. Lin, Y. Huang, J. Jiang, X. Yang, X. Zhang, Z. Huang, A comparison of mortality-related risk factors of COVID-19, SARS, and MERS: A systematic review and meta-analysis, J Infect 81(4) (2020) e18-e25.
[91] K.J. Mahumud RA, Renzaho AMN. , The epidemiological burden and overall distribution of chronic comorbidities in coronavirus disease-2019 among 202,005 infected patients: evidence from a systematic review and meta-analysis, Infection. 48(6) (2020) 813-833.
[92] K. Matsushita, N. Ding, M. Kou, X. Hu, M. Chen, Y. Gao, Y. Honda, D. Zhao, D. Dowdy, Y. Mok, J. Ishigami, L.J. Appel, The Relationship of COVID-19 Severity with Cardiovascular Disease and Its Traditional Risk Factors: A Systematic Review and Meta-Analysis, Glob Heart 15(1) (2020) 64.
[93] M. Meng, Q. Zhao, R. Kumar, C. Bai, Y. Deng, B. Wan, Impact of cardiovascular and metabolic diseases on the severity of COVID-19: a systematic review and meta-analysis, Aging (Albany NY) 12(22) (2020) 23409-23421.
[94] A.E. Mesas, I. Cavero-Redondo, C. Alvarez-Bueno, M.A. Sarria Cabrera, S. Maffei de Andrade, I. Sequi-Dominguez, V. Martinez-Vizcaino, Predictors of in-hospital COVID-19 mortality: A comprehensive systematic review and meta-analysis exploring differences by age, sex and health conditions, PLoS One 15(11) (2020) e0241742.
[95] L.E. Miller, R. Bhattacharyya, A.L. Miller, Diabetes mellitus increases the risk of hospital mortality in patients with Covid-19: Systematic review with meta-analysis, Medicine (Baltimore) 99(40) (2020) e22439.
[96] B. Moazzami, S. Chaichian, A. Kasaeian, S. Djalalinia, M. Akhlaghdoust, M. Eslami, B. Broumand, Metabolic risk factors and risk of Covid-19: A systematic review and meta-analysis, PLoS One 15(12) (2020) e0243600.
[97] S. Momtazmanesh, P. Shobeiri, S. Hanaei, H. Mahmoud-Elsayed, B. Dalvi, E. Malakan Rad, Cardiovascular disease in COVID-19: a systematic review and meta-analysis of 10,898 patients and proposal of a triage risk stratification tool, Egypt Heart J 72(1) (2020) 41.
[98] M. Mudatsir, J.K. Fajar, L. Wulandari, G. Soegiarto, M. Ilmawan, Y. Purnamasari, B.A. Mahdi, G.D. Jayanto, S. Suhendra, Y.A. Setianingsih, R. Hamdani, D.A. Suseno, K. Agustina, H.Y. Naim, M. Muchlas, H.H.D. Alluza, N.A. Rosida, M. Mayasari, M. Mustofa, A. Hartono, R. Aditya, F. Prastiwi, F.X. Meku, M. Sitio, A. Azmy, A.S. Santoso, R.A. Nugroho, C. Gersom, A.A. Rabaan, S. Masyeni, F. Nainu, A.L. Wagner, K. Dhama, H. Harapan, Predictors of COVID-19 severity: a systematic review and meta-analysis, F1000Res 9 (2020) 1107.
[99] M.B. Naeini, M. Sahebi, F. Nikbakht, Z. Jamshidi, M. Ahmadimanesh, M. Hashemi, J. Ramezani, H.H. Miri, R. Yazdian-Robati, A meta-meta-analysis: Evaluation of meta-analyses published in the effectiveness of cardiovascular comorbidities on the severity of COVID-19, Obes Med 22 (2021) 100323.
[100] W.H. Ng, T. Tipih, N.A. Makoah, J.G. Vermeulen, D. Goedhals, J.B. Sempa, F.J. Burt, A. Taylor, S. Mahalingam, Comorbidities in SARS-CoV-2 Patients: a Systematic Review and Meta-Analysis, mBio 12(1) (2021).

[101] I.M. Noor FM, Prevalence and Associated Risk Factors of Mortality Among COVID-19 Patients: A Meta-Analysis, J Community Health. 45(6) (2020) 1270-1282.
[102] R. Parveen, N. Sehar, R. Bajpai, N.B. Agarwal, Association of diabetes and hypertension with disease severity in covid-19 patients: A systematic literature review and exploratory meta-analysis, Diabetes Res Clin Pract 166 (2020) 108295.
[103] N.M. Radwan, N.E. Mahmoud, A.H. Alfaifi, K.I. Alabdulkareem, Comorbidities and severity of coronavirus disease 2019 patients, Saudi Med J 41(11) (2020) 1165-1174.
[104] H.S. Rahman, M.S. Aziz, R.H. Hussein, H.H. Othman, S.H. Salih Omer, E.S. Khalid, N.A. Abdulrahman, K. Amin, R. Abdullah, The transmission modes and sources of COVID-19: A systematic review, International Journal of Surgery Open 26(0) (2020) 125-136.
[105] M. Sepandi, M. Taghdir, Y. Alimohamadi, S. Afrashteh, H. Hosamirudsari, Factors Associated with Mortality in COVID-19 Patients: A Systematic Review and Meta-Analysis, Iran J Public Health 49(7) (2020) 1211-1221.
[106] A. Silverio, M. Di Maio, R. Citro, L. Esposito, G. Iuliano, M. Bellino, C. Baldi, G. De Luca, M. Ciccarelli, C. Vecchione, G. Galasso, Cardiovascular risk factors and mortality in hospitalized patients with COVID-19: systematic review and meta-analysis of 45 studies and 18,300 patients, BMC Cardiovasc Disord 21(1) (2021) 23.
[107] P. Ssentongo, A.E. Ssentongo, E.S. Heilbrunn, D.M. Ba, V.M. Chinchilli, Association of cardiovascular disease and 10 other pre-existing comorbidities with COVID-19 mortality: A systematic review and meta-analysis, PLoS One 15(8) (2020) e0238215.
[108] E. Tan, J. Song, A.M. Deane, M.P. Plummer, Global Impact of Coronavirus Disease 2019 Infection Requiring Admission to the ICU: A Systematic Review and Meta-analysis, Chest 159(2) (2021) 524-536.
[109] E.H. Taylor, Hofmeyr, R., Torborg, A., van Tonder, C., Boden, R., Earle, E., Nejthardt, M., Kabambi, K. F., Isaacs, M., Usenbo, A., Gerber, C., van der Spuy, K., Mrara, B., Ndhlovu, T., Chen, A., Swanevelder, J., Coetzee, J., & Biccard, B. M. , Risk factors and interventions associated with mortality or survival in adult covid-19 patients admitted to critical care: A systematic review and meta-analysis., Southern African Journal of Anaesthesia and Analgesia 26(3) (2020).
[110] Z. Wang, H. Deng, C. Ou, J. Liang, Y. Wang, M. Jiang, S. Li, Clinical symptoms, comorbidities and complications in severe and non-severe patients with COVID-19: A systematic review and meta-analysis without cases duplication, Medicine (Baltimore) 99(48) (2020) e23327.
[111] C.K.H. Wong, J.Y.H. Wong, E.H.M. Tang, C.H. Au, A.K.C. Wai, Clinical presentations, laboratory and radiological findings, and treatments for 11,028 COVID-19 patients: a systematic review and meta-analysis, Sci Rep 10(1) (2020) 19765.
[112] J. Xie, Q. Wang, Y. Xu, T. Zhang, L. Chen, X. Zuo, J. Liu, L. Huang, P. Zhan, T. Lv, Y. Song, Clinical characteristics, laboratory abnormalities and CT findings of COVID-19 patients and risk factors of severe disease: a systematic review and meta-analysis, Ann Palliat Med 10(2) (2021) 1928-1949.
[113] T. Yin, Y. Li, Y. Ying, Z. Luo, Prevalence of comorbidity in Chinese patients with COVID-19: systematic review and meta-analysis of risk factors, BMC Infect Dis 21(1) (2021) 200.
[114] Y. Zhou, Q. Yang, J. Chi, B. Dong, W. Lv, L. Shen, Y. Wang, Comorbidities and the risk of severe or fatal outcomes associated with coronavirus disease 2019: A systematic review and meta-analysis, Int J Infect Dis 99 (2020) 47-56.
[115] S. Nannoni, R. de Groot, S. Bell, H.S. Markus, Stroke in COVID-19: A systematic review and meta-analysis, Int J Stroke 16(2) (2021) 137-149.

[116] P.A. Corona G, Vena W, Rastrelli G, Semeraro F, Isidori AM, Pivonello R, Salonia A, Sforza A, Maggi M. , Diabetes is most important cause for mortality in COVID-19 hospitalized patients: Systematic review and meta-analysis, Rev Endocr Metab Disord 22 (2021) 1-22.
[117] S. Shoar, F. Hosseini, M. Naderan, J.L. Mehta, Meta-analysis of Cardiovascular Events and Related Biomarkers Comparing Survivors Versus Non-survivors in Patients With COVID-19, Am J Cardiol 135 (2020) 50-61.
[118] X. Li, X. Pan, Y. Li, N. An, Y. Xing, F. Yang, L. Tian, J. Sun, Y. Gao, H. Shang, Y. Xing, Cardiac injury associated with severe disease or ICU admission and death in hospitalized patients with COVID-19: a meta-analysis and systematic review, Crit Care 24(1) (2020) 468.
[119] M. Sahranavard, A. Akhavan Rezayat, M. Zamiri Bidary, A. Omranzadeh, F. Rohani, R. Hamidi Farahani, E. Hazrati, S.H. Mousavi, M. Afshar Ardalan, S. Soleiman-Meigooni, S.J. Hosseini-Shokouh, Z. Hejripour, E. Nassireslami, R. Laripour, A. Salarian, A. Nourmohammadi, R. Mosaed, Cardiac Complications in COVID-19: A Systematic Review and Meta-analysis, Arch Iran Med 24(2) (2021) 152-163.
[120] K. Vakili, M. Fathi, A. Pezeshgi, A. Mohamadkhani, M. Hajiesmaeili, M. Rezaei-Tavirani, F. Sayehmiri, Critical complications of COVID-19: A descriptive meta-analysis study, Rev Cardiovasc Med 21(3) (2020) 433-442.
[121] E. Yonas, I. Alwi, R. Pranata, I. Huang, M.A. Lim, E.J. Gutierrez, M. Yamin, B.B. Siswanto, S.S. Virani, Effect of heart failure on the outcome of COVID-19 - A meta analysis and systematic review, Am J Emerg Med (2020).
[122] W. Wen, H. Zhang, M. Zhou, Y. Cheng, L. Ye, J. Chen, M. Wang, Z. Feng, Arrhythmia in patients with severe coronavirus disease (COVID-19): a meta-analysis, Eur Rev Med Pharmacol Sci 24(21) (2020) 11395-11401.
[123] M. Vakhshoori, M. Heidarpour, D. Shafie, M. Taheri, N. Rezaei, N. Sarrafzadegan, Acute Cardiac Injury in COVID-19: A Systematic Review and Meta-analysis, Arch Iran Med 23(11) (2020) 801-812.
[124] G.P. Granger C, Arnaud C, Guendouz S, Cimadevilla C, Kerneis M, Kerneis C, Zeitouni M, Verdonk C, Legeai C, Lebreton G, Leprince P, Désiré E, Sorrentino S, Silvain J, Montalescot G, Hazan F, Varnous S, Dorent R. , Clinical manifestations and outcomes of coronavirus disease-19 in heart transplant recipients: a multicentre case series with a systematic review and meta-analysis. , Transpl Int. (2021).
[125] K.A. Bansal A, Patel D, Puri R, Kalra A, Kapadia SR, Reed GW. , Meta-analysis Comparing Outcomes in Patients With and Without Cardiac Injury and Coronavirus Disease 2019 (COVID 19). Am J Cardiol 141 (2021) 140-146.
[126] L. Zeng, S. Wang, J. Cai, S. Sun, S. Wang, J. Li, L. Sun, Clinical characteristics of COVID-19 with cardiac injury: a systematic review and meta-analysis, Epidemiol Infect 148 (2020) e266.
[127] L. Fu, X. Liu, Y. Su, J. Ma, K. Hong, Prevalence and impact of cardiac injury on COVID-19: A systematic review and meta-analysis, Clin Cardiol 44(2) (2021) 276-283.
[128] Z. Huang, P. Huang, B. Du, L. Kong, W. Zhang, Y. Zhang, J. Dong, Prevalence and clinical outcomes of cardiac injury in patients with COVID-19: A systematic review and meta-analysis, Nutr Metab Cardiovasc Dis 31(1) (2021) 2-13.
[129] N. Prasitlumkum, R. Chokesuwattanaskul, C. Thongprayoon, T. Bathini, S. Vallabhajosyula, W. Cheungpasitporn, Incidence of Myocardial Injury in COVID-19-Infected Patients: A Systematic Review and Meta-Analysis, Diseases 8(4) (2020).

[130] Z. Zhong, H. Li, J. Zhu, P. Ji, B. Li, J. Pang, J. Zhang, X. Liang, Clinical characteristics of 2,459 severe or critically ill COVID-19 patients: A meta-analysis, Medicine (Baltimore) 100(5) (2021) e23781.
[131] C. Liang, W. Zhang, S. Li, G. Qin, Coronary heart disease and COVID-19: A meta-analysis, Med Clin (Barc) (2021).
[132] M.S. Gold, D. Sehayek, S. Gabrielli, X. Zhang, C. McCusker, M. Ben-Shoshan, COVID-19 and comorbidities: a systematic review and meta-analysis, Postgrad Med 132(8) (2020) 749-755.
[133] M. Hashizume, Y. Kim, C.F.S. Ng, Y. Chung, L. Madaniyazi, M.L. Bell, Y.L. Guo, H. Kan, Y. Honda, S.M. Yi, H. Kim, Y. Nishiwaki, Health Effects of Asian Dust: A Systematic Review and Meta-Analysis, Environ Health Perspect 128(6) (2020) 66001.
[134] G. Xiang, L. Xie, Z. Chen, S. Hao, C. Fu, Q. Wu, X. Liu, S. Li, Clinical risk factors for mortality of hospitalized patients with COVID-19: systematic review and meta-analysis, Ann Palliat Med (2021).
[135] S. Biswas, Z. Sarfraz, A. Sarfraz, F. Malanyaon, R. Vijayan, I. Gupta, U. Arif, M. Sarfraz, G. Yatzkan, M.A. Sanchez-Gonzalez, Risk and Outcomes of COVID-19 Patients with Asthma: A Meta-Analysis, Asthma Allergy Immunology (2020) 1-8.
[136] M.H. Hussein, R.M. Elshazli, A.S. Attia, T.P. Nguyen, M. Aboueisha, R. Munshi, E.A. Toraih, M.S. Fawzy, E. Kandil, Asthma and COVID-19; different entities, same outcome: a meta-analysis of 107,983 patients, J Asthma (2021) 1-8.
[137] S. Liu, Y. Cao, T. Du, Y. Zhi, Prevalence of Comorbid Asthma and Related Outcomes in COVID-19: A Systematic Review and Meta-Analysis, J Allergy Clin Immunol Pract 9(2) (2021) 693-701.
[138] L. Shi, J. Xu, W. Xiao, Y. Wang, Y. Jin, S. Chen, G. Duan, H. Yang, Y. Wang, Asthma in patients with coronavirus disease 2019: A systematic review and meta-analysis, Ann Allergy Asthma Immunol (2021).
[139] A.P. Sunjaya, S.M. Allida, G.L. Di Tanna, C. Jenkins, Asthma and risk of infection, hospitalisation, ICU admission and mortality from COVID-19: Systematic review and meta-analysis, J Asthma (2021) 1-22.
[140] C. Awortwe, I. Cascorbi, Meta-analysis on outcome-worsening comorbidities of COVID-19 and related potential drug-drug interactions, Pharmacol Res 161 (2020) 105250.
[141] V. Jain, J.M. Yuan, Predictive symptoms and comorbidities for severe COVID-19 and intensive care unit admission: a systematic review and meta-analysis, Int J Public Health 65(5) (2020) 533-546.
[142] I.M. Poly TN, Yang HC, Lin MC, Jian WS, Hsu MH, Jack Li YC. , Obesity and Mortality Among Patients Diagnosed With COVID-19: A Systematic Review and Meta-Analysis., 8 (2021) 620044.
[143] R. Pranata, A.Y. Soeroto, I. Huang, M.A. Lim, P. Santoso, H. Permana, A.A. Lukito, Effect of chronic obstructive pulmonary disease and smoking on the outcome of COVID-19, Int J Tuberc Lung Dis 24(8) (2020) 838-843.
[144] G. Rabbani, S.M. Shariful Islam, M.A. Rahman, N. Amin, B. Marzan, R.C. Robin, S.M. Alif, Pre-existing COPD is associated with an increased risk of mortality and severity in COVID-19: a rapid systematic review and meta-analysis, Expert Rev Respir Med (2021) 1-12.
[145] Q. Zhao, M. Meng, R. Kumar, Y. Wu, J. Huang, N. Lian, Y. Deng, S. Lin, The impact of COPD and smoking history on the severity of COVID-19: A systemic review and meta-analysis, J Med Virol 92(10) (2020) 1915-1921.
[146] A. Bansal, A.D. Singh, V. Jain, M. Aggarwal, S. Gupta, R.P. Padappayil, M. Nadeem, S. Joshi, A. Mian, T. Greathouse, D. Wells, M. Gupta, M.Z. Khan, The association of D-dimers with mortality, intensive care unit admission or acute respiratory distress syndrome in patients hospitalized with

coronavirus disease 2019 (COVID-19): A systematic review and meta-analysis, Heart Lung 50(1) (2021) 9-12.
[147] S.S. Hasan, T. Capstick, R. Ahmed, C.S. Kow, F. Mazhar, H.A. Merchant, S.T.R. Zaidi, Mortality in COVID-19 patients with acute respiratory distress syndrome and corticosteroids use: a systematic review and meta-analysis, Expert Rev Respir Med 14(11) (2020) 1149-1163.
[148] X. Cui, Z. Zhao, T. Zhang, W. Guo, W. Guo, J. Zheng, J. Zhang, C. Dong, R. Na, L. Zheng, W. Li, Z. Liu, J. Ma, J. Wang, S. He, Y. Xu, P. Si, Y. Shen, C. Cai, A systematic review and meta-analysis of children with coronavirus disease 2019 (COVID-19), J Med Virol 93(2) (2021) 1057-1069.
[149] Y. Xie, Z. Wang, H. Liao, G. Marley, D. Wu, W. Tang, Epidemiologic, Clinical, and Laboratory Findings of the COVID-19 in the current pandemic, Res Sq (2020).
[150] J.J.Y. Zhang, K.S. Lee, L.W. Ang, Y.S. Leo, B.E. Young, Risk Factors for Severe Disease and Efficacy of Treatment in Patients Infected With COVID-19: A Systematic Review, Meta-Analysis, and Meta-Regression Analysis, Clin Infect Dis 71(16) (2020) 2199-2206.
[151] R. Mou, X. Jin, W. Li, M. Wu, X. Liu, Z. Liu, S. Guo, X. Li, Y. Jia, Prostate cancer: a risk factor for COVID-19 in males?: A protocol for systematic review and meta analysis, Medicine (Baltimore) 99(43) (2020) e22591.
[152] M.H. Antikchi, H. Neamatzadeh, Y. Ghelmani, J. Jafari-Nedooshan, S.A. Dastgheib, S. Kargar, M. Noorishadkam, R. Bahrami, M.H. Jarahzadeh, The Risk and Prevalence of COVID-19 Infection in Colorectal Cancer Patients: a Systematic Review and Meta-analysis, J Gastrointest Cancer 52(1) (2021) 73-79.
[153] A. Desai, R. Gupta, S. Advani, L. Ouellette, N.M. Kuderer, G.H. Lyman, A. Li, Mortality in hospitalized patients with cancer and coronavirus disease 2019: A systematic review and meta-analysis of cohort studies, Cancer (2020).
[154] G. Elgohary, COVID-19 infection in cancer patients: a systematic review and meta-analysis with emphasizing the risk and prognosis stratification, Hematol Transfus Cell Ther 42 (2020) 24-25.
[155] V.G. Giannakoulis, E. Papoutsi, Siempos, II, Effect of Cancer on Clinical Outcomes of Patients With COVID-19: A Meta-Analysis of Patient Data, JCO Glob Oncol 6 (2020) 799-808.
[156] H. Liu, D. Yang, X. Chen, Z. Sun, Y. Zou, C. Chen, S. Sun, The effect of anticancer treatment on cancer patients with COVID-19: A systematic review and meta-analysis, Cancer Med 10(3) (2021) 1043-1056.
[157] R. Park, S.A. Lee, S.Y. Kim, A.C. de Melo, A. Kasi, Association of active oncologic treatment and risk of death in cancer patients with COVID-19: a systematic review and meta-analysis of patient data, Acta Oncol 60(1) (2021) 13-19.
[158] M. Peravali, I. Joshi, J. Ahn, C. Kim, A Systematic Review and Meta-Analysis of Clinical Characteristics and Outcomes in Patients With Lung Cancer with Coronavirus Disease 2019, JTO Clin Res Rep 2(3) (2021) 100141.
[159] A. Vijenthira, I.Y. Gong, T.A. Fox, S. Booth, G. Cook, B. Fattizzo, F. Martin-Moro, J. Razanamahery, J.C. Riches, J. Zwicker, R. Patell, M.C. Vekemans, L. Scarfo, T. Chatzikonstantinou, H. Yildiz, R. Lattenist, I. Mantzaris, W.A. Wood, L.K. Hicks, Outcomes of patients with hematologic malignancies and COVID-19: a systematic review and meta-analysis of 3377 patients, Blood 136(25) (2020) 2881-2892.
[160] L. Yang, P. Chai, J. Yu, X. Fan, Effects of cancer on patients with COVID-19: a systematic review and meta-analysis of 63,019 participants, Cancer Biol Med 18(1) (2021) 298-307.
[161] E. Yekeduz, G. Utkan, Y. Urun, A systematic review and meta-analysis: the effect of active cancer treatment on severity of COVID-19, Eur J Cancer 141 (2020) 92-104.

[162] P. Zarifkar, A. Kamath, C. Robinson, N. Morgulchik, S.F.H. Shah, T.K.M. Cheng, C. Dominic, A.O. Fehintola, G. Bhalla, T. Ahillan, L. Mourgue d'Algue, J. Lee, A. Pareek, M. Carey, D.J. Hughes, M. Miller, V.K. Woodcock, M. Shrotri, Clinical Characteristics and Outcomes in Patients with COVID-19 and Cancer: a Systematic Review and Meta-analysis, Clin Oncol (R Coll Radiol) 33(3) (2021) e180-e191.
[163] H. Zhang, H. Han, T. He, K.E. Labbe, A.V. Hernandez, H. Chen, V. Velcheti, J. Stebbing, K.K. Wong, Clinical Characteristics and Outcomes of COVID-19-Infected Cancer Patients: A Systematic Review and Meta-Analysis, J Natl Cancer Inst (2020).
[164] Y. Gao, Y. Chen, M. Liu, M. Niu, Z. Song, M. Yan, J. Tian, Nervous system diseases are associated with the severity and mortality of patients with COVID-19: a systematic review and meta-analysis, Epidemiol Infect 149 (2021) e66.
[165] J. Xu, W. Xiao, X. Liang, P. Zhang, L. Shi, Y. Wang, Y. Wang, H. Yang, The Association of Cerebrovascular Disease with Adverse Outcomes in COVID-19 Patients: A Meta-Analysis Based on Adjusted Effect Estimates, J Stroke Cerebrovasc Dis 29(11) (2020) 105283.
[166] J. Zhang, H. Wang, M. Wei, H. Zhang, B. Xia, X. Wang, Y. Pei, L. Dong, Y. Li, Incidence of cerebrovascular disease as a comorbidity in patients with COVID-19: A meta-analysis, Aging (Albany NY) 12(23) (2020) 23450-23463.
[167] T. Baldini, G.M. Asioli, M. Romoli, M. Carvalho Dias, E.C. Schulte, L. Hauer, D. Aguiar De Sousa, J. Sellner, A. Zini, Cerebral venous thrombosis and severe acute respiratory syndrome coronavirus-2 infection: A systematic review and meta-analysis, Eur J Neurol (2021).
[168] N. Brienza, F. Puntillo, S. Romagnoli, L. Tritapepe, Acute Kidney Injury in Coronavirus Disease 2019 Infected Patients: A Meta-Analytic Study, Blood Purif 50(1) (2021) 35-41.
[169] K.W.Y. Chan, K. Y.; Lee, P. W.; Tang, S. C. , Renal involvement in coronavirus disease 2019 (record): A systematic review and meta-analysis., Journal of the American Society of Nephrology 31(0) (2020) 248.
[170] F. Fabrizi, C.M. Alfieri, R. Cerutti, G. Lunghi, P. Messa, COVID-19 and Acute Kidney Injury: A Systematic Review and Meta-Analysis, Pathogens 9(12) (2020).
[171] E.L. Fu, R.J. Janse, Y. de Jong, V.H.W. van der Endt, J. Milders, E.M. van der Willik, E.N.M. de Rooij, O.M. Dekkers, J.I. Rotmans, M. van Diepen, Acute kidney injury and kidney replacement therapy in COVID-19: a systematic review and meta-analysis, Clin Kidney J 13(4) (2020) 550-563.
[172] P. Hansrivijit, C. Qian, B. Boonpheng, C. Thongprayoon, S. Vallabhajosyula, W. Cheungpasitporn, N. Ghahramani, Incidence of acute kidney injury and its association with mortality in patients with COVID-19: a meta-analysis, J Investig Med 68(7) (2020) 1261-1270.
[173] L. Lin, X. Wang, J. Ren, Y. Sun, R. Yu, K. Li, L. Zheng, J. Yang, Risk factors and prognosis for COVID-19-induced acute kidney injury: a meta-analysis, BMJ Open 10(11) (2020) e042573.
[174] Y.F. Liu, Z. Zhang, X.L. Pan, G.L. Xing, Y. Zhang, Z.S. Liu, S.H. Tu, The chronic kidney disease and acute kidney injury involvement in COVID-19 pandemic: A systematic review and meta-analysis, PLoS One 16(1) (2021) e0244779.
[175] B. Wang, Q. Luo, W. Zhang, S. Yu, X. Cheng, L. Wang, X. Chen, Y. Chen, The Involvement of Chronic Kidney Disease and Acute Kidney Injury in Disease Severity and Mortality in Patients with COVID-19: A Meta-Analysis, Kidney Blood Press Res 46(1) (2021) 17-30.
[176] Q. Yang, X. Yang, Incidence and risk factors of kidney impairment on patients with COVID-19: A meta-analysis of 10180 patients, PLoS One 15(11) (2020) e0241953.
[177] Z. Zhang, L. Zhang, D. Zha, C. Hu, X. Wu, Clinical characteristics and risks of Chinas 2019 novel coronavirus patients with AKI: a systematic review and meta-analysis, Ren Fail 42(1) (2020) 926-931.

[178] S. Zhou, J. Xu, C. Xue, B. Yang, Z. Mao, A.C.M. Ong, Coronavirus-associated kidney outcomes in COVID-19, SARS, and MERS: a meta-analysis and systematic review, Ren Fail 43(1) (2020) 1-15.
[179] Y. Zhou, Q. Ren, G. Chen, Q. Jin, Q. Cui, H. Luo, K. Zheng, Y. Qin, X. Li, Chronic Kidney Diseases and Acute Kidney Injury in Patients With COVID-19: Evidence From a Meta-Analysis, Front Med (Lausanne) 7 (2020) 588301.
[180] R. Cai, J. Zhang, Y. Zhu, L. Liu, Y. Liu, Q. He, Mortality in chronic kidney disease patients with COVID-19: a systematic review and meta-analysis, Int Urol Nephrol (2021).
[181] R. Pranata, R. Supriyadi, I. Huang, H. Permana, M.A. Lim, E. Yonas, N.N.M. Soetedjo, A.A. Lukito, The Association Between Chronic Kidney Disease and New Onset Renal Replacement Therapy on the Outcome of COVID-19 Patients: A Meta-analysis, Clin Med Insights Circ Respir Pulm Med 14 (2020) 1179548420959165.
[182] C.Y. Chen, S.C. Shao, Y.T. Chen, C.K. Hsu, H.J. Hsu, C.C. Lee, C.Y. Sun, Y.C. Chen, M.J. Hung, I.W. Wu, Incidence and Clinical Impacts of COVID-19 Infection in Patients with Hemodialysis: Systematic Review and Meta-Analysis of 396,062 Hemodialysis Patients, Healthcare (Basel) 9(1) (2021).
[183] A. Bansal, Kumar, A., Bansal, R. M., Maheshwari, R., & Chaturvedi, S. , The impact of comorbidities on clinical course and outcome, in kidney transplant recipients with COVID-19: A systematic review and analysis., Indian Journal of Transplantation 14(4) (2020).
[184] M. Du, Y.X. Lin, W.X. Yan, L.Y. Tao, M. Liu, J. Liu, Prevalence and impact of diabetes in patients with COVID-19 in China, World J Diabetes 11(10) (2020) 468-480.
[185] M.M. Faghir-Gangi, H.; Abdolmohamadi, N.; Nematollahi, S. , The prevalence of type 2 diabetes in patients with COVID-19: a systematic review and meta-analysis., Clinical Diabetology 9(5) (2020) 271-278.
[186] S. Hussain, H. Baxi, M. Chand Jamali, N. Nisar, M.S. Hussain, Burden of diabetes mellitus and its impact on COVID-19 patients: A meta-analysis of real-world evidence, Diabetes Metab Syndr 14(6) (2020) 1595-1602.
[187] L. Palaiodimos, N. Chamorro-Pareja, D. Karamanis, W. Li, P.D. Zavras, K.M. Chang, P. Mathias, D.G. Kokkinidis, Diabetes is associated with increased risk for in-hospital mortality in patients with COVID-19: a systematic review and meta-analysis comprising 18,506 patients, Hormones (Athens) (2020).
[188] L. Shang, M. Shao, Q. Guo, J. Shi, Y. Zhao, J. Xiaokereti, B. Tang, Diabetes Mellitus is Associated with Severe Infection and Mortality in Patients with COVID-19: A Systematic Review and Meta-analysis, Arch Med Res 51(7) (2020) 700-709.
[189] Z.H. Wu, Y. Tang, Q. Cheng, Diabetes increases the mortality of patients with COVID-19: a meta-analysis, Acta Diabetol 58(2) (2021) 139-144.
[190] J. Yang, C. Tian, Y. Chen, C. Zhu, H. Chi, J. Li, Obesity aggravates COVID-19: An updated systematic review and meta-analysis, J Med Virol (2020).
[191] T.I. Hariyanto, C. Putri, J. Arisa, R.F.V. Situmeang, A. Kurniawan, Dementia and outcomes from coronavirus disease 2019 (COVID-19) pneumonia: A systematic review and meta-analysis, Arch Gerontol Geriatr 93 (2021) 104299.
[192] J. July, R. Pranata, Prevalence of dementia and its impact on mortality in patients with coronavirus disease 2019: A systematic review and meta-analysis, Geriatr Gerontol Int 21(2) (2021) 172-177.
[193] N. Liu, J. Sun, X. Wang, M. Zhao, Q. Huang, H. Li, The Impact of Dementia on the Clinical Outcome of COVID-19: A Systematic Review and Meta-Analysis, J Alzheimers Dis 78(4) (2020) 1775-1782.

[194] M.G. Zuin, P.; Roncon, L.; Cervellati, C.; Zuliani, G., Dementia and the risk of death in elderly patients with COVID-19 infection: Systematic review and meta-analysis, International Journal of Geriatric Psychiatry. 0(0) (2020).
[195] S. Parsay, A. Vosoughi, A. Khabbaz, S. Sadigh-Eteghad, The Incidence and Mortality Ratio of Ischemic Cerebrovascular Accidents in COVID-19 Cases: A Systematic Review and Meta-Analysis, J Stroke Cerebrovasc Dis 30(3) (2021) 105552.
[196] H. Shokri Afra, N. Amiri-Dashatan, F. Ghorbani, I. Maleki, M. Rezaei-Tavirani, Positive association between severity of COVID-19 infection and liver damage: a systematic review and meta-analysis, Gastroenterol Hepatol Bed Bench 13(4) (2020) 292-304.
[197] J. Ampuero, Y. Sanchez, M.R. Garcia-Lozano, D. Maya-Miles, M. Romero Gomez, Impact of liver injury on the severity of COVID-19: a systematic review with meta-analysis, Rev Esp Enferm Dig 113(2) (2021) 125-135.
[198] Z.H. Wu, D.L. Yang, A meta-analysis of the impact of COVID-19 on liver dysfunction, Eur J Med Res 25(1) (2020) 54.
[199] K. Jayant, I. Reccia, F. Virdis, J.S. Pyda, P.J. Bachul, D. di Sabato, R.N. Barth, J. Fung, T. Baker, P. Witkowski, COVID-19 in hospitalized liver transplant recipients: An early systematic review and meta-analysis, Clin Transplant (2021) e14246.
[200] M.A. Waleed, M. A.; Abdallah, M.; Younossi, Z. M.; Singal, A. K. , Disease severity and time since transplantation determine patient mortality among liver transplant recipients with COVID-19 infection: A meta-analysis., Hepatology 72(0) (2020) 271A.
[201] M.P. Kumar, S. Mishra, D.K. Jha, J. Shukla, A. Choudhury, R. Mohindra, H.S. Mandavdhare, U. Dutta, V. Sharma, Coronavirus disease (COVID-19) and the liver: a comprehensive systematic review and meta-analysis, Hepatol Int 14(5) (2020) 711-722.
[202] S. Vancsa, P.J. Hegyi, N. Zadori, L. Szako, N. Vorhendi, K. Ocskay, M. Foldi, F. Dembrovszky, Z.R. Domotor, K. Janosi, Z. Rakonczay, Jr., P. Hartmann, T. Horvath, B. Eross, S. Kiss, Z. Szakacs, D. Nemeth, P. Hegyi, G. Par, Pre-existing Liver Diseases and On-Admission Liver-Related Laboratory Tests in COVID-19: A Prognostic Accuracy Meta-Analysis With Systematic Review, Front Med (Lausanne) 7 (2020) 572115.
[203] E. Merola, C. Pravadelli, G. de Pretis, Prevalence of liver injury in patients with coronavirus disease 2019 (COVID-19) : a systematic review and meta-analysis, Acta Gastroenterol Belg 83(3) (2020) 454-460.
[204] A.M. Kamel, M. Sobhy, N. Magdy, N. Sabry, S. Farid, Anticoagulation outcomes in hospitalized Covid-19 patients: A systematic review and meta-analysis of case-control and cohort studies, Rev Med Virol (2020) e2180.
[205] B. Kefale, G.T. Tegegne, A. Degu, M. Tadege, D. Tesfa, Prevalence and Risk Factors of Thromboembolism among Patients With Coronavirus Disease-19: A Systematic Review and Meta-Analysis, Clin Appl Thromb Hemost 26 (2020) 1076029620967083.
[206] X. Li, Z. Xu, T. Wang, X. Xu, H. Li, Q. Sun, X. Zhou, G. Chen, Clinical laboratory characteristics of severe patients with coronavirus disease 2019 (COVID-19): A systematic review and meta-analysis, Clin Epidemiol Glob Health 9 (2021) 184-190.
[207] C. Wang, H. Zhang, M. Zhou, Y. Cheng, L. Ye, J. Chen, M. Wang, Z. Feng, Prognosis of COVID-19 in patients with vein thrombosis: a systematic review and meta-analysis, Eur Rev Med Pharmacol Sci 24(19) (2020) 10279-10285.

[208] G. Xiang, S. Hao, C. Fu, W. Hu, L. Xie, Q. Wu, S. Li, X. Liu, The effect of coagulation factors in 2019 novel coronavirus patients: A systematic review and meta-analysis, Medicine (Baltimore) 100(7) (2021) e24537.
[209] Y. Zhu, C.J. Bloxham, K.D. Hulme, J.E. Sinclair, Z.W.M. Tong, L.E. Steele, E.C. Noye, J. Lu, Y. Xia, K.Y. Chew, J. Pickering, C. Gilks, A.C. Bowen, K.R. Short, A meta-analysis on the role of children in SARS-CoV-2 in household transmission clusters, Clin Infect Dis (2020).
[210] A. Di Minno, P. Ambrosino, I. Calcaterra, M.N.D. Di Minno, COVID-19 and Venous Thromboembolism: A Meta-analysis of Literature Studies, Semin Thromb Hemost 46(7) (2020) 763-771.
[211] Y. Liu, J. Cai, C. Wang, J. Jin, L. Qu, Incidence, prognosis, and laboratory indicators of venous thromboembolism in hospitalized patients with coronavirus disease 2019: a systematic review and meta-analysis, J Vasc Surg Venous Lymphat Disord (2021).
[212] R.S. Loomba, G. Aggarwal, E.G. Villarreal, J.S. Farias, S. Flores, C.J. Lavie, S. Aggarwal, Factors associated with deep venous thrombosis in patients infected with coronavirus disease 2019: a meta-analysis, Blood Coagul Fibrinolysis 32(1) (2021) 23-28.
[213] Y.F. Lu, L.Y. Pan, W.W. Zhang, F. Cheng, S.S. Hu, X. Zhang, H.Y. Jiang, A meta-analysis of the incidence of venous thromboembolic events and impact of anticoagulation on mortality in patients with COVID-19, Int J Infect Dis 100 (2020) 34-41.
[214] M.B. Malas, I.N. Naazie, N. Elsayed, A. Mathlouthi, R. Marmor, B. Clary, Thromboembolism risk of COVID-19 is high and associated with a higher risk of mortality: A systematic review and meta-analysis, EClinicalMedicine 29 (2020) 100639.
[215] T. Mir, H.B. Attique, Y. Sattar, N. Regmi, M.S. Khan, H. Youns, B. Qayoom, M.T. Jerger, M.C. Alraies, Does pulmonary embolism in critically ill COVID-19 patients worsen the in-hospital mortality: A meta-analysis, Cardiovasc Revasc Med (2020).
[216] S. Nopp, F. Moik, B. Jilma, I. Pabinger, C. Ay, Risk of venous thromboembolism in patients with COVID-19: A systematic review and meta-analysis, Res Pract Thromb Haemost (2020).
[217] A. Porfidia, E. Valeriani, R. Pola, E. Porreca, A.W.S. Rutjes, M. Di Nisio, Venous thromboembolism in patients with COVID-19: Systematic review and meta-analysis, Thromb Res 196 (2020) 67-74.
[218] L. Roncon, M. Zuin, S. Barco, L. Valerio, G. Zuliani, P. Zonzin, S.V. Konstantinides, Incidence of acute pulmonary embolism in COVID-19 patients: Systematic review and meta-analysis, Eur J Intern Med 82 (2020) 29-37.
[219] G.K. Sridharan, R. Vegunta, V.R.P. Rokkam, V. Meyyur Aravamudan, R. Vegunta, S.R. Khan, S. Ponnada, U. Boregowda, K. Prudhvi, G. Chamarthi, B.P. Mohan, Venous Thromboembolism in Hospitalized COVID-19 Patients, Am J Ther 27(6) (2020) e599-e610.
[220] T. Wu, Z. Zuo, D. Yang, X. Luo, L. Jiang, Z. Xia, X. Xiao, J. Liu, M. Ye, M. Deng, Venous thromboembolic events in patients with COVID-19: a systematic review and meta-analysis, Age Ageing 50(2) (2021) 284-293.
[221] R. Zhang, L. Ni, X. Di, X. Wang, B. Ma, S. Niu, C. Liu, Systematic review and meta-analysis of the prevalence of venous thromboembolic events in novel coronavirus disease-2019 patients, J Vasc Surg Venous Lymphat Disord 9(2) (2021) 289-298 e5.
[222] S. Akiyama, S. Hamdeh, D. Micic, A. Sakuraba, Response to: 'Correspondence on 'Prevalence and clinical outcomes of COVID-19 in patients with autoimmune diseases: a systematic review and meta-analysis'' by Lee, Ann Rheum Dis (2021).

[223] B.G. Pijls, S. Jolani, A. Atherley, R.T. Derckx, J.I.R. Dijkstra, G.H.L. Franssen, S. Hendriks, A. Richters, A. Venemans-Jellema, S. Zalpuri, M.P. Zeegers, Demographic risk factors for COVID-19 infection, severity, ICU admission and death: a meta-analysis of 59 studies, BMJ Open 11(1) (2021) e044640.
[224] C. Yifan, P. Jun, Understanding the Clinical Features of Coronavirus Disease 2019 From the Perspective of Aging: A Systematic Review and Meta-Analysis, Front Endocrinol (Lausanne) 11 (2020) 557333.
[225] J.F. Cohen, D.A. Korevaar, S. Matczak, M. Chalumeau, S. Allali, J. Toubiana, COVID-19-Related Fatalities and Intensive-Care-Unit Admissions by Age Groups in Europe: A Meta-Analysis, Front Med (Lausanne) 7 (2020) 560685.
[226] I.J. Borges do Nascimento, T.C. von Groote, D.P. O'Mathuna, H.M. Abdulazeem, C. Henderson, U. Jayarajah, I. Weerasekara, T. Poklepovic Pericic, H.E.G. Klapproth, L. Puljak, N. Cacic, I. Zakarija-Grkovic, S.M.M. Guimaraes, A.N. Atallah, N.L. Bragazzi, M.S. Marcolino, A. Marusic, A. Jeroncic, D. International Task Force Network of Coronavirus, Clinical, laboratory and radiological characteristics and outcomes of novel coronavirus (SARS-CoV-2) infection in humans: A systematic review and series of meta-analyses, PLoS One 15(9) (2020) e0239235.
[227] Z.J. Lim, A. Subramaniam, M. Ponnapa Reddy, G. Blecher, U. Kadam, A. Afroz, B. Billah, S. Ashwin, M. Kubicki, F. Bilotta, J.R. Curtis, F. Rubulotta, Case Fatality Rates for Patients with COVID-19 Requiring Invasive Mechanical Ventilation. A Meta-analysis, Am J Respir Crit Care Med 203(1) (2021) 54-66.
[228] S.M.M. Aghili, M. Ebrahimpur, B. Arjmand, Z. Shadman, M. Pejman Sani, M. Qorbani, B. Larijani, M. Payab, Obesity in COVID-19 era, implications for mechanisms, comorbidities, and prognosis: a review and meta-analysis, Int J Obes (Lond) (2021).
[229] C.W.S. Hoong, I. Hussain, V.M. Aravamudan, E.E. Phyu, J.H.X. Lin, H. Koh, Obesity is Associated with Poor Covid-19 Outcomes: A Systematic Review and Meta-Analysis, Horm Metab Res 53(2) (2021) 85-93.
[230] Y. Chu, J. Yang, J. Shi, P. Zhang, X. Wang, Obesity is associated with increased severity of disease in COVID-19 pneumonia: a systematic review and meta-analysis, Eur J Med Res 25(1) (2020) 64.
[231] L. Deng, J. Zhang, M. Wang, L. Chen, Obesity is associated with severe COVID-19 but not death: a dose-response meta-analysis, Epidemiol Infect (2021) 1-27.
[232] J.S.Y. Ho, D.I. Fernando, M.Y. Chan, C.H. Sia, Obesity in COVID-19: A Systematic Review and Meta-analysis, Ann Acad Med Singap 49(12) (2020) 996-1008.
[233] Y. Huang, Y. Lu, Y.M. Huang, M. Wang, W. Ling, Y. Sui, H.L. Zhao, Obesity in patients with COVID-19: a systematic review and meta-analysis, Metabolism 113 (2020) 154378.
[234] V.S. Malik, K. Ravindra, S.V. Attri, S.K. Bhadada, M. Singh, Higher body mass index is an important risk factor in COVID-19 patients: a systematic review and meta-analysis, Environ Sci Pollut Res Int 27(33) (2020) 42115-42123.
[235] A.Y. Soeroto, N.N. Soetedjo, A. Purwiga, P. Santoso, I.D. Kulsum, H. Suryadinata, F. Ferdian, Effect of increased BMI and obesity on the outcome of COVID-19 adult patients: A systematic review and meta-analysis, Diabetes Metab Syndr 14(6) (2020) 1897-1904.
[236] X. Zhao, X. Gang, G. He, Z. Li, Y. Lv, Q. Han, G. Wang, Obesity Increases the Severity and Mortality of Influenza and COVID-19: A Systematic Review and Meta-Analysis, Front Endocrinol (Lausanne) 11 (2020) 595109.

[237] R.K. Reddy, W.N. Charles, A. Sklavounos, A. Dutt, P.T. Seed, A. Khajuria, The effect of smoking on COVID-19 severity: A systematic review and meta-analysis, J Med Virol 93(2) (2021) 1045-1056.
[238] A. Gulsen, B.A. Yigitbas, B. Uslu, D. Dromann, O. Kilinc, The Effect of Smoking on COVID-19 Symptom Severity: Systematic Review and Meta-Analysis, Pulm Med 2020 (2020) 7590207.
[239] C.A. Jimenez-Ruiz, D. Lopez-Padilla, A. Alonso-Arroyo, R. Aleixandre-Benavent, S. Solano-Reina, J.I. de Granda-Orive, COVID-19 and Smoking: A Systematic Review and Meta-Analysis of the Evidence, Arch Bronconeumol 57 Suppl 1 (2021) 21-34.
[240] A. Karanasos, K. Aznaouridis, G. Latsios, A. Synetos, S. Plitaria, D. Tousoulis, K. Toutouzas, Impact of Smoking Status on Disease Severity and Mortality of Hospitalized Patients With COVID-19 Infection: A Systematic Review and Meta-analysis, Nicotine Tob Res 22(9) (2020) 1657-1659.
[241] E.P. Lansiaux, Pierre-Philippe & Picard, Jean-Laurent & Son-Forget, Joachim. , Meta-Analysis: COVID-19 Disease Severity Correlates with Smoking Status., Clinical Pulmonary Medecine 27 (2020) 99-104.
[242] R. Patanavanich, S.A. Glantz, Smoking is associated with worse outcomes of COVID-19 particularly among younger adults: A systematic review and meta-analysis, medRxiv (2020).
[243] R. Patanavanich, S.A. Glantz, Smoking Is Associated With COVID-19 Progression: A Meta-analysis, Nicotine Tob Res 22(9) (2020) 1653-1656.
[244] H.M. Salah, T. Sharma, J. Mehta, Smoking Doubles the Mortality Risk in COVID-19: A Meta-Analysis of Recent Reports and Potential Mechanisms, Cureus 12(10) (2020) e10837.
[245] A. Umnuaypornlert, S. Kanchanasurakit, D.E.I. Lucero-Prisno, S. Saokaew, Smoking and risk of negative outcomes among COVID-19 patients: A systematic review and meta-analysis, Tob Induc Dis 19 (2021) 09.
[246] H. Zhang, S. Ma, T. Han, G. Qu, C. Cheng, J.P. Uy, M.B. Shaikh, Q. Zhou, E.J. Song, C. Sun, Association of smoking history with severe and critical outcomes in COVID-19 patients: A systemic review and meta-analysis, Eur J Integr Med 43 (2021) 101313.
[247] A. Aminian, C. Tu, Association of Bariatric Surgery with Clinical Outcomes of SARS-CoV-2 Infection: a Systematic Review and Meta-analysis in the Initial Phase of COVID-19 Pandemic, Obes Surg (2021).
[248] I. Lakbar, D. Luque-Paz, J.L. Mege, S. Einav, M. Leone, COVID-19 gender susceptibility and outcomes: A systematic review, PLoS One 15(11) (2020) e0241827.
[249] U. Patel, P. Malik, M.S. Usman, D. Mehta, A. Sharma, F.A. Malik, N. Khan, T.J. Siddiqi, J. Ahmed, A. Patel, H. Sacks, Age-Adjusted Risk Factors Associated with Mortality and Mechanical Ventilation Utilization Amongst COVID-19 Hospitalizations-a Systematic Review and Meta-Analysis, SN Compr Clin Med (2020) 1-10.
[250] H. Peckham, N.M. de Gruijter, C. Raine, A. Radziszewska, C. Ciurtin, L.R. Wedderburn, E.C. Rosser, K. Webb, C.T. Deakin, Male sex identified by global COVID-19 meta-analysis as a risk factor for death and ITU admission, Nat Commun 11(1) (2020) 6317.
[251] R. Pranata, J. Henrina, M.A. Lim, S. Lawrensia, E. Yonas, R. Vania, I. Huang, A.A. Lukito, K. Suastika, R.A.T. Kuswardhani, S. Setiati, Clinical frailty scale and mortality in COVID-19: A systematic review and dose-response meta-analysis, Arch Gerontol Geriatr 93 (2021) 104324.
[252] K. Wang, C. Wu, J. Xu, B. Zhang, X. Zhang, Z. Gao, Z. Xia, Factors affecting the mortality of patients with COVID-19 undergoing surgery and the safety of medical staff: A systematic review and meta-analysis, EClinicalMedicine 29 (2020) 100612.
[253] N. Pabalan, P. Tharabenjasin, P. Suntornsaratoon, H. Jarjanazi, C. Muanprasat, Ethnic and age-specific acute lung injury/acute respiratory distress syndrome risk associated with angiotensin-

converting enzyme insertion/deletion polymorphisms, implications for COVID-19: A meta-analysis, Infect Genet Evol 88 (2021) 104682.
[254] A. Raharja, A. Tamara, L.T. Kok, Association Between Ethnicity and Severe COVID-19 Disease: a Systematic Review and Meta-analysis, J Racial Ethn Health Disparities (2020).
[255] S. Sze, D. Pan, C.R. Nevill, L.J. Gray, C.A. Martin, J. Nazareth, J.S. Minhas, P. Divall, K. Khunti, K.R. Abrams, L.B. Nellums, M. Pareek, Ethnicity and clinical outcomes in COVID-19: A systematic review and meta-analysis, EClinicalMedicine 29 (2020) 100630.
[256] N. Liu, T. Zhang, L. Ma, H. Zhang, H. Wang, W. Wei, H. Pei, H. Li, The impact of ABO blood group on COVID-19 infection risk and mortality: A systematic review and meta-analysis, Blood Rev (2020) 100785.
[257] F. Pourali, M. Afshari, R. Alizadeh-Navaei, J. Javidnia, M. Moosazadeh, A. Hessami, Relationship between blood group and risk of infection and death in COVID-19: a live meta-analysis, New Microbes New Infect 37 (2020) 100743.
[258] B.B. Wu, D.Z. Gu, J.N. Yu, J. Yang, W.Q. Shen, Association between ABO blood groups and COVID-19 infection, severity and demise: A systematic review and meta-analysis, Infect Genet Evol 84 (2020) 104485.
[259] J. Allotey, E. Stallings, M. Bonet, M. Yap, S. Chatterjee, T. Kew, L. Debenham, A.C. Llavall, A. Dixit, D. Zhou, R. Balaji, S.I. Lee, X. Qiu, M. Yuan, D. Coomar, M. van Wely, E. van Leeuwen, E. Kostova, H. Kunst, A. Khalil, S. Tiberi, V. Brizuela, N. Broutet, E. Kara, C.R. Kim, A. Thorson, O.T. Oladapo, L. Mofenson, J. Zamora, S. Thangaratinam, C.O.V.L.S.R.C. for Preg, Clinical manifestations, risk factors, and maternal and perinatal outcomes of coronavirus disease 2019 in pregnancy: living systematic review and meta-analysis, BMJ 370 (2020) m3320.
[260] G. Capobianco, L. Saderi, S. Aliberti, M. Mondoni, A. Piana, F. Dessole, M. Dessole, P.L. Cherchi, S. Dessole, G. Sotgiu, COVID-19 in pregnant women: A systematic review and meta-analysis, Eur J Obstet Gynecol Reprod Biol 252 (2020) 543-558.
[261] F. Di Toro, M. Gjoka, G. Di Lorenzo, D. De Santo, F. De Seta, G. Maso, F.M. Risso, F. Romano, U. Wiesenfeld, R. Levi-D'Ancona, L. Ronfani, G. Ricci, Impact of COVID-19 on maternal and neonatal outcomes: a systematic review and meta-analysis, Clin Microbiol Infect 27(1) (2021) 36-46.
[262] R.A. Kadir, T. Kobayashi, T. Iba, O. Erez, J. Thachil, S. Kazi, A.K. Malinowski, M. Othman, COVID-19 coagulopathy in pregnancy: Critical review, preliminary recommendations, and ISTH registry-Communication from the ISTH SSC for Women's Health, J Thromb Haemost 18(11) (2020) 3086-3098.
[263] M. Jafari, A. Pormohammad, S.A. Sheikh Neshin, S. Ghorbani, D. Bose, S. Alimohammadi, S. Basirjafari, M. Mohammadi, C. Rasmussen-Ivey, M.H. Razizadeh, M. Nouri-Vaskeh, M. Zarei, Clinical characteristics and outcomes of pregnant women with COVID-19 and comparison with control patients: A systematic review and meta-analysis, Rev Med Virol (2021) e2208.
[264] M.U. Bhuiyan, E. Stiboy, M.Z. Hassan, M. Chan, M.S. Islam, N. Haider, A. Jaffe, N. Homaira, Epidemiology of COVID-19 infection in young children under five years: A systematic review and meta-analysis, Vaccine 39(4) (2021) 667-677.
[265] K.S. Dube R, COVID-19 in pregnancy: the foetal perspective—a systematic review, BMJ Paediatr Open 4(1) (2020).
[266] R. Abou Ghayda, H. Li, K.H. Lee, H.W. Lee, S.H. Hong, M. Kwak, M. Lee, M. Kwon, A. Koyanagi, A. Kronbichler, L. Jacob, L. Smith, J.I. Shin, COVID-19 and Adverse Pregnancy Outcome: A Systematic Review of 104 Cases, J Clin Med 9(11) (2020).

[267] I. Bellos, A. Pandita, R. Panza, Maternal and perinatal outcomes in pregnant women infected by SARS-CoV-2: A meta-analysis, Eur J Obstet Gynecol Reprod Biol 256 (2021) 194-204.
[268] M. Soheili, G. Moradi, H.R. Baradaran, M. Soheili, M.M. Mokhtari, Y. Moradi, Clinical manifestation and maternal complications and neonatal outcomes in pregnant women with COVID-19: a comprehensive evidence synthesis and meta-analysis, J Matern Fetal Neonatal Med (2021) 1-14.
[269] O. Irfan, F. Muttalib, K. Tang, L. Jiang, Z.S. Lassi, Z. Bhutta, Clinical characteristics, treatment and outcomes of paediatric COVID-19: a systematic review and meta-analysis, Arch Dis Child (2021).
[270] W.C. Koh, L. Naing, L. Chaw, M.A. Rosledzana, M.F. Alikhan, S.A. Jamaludin, F. Amin, A. Omar, A. Shazli, M. Griffith, R. Pastore, J. Wong, What do we know about SARS-CoV-2 transmission? A systematic review and meta-analysis of the secondary attack rate and associated risk factors, PLoS One 15(10) (2020) e0240205.
[271] B. Li, S. Zhang, R. Zhang, X. Chen, Y. Wang, C. Zhu, Epidemiological and Clinical Characteristics of COVID-19 in Children: A Systematic Review and Meta-Analysis, Front Pediatr 8 (2020) 591132.
[272] R.M. Viner, O.T. Mytton, C. Bonell, G.J. Melendez-Torres, J. Ward, L. Hudson, C. Waddington, J. Thomas, S. Russell, F. van der Klis, A. Koirala, S. Ladhani, J. Panovska-Griffiths, N.G. Davies, R. Booy, R.M. Eggo, Susceptibility to SARS-CoV-2 Infection Among Children and Adolescents Compared With Adults: A Systematic Review and Meta-analysis, JAMA Pediatr 175(2) (2021) 143-156.
[273] J.G. Wang, Z.J. Zhong, Y.F. Mo, L.C. Wang, R. Chen, Epidemiological features of coronavirus disease 2019 in children: a meta-analysis, Eur Rev Med Pharmacol Sci 25(2) (2021) 1146-1157.
[274] V.D. Williams, N.; Suthar, R.; Moh; oss, V.; Jaiswal, N.; Kavitha, T. K.; Nallasamy, K.; Angurana, S. K. C, Clinicolaboratory Profile, Treatment, Intensive Care Needs, and Outcome of Pediatric Inflammatory Multisystem Syndrome Temporally Associated with SARS-CoV-2: A Systematic Review and Meta-analysis. , Journal of Pediatric Intensive Care 0(0) (2020).
[275] E. Dorantes-Acosta, D. Avila-Montiel, M. Klunder-Klunder, L. Juarez-Villegas, H. Marquez-Gonzalez, Survival and Complications in Pediatric Patients With Cancer and COVID-19: A Meta-Analysis, Front Oncol 10 (2020) 608282.
[276] B.K. Tsankov, J.M. Allaire, M.A. Irvine, A.A. Lopez, L.J. Sauve, B.A. Vallance, K. Jacobson, Severe COVID-19 Infection and Pediatric Comorbidities: A Systematic Review and Meta-Analysis, Int J Infect Dis 103 (2021) 246-256.
[277] W.A. Brown, E.M. Moore, D.A. Watters, Mortality of patients with COVID-19 who undergo an elective or emergency surgical procedure: a systematic review and meta-analysis, ANZ J Surg 91(1-2) (2021) 33-41.
[278] J.W. Li, T.W. Han, M. Woodward, C.S. Anderson, H. Zhou, Y.D. Chen, B. Neal, The impact of 2019 novel coronavirus on heart injury: A Systematic review and Meta-analysis, Prog Cardiovasc Dis 63(4) (2020) 518-524.
[279] R. Tariq, S. Saha, F. Furqan, L. Hassett, D. Pardi, S. Khanna, Prevalence and Mortality of COVID-19 Patients With Gastrointestinal Symptoms: A Systematic Review and Meta-analysis, Mayo Clin Proc 95(8) (2020) 1632-1648.
[280] J. Almqvist, T. Granberg, A. Tzortzakakis, S. Klironomos, E. Kollia, C. Ohberg, R. Martin, F. Piehl, R. Ouellette, B.V. Ineichen, Neurological manifestations of coronavirus infections - a systematic review, Ann Clin Transl Neurol 7(10) (2020) 2057-2071.
[281] X. Chen, S. Laurent, O.A. Onur, N.N. Kleineberg, G.R. Fink, F. Schweitzer, C. Warnke, A systematic review of neurological symptoms and complications of COVID-19, J Neurol 268(2) (2021) 392-402.

[282] F. Gul, K.B. Lo, J. Peterson, P.A. McCullough, A. Goyal, J. Rangaswami, Meta-analysis of outcomes of patients with COVID-19 infection with versus without gastrointestinal symptoms, Proc (Bayl Univ Med Cent) 33(3) (2020) 366-369.
[283] R. Mao, Y. Qiu, J.S. He, J.Y. Tan, X.H. Li, J. Liang, J. Shen, L.R. Zhu, Y. Chen, M. Iacucci, S.C. Ng, S. Ghosh, M.H. Chen, Manifestations and prognosis of gastrointestinal and liver involvement in patients with COVID-19: a systematic review and meta-analysis, Lancet Gastroenterol Hepatol 5(7) (2020) 667-678.
[284] T.H. Chua, Z. Xu, N.K.K. King, Neurological manifestations in COVID-19: a systematic review and meta-analysis, Brain Inj 34(12) (2020) 1549-1568.
[285] L.P. Samaranayake, K.S. Fakhruddin, C. Panduwawala, Sudden onset, acute loss of taste and smell in coronavirus disease 2019 (COVID-19): a systematic review, Acta Odontol Scand 78(6) (2020) 467-473.
[286] A. De Lorenzo, D.A. Kasal, B.R. Tura, C.C. Lamas, H.C. Rey, Acute cardiac injury in patients with COVID-19, Am J Cardiovasc Dis 10(2) (2020) 28-33.
[287] L. Zhang, T.G. Peres, M.V.F. Silva, P. Camargos, What we know so far about Coronavirus Disease 2019 in children: A meta-analysis of 551 laboratory-confirmed cases, Pediatr Pulmonol 55(8) (2020) 2115-2127.
[288] M.A. Ashraf, P. Keshavarz, P. Hosseinpour, A. Erfani, A. Roshanshad, A. Pourdast, P. Nowrouzi-Sohrabi, S. Chaichian, T. Poordast, Coronavirus Disease 2019 (COVID-19): A Systematic Review of Pregnancy and the Possibility of Vertical Transmission, J Reprod Infertil 21(3) (2020) 157-168.
[289] S. Fridman, M. Bres Bullrich, A. Jimenez-Ruiz, P. Costantini, P. Shah, C. Just, D. Vela-Duarte, I. Linfante, A. Sharifi-Razavi, N. Karimi, R. Bagur, D.B. Debicki, T.E. Gofton, D.A. Steven, L.A. Sposato, Stroke risk, phenotypes, and death in COVID-19: Systematic review and newly reported cases, Neurology 95(24) (2020) e3373-e3385.
[290] A.H. Katsanos, L. Palaiodimou, R. Zand, S. Yaghi, H. Kamel, B.B. Navi, G. Turc, M. Romoli, V.K. Sharma, D. Mavridis, S. Shahjouei, L. Catanese, A. Shoamanesh, K. Vadikolias, K. Tsioufis, P. Lagiou, A.V. Alexandrov, S. Tsiodras, G. Tsivgoulis, The Impact of SARS-CoV-2 on Stroke Epidemiology and Care: A Meta-Analysis, Ann Neurol 89(2) (2021) 380-388.
[291] T. Siepmann, A. Sedghi, E. Simon, S. Winzer, J. Barlinn, K. de With, L. Mirow, M. Wolz, T. Gruenewald, P. Schroettner, S. von Bonin, L.P. Pallesen, B. Rosengarten, J. Schubert, T. Lohmann, J. Machetanz, P. Spieth, T. Koch, S. Bornstein, H. Reichmann, V. Puetz, K. Barlinn, Increased risk of acute stroke among patients with severe COVID-19: a multicenter study and meta-analysis, Eur J Neurol 28(1) (2021) 238-247.
[292] I. Siow, K.S. Lee, J.J.Y. Zhang, S.E. Saffari, A. Ng, B. Young, Stroke as a Neurological Complication of COVID-19: A Systematic Review and Meta-Analysis of Incidence, Outcomes and Predictors, J Stroke Cerebrovasc Dis 30(3) (2021) 105549.
[293] M. Yamakawa, T. Kuno, T. Mikami, H. Takagi, G. Gronseth, Clinical Characteristics of Stroke with COVID-19: A Systematic Review and Meta-Analysis, J Stroke Cerebrovasc Dis 29(12) (2020) 105288.
[294] L. Yang, J. Jin, W. Luo, Y. Gan, B. Chen, W. Li, Risk factors for predicting mortality of COVID-19 patients: A systematic review and meta-analysis, PLoS One 15(11) (2020) e0243124.
[295] X.C. Ling, E.Y. Kang, J.Y. Lin, H.C. Chen, C.C. Lai, D.H. Ma, W.C. Wu, Ocular manifestation, comorbidities, and detection of severe acute respiratory syndrome-coronavirus 2 from conjunctiva in coronavirus disease 2019: A systematic review and meta-analysis, Taiwan J Ophthalmol 10(3) (2020) 153-166.

[296] J. Amorim Dos Santos, A.G.C. Normando, R.L. Carvalho da Silva, A.C. Acevedo, G. De Luca Canto, N. Sugaya, A.R. Santos-Silva, E.N.S. Guerra, Oral Manifestations in Patients with COVID-19: A Living Systematic Review, J Dent Res 100(2) (2021) 141-154.
[297] M. Banakar, K. Bagheri Lankarani, D. Jafarpour, S. Moayedi, M.H. Banakar, A. MohammadSadeghi, COVID-19 transmission risk and protective protocols in dentistry: a systematic review, BMC Oral Health 20(1) (2020) 275.
[298] F.D.P. Cabrera-Tasayco, J.M. Rivera-Carhuavilca, K.J. Atoche-Socola, C. Pena-Soto, L.E. Arriola-Guillen, Biosafety Measures at the Dental Office After the Appearance of COVID-19: A Systematic Review, Disaster Med Public Health Prep (2020) 1-5.
[299] A.A. Siles-Garcia, A.G. Alzamora-Cepeda, K.J. Atoche-Socola, C. Pena-Soto, L.E. Arriola-Guillen, Biosafety for Dental Patients During Dentistry Care After COVID-19: A Review of the Literature, Disaster Med Public Health Prep (2020) 1-6.
[300] M. Al-Halabi, A. Salami, E. Alnuaimi, M. Kowash, I. Hussein, Assessment of paediatric dental guidelines and caries management alternatives in the post COVID-19 period. A critical review and clinical recommendations, Eur Arch Paediatr Dent 21(5) (2020) 543-556.
[301] E. Monaghesh, A. Hajizadeh, The role of telehealth during COVID-19 outbreak: a systematic review based on current evidence, BMC Public Health 20(1) (2020) 1193.
[302] H. Achmad, M. Tanumihardja, Y.F. Ramadhany, Teledentistry as a solution in dentistry during the covid-19 pandemic period: A systematic review, International Journal of Pharmaceutical Research 1 (2020) 12.
[303] P. Bastani, M. Mohammadpour, A. Ghanbarzadegan, K. Kapellas, L.G. Do, Global concerns of dental and oral health workers during COVID-19 outbreak: a scope study on the concerns and the coping strategies, Syst Rev 10(1) (2021) 45.
[304] L. Aquilanti, A. Santarelli, M. Mascitti, M. Procaccini, G. Rappelli, Dental Care Access and the Elderly: What Is the Role of Teledentistry? A Systematic Review, Int J Environ Res Public Health 17(23) (2020).
[305] G. Bedi, K.S. Vyas, M.T. Chung, S.D. Morrison, M. Asaad, S. Mardini, Telemedicine in International Cleft Care: A Systematic Review, Cleft Palate Craniofac J (2021) 1055665621989140.
[306] S.G. Alonso, G. Marques, I. Barrachina, B. Garcia-Zapirain, J. Arambarri, J.C. Salvador, I. de la Torre Diez, Telemedicine and e-Health research solutions in literature for combatting COVID-19: a systematic review, Health Technol (Berl) (2021) 1-10.
[307] E.B. de Moraes, J.B. Santos Garcia, J. de Macedo Antunes, D.V. Daher, F.L. Seixas, M.F. Muniz Ferrari, Chronic Pain Management during the Covid-19 Pandemic: A Scoping Review, Pain Manag Nurs (2020).
[308] H. Kondylakis, D.G. Katehakis, A. Kouroubali, F. Logothetidis, A. Triantafyllidis, I. Kalamaras, K. Votis, D. Tzovaras, COVID-19 Mobile Apps: A Systematic Review of the Literature, J Med Internet Res 22(12) (2020) e23170.
[309] S.S. Mahdi, Z. Ahmed, R. Allana, A. Peretti, F. Amenta, M. Nadeem Bijle, L.L. Seow, U. Daood, Pivoting Dental Practice Management during the COVID-19 Pandemic-A Systematic Review, Medicina (Kaunas) 56(12) (2020).
[310] K.A. Turkistani, K.A. Turkistani, Dental Risks and Precautions during COVID-19 Pandemic: A Systematic Review, J Int Soc Prev Community Dent 10(5) (2020) 540-548.
[311] M. Delikhoon, M.I. Guzman, R. Nabizadeh, A. Norouzian Baghani, Modes of Transmission of Severe Acute Respiratory Syndrome-Coronavirus-2 (SARS-CoV-2) and Factors Influencing on the Airborne Transmission: A Review, Int J Environ Res Public Health 18(2) (2021).

[312] B.A. Kathree, S.B. Khan, R. Ahmed, R. Maart, N. Layloo, W. Asia-Michaels, COVID-19 and its impact in the dental setting: A scoping review, PLoS One 15(12) (2020) e0244352.
[313] M. Tysiac-Mista, S. Bulanda, The utilization of rapid serological tests in COVID-19 diagnostics - a high risk of false-negative results in outpatient care, with particular emphasis on dental treatment, Med Pr (2020).
[314] A. Licina, A. Silvers, R.L. Stuart, Use of powered air-purifying respirator (PAPR) by healthcare workers for preventing highly infectious viral diseases-a systematic review of evidence, Syst Rev 9(1) (2020) 173.
[315] M. Zhang, A.R. Emery, R.J. Tannyhill, 3rd, H. Zheng, J. Wang, Masks or N95 Respirators During COVID-19 Pandemic-Which One Should I Wear?, J Oral Maxillofac Surg 78(12) (2020) 2114-2127.
[316] L.P. Samaranayake, K.S. Fakhruddin, H.C. Ngo, J.W.W. Chang, C. Panduwawala, The effectiveness and efficacy of respiratory protective equipment (RPE) in dentistry and other health care settings: a systematic review, Acta Odontol Scand 78(8) (2020) 626-639.
[317] N. Shaukat, D.M. Ali, J. Razzak, Physical and mental health impacts of COVID-19 on healthcare workers: a scoping review, Int J Emerg Med 13(1) (2020) 40.
[318] S. Hegde, Which type of personal protective equipment (PPE) and which method of donning or doffing PPE carries the least risk of infection for healthcare workers?, Evid Based Dent 21(2) (2020) 74-76.
[319] P. Bradford Smith, G. Agostini, J.C. Mitchell, A scoping review of surgical masks and N95 filtering facepiece respirators: Learning from the past to guide the future of dentistry, Saf Sci 131 (2020) 104920.
[320] J.V. Gross, J. Mohren, T.C. Erren, COVID-19 and healthcare workers: a rapid systematic review into risks and preventive measures, BMJ Open 11(1) (2021) e042270.
[321] D.P. Griswold, A. Gempeler, A.G. Kolias, P.J. Hutchinson, A.M. Rubiano, Personal protective equipment for reducing the risk of COVID-19 infection among healthcare workers involved in emergency trauma surgery during the pandemic: an umbrella review protocol, BMJ Open 11(3) (2021) e045598.
[322] D.K. Chu, E.A. Akl, S. Duda, K. Solo, S. Yaacoub, H.J. Schunemann, C.-S.U.R.G.E.s. authors, Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis, Lancet 395(10242) (2020) 1973-1987.
[323] K. Barycka, L. Szarpak, K.J. Filipiak, M. Jaguszewski, J. Smereka, J.R. Ladny, O. Turan, Comparative effectiveness of N95 respirators and surgical/face masks in preventing airborne infections in the era of SARS-CoV2 pandemic: A meta-analysis of randomized trials, PLoS One 15(12) (2020) e0242901.
[324] D. Coclite, A. Napoletano, S. Gianola, A. Del Monaco, D. D'Angelo, A. Fauci, L. Iacorossi, R. Latina, G. Torre, C.M. Mastroianni, C. Renzi, G. Castellini, P. Iannone, Face Mask Use in the Community for Reducing the Spread of COVID-19: A Systematic Review, Front Med (Lausanne) 7 (2020) 594269.
[325] J. Brainard, N.R. Jones, I.R. Lake, L. Hooper, P.R. Hunter, Community use of face masks and similar barriers to prevent respiratory illness such as COVID-19: a rapid scoping review, Euro Surveill 25(49) (2020).
[326] S. Gertsman, A. Agarwal, K. O'Hearn, R. Webster, A. Tsampalieros, N. Barrowman, M. Sampson, L. Sikora, E. Staykov, R. Ng, J. Gibson, T. Dinh, K. Agyei, G. Chamberlain, J.D. McNally, Microwave- and

heat-based decontamination of N95 filtering facepiece respirators: a systematic review, J Hosp Infect 106(3) (2020) 536-553.
[327] M. Santos, D. Torres, P.C. Cardoso, N. Pandis, C. Flores-Mir, R. Medeiros, A.D. Normando, Are cloth masks a substitute to medical masks in reducing transmission and contamination? A systematic review, Braz Oral Res 34 (2020) e123.
[328] O. Fakheran, M. Dehghannejad, A. Khademi, Saliva as a diagnostic specimen for detection of SARS-CoV-2 in suspected patients: a scoping review, Infect Dis Poverty 9(1) (2020) 100.
[329] T. Jackson, D. Deibert, G. Wyatt, Q. Durand-Moreau, A. Adisesh, K. Khunti, S. Khunti, S. Smith, X.H.S. Chan, L. Ross, N. Roberts, E. Toomey, T. Greenhalgh, I. Arora, S.M. Black, J. Drake, N. Syam, R. Temple, S. Straube, Classification of aerosol-generating procedures: a rapid systematic review, BMJ Open Respir Res 7(1) (2020).
[330] A.S. van Doorn, B. Meijer, C.M.A. Frampton, M.L. Barclay, N.K.H. de Boer, Systematic review with meta-analysis: SARS-CoV-2 stool testing and the potential for faecal-oral transmission, Aliment Pharmacol Ther 52(8) (2020) 1276-1288.
[331] N.R. Rahimi, R. Fouladi-Fard, R. Aali, A. Shahryari, M. Rezaali, Y. Ghafouri, M.R. Ghalhari, M. Asadi-Ghalhari, B. Farzinnia, O. Conti Gea, M. Fiore, Bidirectional association between COVID-19 and the environment: A systematic review, Environ Res 194 (2021) 110692.
[332] W. Gwenzi, Leaving no stone unturned in light of the COVID-19 faecal-oral hypothesis? A water, sanitation and hygiene (WASH) perspective targeting low-income countries, Sci Total Environ 753 (2021) 141751.
[333] N. Innes, I.G. Johnson, W. Al-Yaseen, R. Harris, R. Jones, S. Kc, S. McGregor, M. Robertson, W.G. Wade, J.E. Gallagher, A systematic review of droplet and aerosol generation in dentistry, J Dent 105 (2021) 103556.
[334] E.B. McCarty, L. Soldatova, J.A. Brant, J.G. Newman, Innovations in otorhinolaryngology in the age of COVID-19: a systematic literature review, World J Otorhinolaryngol Head Neck Surg (2021).
[335] J.E. Gallagher, C.S. K, I.G. Johnson, W. Al-Yaseen, R. Jones, S. McGregor, M. Robertson, R. Harris, N. Innes, W.G. Wade, A systematic review of contamination (aerosol, splatter and droplet generation) associated with oral surgery and its relevance to COVID-19, BDJ Open 6 (2020) 25.
[336] S. Kumbargere Nagraj, P. Eachempati, M. Paisi, M. Nasser, G. Sivaramakrishnan, J.H. Verbeek, Interventions to reduce contaminated aerosols produced during dental procedures for preventing infectious diseases, Cochrane Database Syst Rev 10 (2020) CD013686.
[337] M.J. Burton, J.E. Clarkson, B. Goulao, A.M. Glenny, A.J. McBain, A.G. Schilder, K.E. Webster, H.V. Worthington, Use of antimicrobial mouthwashes (gargling) and nasal sprays by healthcare workers to protect them when treating patients with suspected or confirmed COVID-19 infection, Cochrane Database Syst Rev 9 (2020) CD013626.
[338] K.L. Ortega, B.O. Rech, G.L.C. El Haje, C.B. Gallo, M. Perez-Sayans, P.H. Braz-Silva, Do hydrogen peroxide mouthwashes have a virucidal effect? A systematic review, J Hosp Infect 106(4) (2020) 657-662.
[339] S. Singh, N. Sharma, U. Singh, T. Singh, D.K. Mangal, V. Singh, Nasopharyngeal wash in preventing and treating upper respiratory tract infections: Could it prevent COVID-19?, Lung India 37(3) (2020) 246-251.
[340] M.S. Moosavi, P. Aminishakib, M. Ansari, Antiviral mouthwashes: possible benefit for COVID-19 with evidence-based approach, J Oral Microbiol 12(1) (2020) 1794363.
[341] L.P. Samaranayake, K.S. Fakhruddin, B. Buranawat, C. Panduwawala, The efficacy of bio-aerosol reducing procedures used in dentistry: a systematic review, Acta Odontol Scand 79(1) (2021) 69-80.

[342] A. Butera, C. Maiorani, V. Natoli, A. Bruni, C. Coscione, G. Magliano, G. Giacobbo, A. Morelli, S. Moressa, A. Scribante, Bio-Inspired Systems in Nonsurgical Periodontal Therapy to Reduce Contaminated Aerosol during COVID-19: A Comprehensive and Bibliometric Review, J Clin Med 9(12) (2020).
[343] M.J. Burton, J.E. Clarkson, B. Goulao, A.M. Glenny, A.J. McBain, A.G. Schilder, K.E. Webster, H.V. Worthington, Antimicrobial mouthwashes (gargling) and nasal sprays administered to patients with suspected or confirmed COVID-19 infection to improve patient outcomes and to protect healthcare workers treating them, Cochrane Database Syst Rev 9 (2020) CD013627.
[344] N.A. Mohamed, N. Baharom, W.S.W. Sulaiman, Z.Z. Rashid, W.K. Ken, U.K. Ali, S.N. Othman, M.N. Samat, N. Kori, P. Periyasamy, N.A. Zakaria, A.N.K. Sugurmar, N.E.M. Kazmin, C.X. Khee, S.M. Saniman, I. Isahak, Early Viral Clearance among COVID-19 Patients When Gargling with Povidone-Iodine and Essential Oils: A Clinical Trial, International Medical Journal 27(6) (2020) 651-654.
[345] B.L. Cavalcante-Leao, C.M. de Araujo, I.B. Basso, A.G. Schroder, O. Guariza-Filho, G.C. Ravazzi, F.M. Goncalves, B.S. Zeigelboim, R.S. Santos, J. Stechman-Neto, Is there scientific evidence of the mouthwashes effectiveness in reducing viral load in Covid-19? A systematic review, J Clin Exp Dent 13(2) (2021) e179-e189.
[346] H. Taninokuchi, H. Nakata, Y. Takahashi, K. Inoue, S. Kasugai, S. Kuroda, Evaluation of a Cetylpyridinium Chloride-, Dipotassium Glycyrrhizinate-, and Tranexamic Acid-based Mouthwash after Implant Placement: A Double-blind Randomised Clinical Trial, Oral Health Prev Dent 19(1) (2021) 157-167.
[347] A. Burela, A. Hernandez-Vasquez, D. Comande, V. Peralta, F. Fiestas, Chlorine dioxide and chlorine derivatives for the prevention or treatment of COVID-19: a systematic review, Rev Peru Med Exp Salud Publica 37(4) (2020) 605-610.
[348] M. Tysiac-Mista, A. Dubiel, K. Brzoza, M. Burek, K. Palkiewicz, Air disinfection procedures in the dental office during the COVID-19 pandemic, Med Pr 72(1) (2021) 39-48.
[349] L. Barbato, F. Bernardelli, G. Braga, M. Clementini, C. Di Gioia, C. Littarru, F. Oreglia, M. Raspini, E. Brambilla, I. Iavicoli, V. Pinchi, L. Landi, N.M. Sforza, R. Cavalcanti, A. Crea, F. Cairo, Surface disinfection and protective masks for SARS-CoV-2 and other respiratory viruses: A review by SIdP COVID-19 task force, Oral Dis (2020).
[350] A. Di Fiore, C. Monaco, S. Granata, E. Stellini, Disinfection protocols during COVID-19 pandemic and their effects on prosthetic surfaces: a systematic review, Int J Prosthodont (2021).
[351] P.M.S. Shimabukuro, M.L. Duarte, A.M. Imoto, A.N. Atallah, E.S.B. Franco, M.S. Peccin, M. Taminato, Environmental cleaning to prevent COVID-19 infection. A rapid systematic review, Sao Paulo Med J 138(6) (2020) 505-514.
[352] C.C.R. Ramos, J.L.A. Roque, D.B. Sarmiento, L.E.G. Suarez, J.T.P. Sunio, K.I.B. Tabungar, G.S.C. Tengco, P.C. Rio, A.L. Hilario, Use of ultraviolet-C in environmental sterilization in hospitals: A systematic review on efficacy and safety, Int J Health Sci (Qassim) 14(6) (2020) 52-65.

Appendices

APPENDIX A: Key findings for topic a) patients at greater risk of the consequences of COVID-19.

Condition	Main findings	Source*
Strong evidence		
Cardiovascular disease (CVD)	Higher risk for COVID-19: (i) severity: odds 1.70 to 4.81x greater, RR=2.25 to 4.97 (ii) ICU admission: odds 1.50 to 3.11x greater (iii) mortality: 10.9% to 37%, odds 2.71 to 10.08x greater, RR 2.1 Prevalence: 9.7% to 28.30%	SR and meta-analysis: *Sabatino et al.* [68]; SR and meta-analysis: *Zhang et al.* [67]; Meta-analysis: *Barek et al. [69];* SR and meta-analysis: *Bhattacharyya et al. [71];* SR and meta-analysis: *Biswas et al.*[72]; SR and meta-analysis: *Cordero et al.[74];* SR and meta-analysis: *Corona et al.[116];* SR and meta-analysis: *de Almeida-Pititto et al. [76];* SR and meta-analysis: *Del Sole et al. [77];* SR and meta-analysis: *Dorjee et al. [78];* SR and meta-analysis: *Emami et al. [81];* SR and meta-analysis: *Fathi et al.[82]* ;SR and meta-analysis: *Honardoost et al. [84];* SR and meta-analysis: *Katzenschlager et al. [86];* SR and meta-analysis: *Khamis et al.[87];* SR and meta-analysis: *Khan et al.[88];* SR and meta-analysis: *Mahumud et al.* [91]; SR and meta-analysis: *Matsushita et al.* [92]; SR and meta-analysis: *Mudatsir et al. [98]; Meta-analysis: Naeini et al.[99];* SR and meta-analysis: *Nannoni et al.* [115]; Meta-analysis: *Noor et al.[101];* Meta-analysis: *Shoar et al. [117];* SR and meta-analysis: *Ssentongo et al.[107];* SR and meta-analysis: *Yin et al.* [113]; SR and meta-analysis: *Zhou Y et al.* [114]
Congestive heart failure	Higher risk for COVID-19: (i) poor outcomes: odds 2.86x greater (ii) hospitalization: odds 2.37x greater (iii) severity: odds 4.76x greater, RR=2.03 (iv) mortality: odds 3.46x to 6.02x greater, RR 2.35 Prevalence in patients with COVID-19: 11.50% to 22.34%	SR and meta-analysis: *Chidambaram et al. [73];* SR and meta-analysis: *Dalia et al. [75];* SR and meta-analysis: *Li X et al.* [118]; SR and meta-analysis: *Sahranavard et al.* [119]; SR and meta-analysis: *Ssentongo et al. [107];* Meta-analysis : *Vakili et al.[120] ;* SR and meta-analysis: *Yonas et al.* [121]
Cardiac arrythmias	Higher risk for COVID-19: (i) severity: odds 3.61x greater (ii) ICU admission:13.09x greater (iii) associated with pneumonia: severity odds 17.97x greater Prevalence in patients with COVID-19: 10.11% to 16.64%	SR and meta-analysis: *Dalia et al. [75];* SR and meta-analysis: *Sahranavard et al.* [119]; Meta-analysis : *Vakili et al. [120];* Meta-analysis : *Wen et al. [122]*
Myocardial Injury	Higher risk for COVID-19: (i) severity: 44% (ii) mortality: 74% Prevalence in patients with COVID-19: 17.85%	SR and meta-analysis: *Sahranavard et al.* [119]; SR and meta-analysis: *2 Vakhshoori et al.* [123]
Heart transplant recipients	Higher risk for COVID-19: (i) mechanical ventilation: 33.3%	SR and meta-analysis: *Granger et al. [124]*

	(ii) mortality: 25.6% (iii) with diabetes: odds 3.60x greater (iv) with Chronic kidney disease: odds 3.79x greater	
Cardiac Injury	Higher risk for: (i) severe COVID-19: developing coagulopathy (RR: 3.86); (ii) ICU admission: 30% (RR: 4.06); (iii) mechanical ventilation (RR: 5.53); (iv) mortality (RR:7.79) Lower chance to increased risk when associated to: (i) acute respiratory distress syndrome (RR:3.22); (ii) acute kidney injury (RR: 11.52)	Meta-analysis: *Bansal et al. [125];* SR and meta-analysis: *Koeppen et al.[89];* SR and meta-analysis: *Zeng et al.[126]*
Acute cardiac Injury	Higher risk for COVID-19: (i) severity: 36%, odds -8.52 to 16.79x greater (ii) mortality: 48%, odds 16.79x greater, Prevalence in patients with COVID-19: -15.68% to 37.1% -age <60 years: 15% -age >60 years: 30% - males: 54.3%	SR and meta-analysis: *Zhang et al.* [67]; SR and meta-analysis: *Dalia et al. [75];* SR and meta-analysis: *Fu et al.[127];* SR and meta-analysis: *Huang et al.* [128]; SR and meta-analysis: *Momtazmanesh et al.[97];* SR and meta-analysis: *Prasitlumkum et al.[129];* SR and meta-analysis: *Vakhshoori et al.* [123]; Meta-analysis : *Vakili et al. [120];* SR and meta-analysis : *Wang Z et al. [110];* Meta-analysis: *Zhong et al.[130]*
Coronary heart disease	Higher risk for COVID-19: (i) severity: odds 3.23 to 4.10x greater (ii) ICU admission: odds 2.25x greater (iii) mortality: odds 4.37x greater Higher risk to developing acute cerebrovascular diseases, compared to those who did not: odds 3.12x greater. Higher risk to developing hypertension: 30%, odds 3.78x greater.	SR and meta-analysis: *Nannoni et al.* [115]; Meta-analysis: *Liang et al.* [131]; SR and meta-analysis: *Meng et al.* [93]; SR and meta-analysis: *Radwan et al.* [103]; SR and meta-analysis *Sepandi et al.* [105]
Hypertension	Higher risk for COVID-19: (i) severity: 32% to 37%; odds 0.71 to 3.17x greater, RR= 1.79 to 2.87 (ii) ICU admission: 49.5%, odds 1.62 to 2.95x greater, RR=2.11 (iii) mortality: 46% to 66%, odds 1.97 to 4.17x greater; RR 1.52 to 1.8 Prevalence: 11.7% to 55%	SR and meta-analysis: *Zhang et al.* [67]; SR and meta-analysis: *Sabatino et al.* [68]; Meta-analysis: *Barek et al. [69];* SR and meta-analysis: *Barrera et al.[70];* SR and meta-analysis: *Bhattacharyya et al. [71];* SR and meta-analysis: *Biswas et al.* [72]; SR and meta-analysis: *Chidambaram et al. [73];* SR and meta-analysis: *Cordero et al. [74];* SR and meta-analysis: *Dalia et al. [75];* SR and meta-analysis: *de Almeida-Pititto et al. [76];* SR and meta-analysis: *Del Sole et al. [77];* SR and meta-analysis: *Dorjee et al. [78];* SR and meta-analysis: *Du et al. [79];* SR and meta-analysis: *Ebrahimi et al.* [80]; SR and meta-analysis: *Emami et al. [81];* SR and meta-analysis: *Fathi et al. [82];* SR and meta-analysis: *GuoX et al. [83];* SR and meta-analysis: *Honardoost et al. [84];* SR and meta-analysis: *Javanmardi et al. [85];* SR and meta-analysis: *Katzenschlager et al. [86];* SR and meta-analysis: *Khamis et al. [87];* SR and meta-analysis: *Khan et al. [88];* SR and meta-analysis: *Koeppen et al. [89];* SR and meta-analysis: *Lu et*

	Patients with COVID-19 developing acute cerebrovascular diseases, compared to those who did not: odds 7.35 x greater	al.[90]; SR and meta-analysis: Mahumud et al. [91]; SR and meta-analysis: Matsushita et al. [92]; SR and meta-analysis: Meng et al. [93]; SR and meta-analysis: Mesas et al. [94]; SR and meta-analysis: Miller et al. [95]; SR and meta-analysis: Moazzami et al. [96]; SR and meta-analysis: Momtazmanesh et al. [97]; SR and meta-analysis: Mudatsir et al. [98]; Meta-analysis: Naeini et al. [99]; SR and meta-analysis: Ng et al. [100]; Meta-analysis: Noor et al. [101]; SR and meta-analysis: Parveen et al. [102]; SR and meta-analysis: Radwan et al. [103]; Meta-analysis : Rahman et al.[104]; SR and meta-analysis : Sepandi et al. [105]; SR and meta-analysis: Silverio et al. [106]; SR and meta-analysis: Ssentongo et al. [107]; SR and meta-analysis: Tan et al. [108]; SR and meta-analysis: Taylor et al. [109]; SR and meta-analysis : Wang Z et al. [110]; SR and meta-analysis: Wong et al. [111]; SR and meta-analysis: Xie et al. [112]; SR and meta-analysis: Yin et al. [113]; SR and meta-analysis: Zhou Y et al. [114];SR and meta-analysis: Nannoni et al. [115]
Respiratory disease (general)	Higher risk for COVID-19: (i) severity: odds3.33x greater (ii) mortality: odds 2.55x greater Prevalence in patients with COVID-19: 8% to 10.8%	Meta-analysis: Barek et al. [69]; SR and meta-analysis: Gold et al.[132]; SR and meta-analysis: Hashizume et al.[133]; SR and meta-analysis : Sepandi et al. [105]; SR and meta-analysis: Xiang et al. [134]; SR and meta-analysis: Zhou Y et al. [114]
	Asthma: Higher risk for COVID-19: (i) severity: 14.55%, RR=1.21 (ii) ICU admission: odds 1.39x greater, RR=0.87 to 1.19 (iii) endotracheal intubation: RR=1.27 (iv) mechanical ventilation: 14%, odds 0.96x greater, RR=0.87 to 1.03 (v) mortality: 9%, odds 1.94x greater, RR=0.80 to1.09 (vi) prevalence in patients with COVID-19: 1.1% to 16.9%	Meta-analysis: Biswas et al.[135]; SR and meta-analysis: Hashizume et al. [133]; Meta-analysis: Hussein et al.[136]; SR and meta-analysis: Javanmardi et al. [85]; SR and meta-analysis: Khan et al. [88]; SR and meta-analysis: Liu S et al. [137]; SR and meta-analysis: Mahumud et al. [91]; SR and meta-analysis: Mesas et al. [94]; SR and meta-analysis: Ng et al. [100];; SR and meta-analysis: Shi et al. [138]; SR and meta-analysis: Sunjaya et al. [139]
	Pneumonia/ Bilateral lung involvement: Higher risk for COVID-19 severity: 8.51%, odds 4.86x greater Prevalence in patients with COVID-19: 82.2%	SR and meta-analysis: Chidambaram et al. [73]; SR and meta-analysis: Hashizume et al. [133]; SR and meta-analysis: Xie et al. [112]
Chronic obstructive pulmonary disease (COPD)	Higher risk for: (i) poor outcomes: odds 5.01x greater (ii) severe COVID-19 (risk difference: 0.05; odds 2.48 to 4.67x greater, RR=3.63)	SR and meta-analysis: Zhang et al. [67]; Meta-analysis: Awortwe et al. [140]; SR and meta-analysis: Corona et al. [116]; SR and meta-analysis: Del Sole et al. [77]; SR and meta-analysis: Honardoost

	(iii) severity associated with smokers: odds 1.65x greater (iv) ICU admission (risk difference: 0.10, odds 1.39 to 8.33x greater) (v) COVID-19 mortality: 6.8% (risk difference: 0.12, odds 3.43 to 4.36x greater, RR=3.18) (vi) mortality associated with males: RR=1.20	*et al. [84];* SR and meta-analysis: *Jain et al. [141];* SR and meta-analysis: *Katzenschlager et al. [86];* SR and meta-analysis: *Lu et al. [90];* SR and meta-analysis: *Mudatsir et al. [98];* SR and meta-analysis: *Poly et al. [142];* SR and meta-analysis: *Pranata et al.* [143]; SR and meta-analysis: *Rabbani et al.* [144]; SR and meta-analysis: *Yin et al.* [113]; SR and meta-analysis: *Zhao et al.* [145]; SR and meta-analysis: *Zhou Y et al.* [114]
Acute Respiratory Distress Syndrome (ARDS)	Higher risk for COVID-19: (i) severity: 33.15% to 39%; odds: 26.12 to 34.45x greater (ii) worse clinical outcomes for patients infected with SARS-CoV-2 with elevated D-dimers. (iii) ICU admission: 76.1% (iv) mortality: odds 2.74x greater Prevalence in patients with COVID-19: 14.6% to 60.8%	SR and meta-analysis: *Zhang et al.* [67]; SR and meta-analysis: *Bansal et al.[146];* SR and meta-analysis: *Bhattacharyya et al. [71];* SR and meta-analysis: *Biswas et al.* [72]; SR and meta-analysis: *Hasan et al. [147];* SR and meta-analysis: *Cui et al.* [148]; SR and meta-analysis: *Tan et al.* [108]; Meta-analysis : *Vakili et al. [120];* SR and meta-analysis : *Wang Z et al. [110];* SR and meta-analysis: *Xie Y et al.* [149]; SR and meta-analysis: *Zhang JJY et al.* [150]; Meta-analysis: *Zhong et al. [130]*
Diabetes mellitus	Higher risk to developing acute cerebrovascular diseases, compared to those who did not: 17% vs 6%; odds 5.56x greater. Higher risk for COVID-19: (i) severity: 10.6% to18%, odds 1.48 to 2.78x greater, RR=1.51 to 3.20. (ii) ICU admission:26.6%, odds 1.58x greater, RR=1.16 to 1.88. (iii) mechanical ventilation: odds 1.35x greater (iv) mortality: 13.3% to 39%, odds 1.02 to 3.73x greater, RR=1.61 to 3.16 (v) mortality with hyperglycemia rates: odds 3.45x greater Prevalence in patients with COVID-19: -7.87% to 33%	SR and meta-analysis: *Nannoni et al.* [115];SR and meta-analysis: *Zhang et al.* [67]; SR and meta-analysis: *Sabatino et al.* [68]; Meta-analysis: *Barek et al. [69];* SR and meta-analysis: *Barrera et al. [70];* SR and meta-analysis: *Bhattacharyya et al. [71];* SR and meta-analysis: *Biswas et al.* [72]; SR and meta-analysis: *Chidambaram et al. [73];* SR and meta-analysis: *Cordero et al. [74];* SR and meta-analysis: *Corona et al. [116];* SR and meta-analysis: *de Almeida-Pititto et al. [76];* SR and meta-analysis: *Del Sole et al. [77];* SR and meta-analysis: *Dorjee et al. [78];* SR and meta-analysis: *Du et al.* [184]; SR and meta-analysis: *Ebrahimi et al[80];* SR and meta-analysis: *Emami et al. [81];* SR and meta-analysis: *Faghir-Gangi et al.* [185]; SR and meta-analysis: *Fathi et al[82];* SR and meta-analysis: *Gold et al. [132];* SR and meta-analysis: *Honardoost et al. [84];* Meta-analysis: *Hussain et al.* [186] ; SR and meta-analysis: *Katzenschlager et al. [86];* SR and meta-analysis: *Khamis et al. [87];* SR and meta-analysis: *Khan et al. [88];* SR and meta-analysis: *Lu et al. [90];* SR and meta-analysis: *Mahumud et al.* [91]; SR and meta-analysis: *Matsushita et al.* [92]; SR and meta-analysis: *Meng et al.* [93]; SR and meta-analysis: *Mesas et al.[94];* SR and meta-analysis: *Miller et al.* [95]; SR and meta-analysis: *Moazzami et al.* [96]; SR and meta-analysis: *Momtazmanesh et al. [97];* SR and meta-analysis: *Mudatsir et al. [98];* SR and meta-analysis: *Ng et al. [100];*; Meta-analysis: *Noor et al. [101];* SR and meta-analysis: *Palaiodimos et*

		al. [187]; SR and meta-analysis: Parveen et al. [102]; SR and meta-analysis: Poly et al. [142]; SR and meta-analysis: Radwan et al. [103]; Meta-analysis : Rahman et al. [104]; SR and meta-analysis : Sepandi et al. [105]; SR and meta-analysis : Shang et al.[188]; SR and meta-analysis: Silverio et al. [106]; SR and meta-analysis: Ssentongo et al. [107]; SR and meta-analysis: Tan et al. [108]; SR and meta-analysis : Wang Z et al. [110]; SR and meta-analysis: Wu ZH et al. [189]; SR and meta-analysis: Xie et al. [112]; Meta-analysis: Yang J et al. [190]; SR and meta-analysis: Yin et al. [113]; SR and meta-analysis: Zhou Y et al. [114]
Cancer	Higher risk infection in patients with COVID-19 with different types of cancer: (i) prostate cancer: a worse prognosis, 2.6% (n=118/4532). (ii) colorectal cancer: not a significant risk in the global population (odds 0.261x greater), but significant correlation in Chinese patients (odds 0.221x greater). (iii) hematological cancer: RR=2.68. (iv) solid tumor: RR=1.16 Higher risk for COVID-19: (i) severity: 45.4%, odds 2.28 to 3.91x greater, RR=1.47 (ii) ICU admission: 14.5%, odds 3.10x greater, RR=1.56 (iii) mechanical ventilation: 11.7%, odds 2.5 to 4.86x greater (iv) mortality: 8.2% to 30%, odds 1.63 to 3.7x greater, RR =1.66 to 1.8 (v) mortality of patients > 65 years with cancer and COVID-19: RR=1.06 to 1.82 (vi) mortality of male patients with cancer and COVID-19: RR=1.16 (vii) mortality of patients with comorbidities, cancer and COVID-19: RR=1.12 (viii) mortality lung cancer: RR=1.8 (viii) mortality in patients with active chemotherapy: odds 1.42 to 1.85x greater (ix) lung cancer: mortality odds 1.62x greater (x) hematologic cancer: mortality in adults: 34%, in children:4%, > 60 years RR=1.82	SR and meta-analysis: Mou et al. [151] [88]; SR and meta-analysis: Zhang et al. [67]; SR and meta-analysis: Antikchi et al. [152]; Meta-analysis: Barek et al. [69]; SR and meta-analysis: Biswas et al. [72]; SR and meta-analysis: Corona et al. [116]; SR and meta-analysis: Desai et al. [153]; SR and meta-analysis: Elgohary [154]; Meta-analysis: Giannakoulis et al. [155]; SR and meta-analysis: Honardoost et al. [84]; SR and meta-analysis: Katzenschlager et al. [86]; SR and meta-analysis: Khan et al. [88]; SR and meta-analysis: Liu H et al. [156] ; SR and meta-analysis: Liu Y et al.[353] SR and meta-analysis: Mesas et al. [94]; SR and meta-analysis: Ng et al. [100]; ; Meta-analysis: Noor et al. [101]; SR and meta-analysis: Park et al. [157]; SR and meta-analysis: Peravali et al. [158]; SR and meta-analysis: Radwan et al. [103]; SR and meta-analysis: Ssentongo et al. [107]; SR and meta-analysis: Vijenthira et al. [159]; SR and meta-analysis: Yang L et al. [160] ;SR and meta-analysis: Yekeduz et al. [161]; SR and meta-analysis: Yin et al. [113]; SR and meta-analysis: Zarifkar et al. [162]; SR and meta-analysis: Zhang et al. [163]; SR and meta-analysis: Zhou Y et al. [114]
Cerebrovascular diseases	Patients with COVID-19 developing acute cerebrovascular diseases, compared to those who did not: (i)older (pooled median difference = 4.8 years)	SR and meta-analysis: Nannoni et al. [115]

	Higher risk for COVID-19: (i) severity: odds 2.42 to 5.10x greater (ii) ICU admission: odds 5.88x greater (iii) mortality: odds 5.21x greater Prevalence in patients with COVID-19: 6% to 15.58% *Cerebral venous thrombosis*: - 4.2% of cerebrovascular diseases in individuals with COVID-19 (n=406 patients) - Predisposing factors (31%) - Mortality (40%) - 0.08% frequency among patients hospitalized for SARS-CoV-2 (n=34,331 patients)	SR and meta-analysis: *Zhang et al.* [67] Meta-analysis: *Barek et al. [69];* SR and meta-analysis: *Nannoni et al.* [115]; SR and meta-analysis: *Biswas et al.* [72]; SR and meta-analysis: *Del Sole et al. [77];* SR and meta-analysis: *Gao et al. [164];* SR and meta-analysis: *Honardoost et al. [84];* SR and meta-analysis: *Katzenschlager et al. [86];* SR and meta-analysis: *Khan et al. [88];* Meta-analysis: *Xu J et al.* [165]; SR and meta-analysis: *Yin et al.* [113]; Meta-analysis: *Zhang J et al.* [166]; SR and meta-analysis: *Zhou Y et al.* [114] SR and meta-analysis: *Baldini et al.* [167]
Nervous System diseases	Higher risk for COVID-19: (i) severity: odds 3.19x greater (ii) mortality: odds 3.75x greater *Ischemic cerebrovascular accidents:* -Prevalence in patients with COVID-19: 1.7% - Higher risk for COVID-19: (i) mortality: 29.2%	SR and meta-analysis: *Gao et al. [164]* SR and meta-analysis: *Parsay et al.* [195]
Dementia	Higher risk for COVID-19: (i) severity: odds 2.63x greater (ii) mortality: odds 2.62 to 5.17x greater (iii) poor outcomes: odds 2.67x greater	Meta-analysis: *Hariyanto et al.* [191] [128]; SR and meta-analysis: *July et al.* [192]; SR and meta-analysis: *Liu N et al.* [193]; SR and meta-analysis: *Zuin et al.* [194]
Chronic kidney diseases (CKD)	Higher risk for COVID-19: (i) severity: risk difference: 0.05; odds 1.26 to 4.06x greater, RR=2.89 to 3.25 (ii) admission to ICU: risk difference: 0.10, odds 1.48x greater (iii) mechanical ventilation: odds 2.4x greater (iv) mortality: 27%, risk difference: 0.12, odds 2.36 to 5.81x greater, RR=3.47 (v) poor outcomes: RR=2.63 Prevalence in patients with COVID-19: 3.52% to 5.19% *Kidney transplant:*	SR and meta-analysis: *Zhang et al.* [67]; Meta-analysis: Awortwe *et al.* [140];; Meta-analysis: *Barek et al. [69];* SR and meta-analysis: *Cai et al.* [180]; SR and meta-analysis: *Fathi et al. [82];* SR and meta-analysis: *Katzenschlager et al. [86];* SR and meta-analysis: *Khan et al. [88];* SR and meta-analysis: *Liu YF et al.* [174] ; SR and meta-analysis: *Mesas et al. [94];* SR and meta-analysis: *Ng et al. [100];*; SR and meta-analysis: *Poly et al. [142];* SR and meta-analysis: *Pranata et al.* [181]; SR and meta-analysis: *Radwan et al.* [103]; SR and meta-analysis : *Sepandi et al.* [105]; SR and meta-analysis: *Ssentongo et al. [107];* Meta-analysis: *Wang et al.* [175]; SR and meta-analysis: *Yin et al.* [113]; SR and meta-analysis: *Zhou et al.* [178]; SR and meta-analysis: *Zhou Y et al.* [179]

	Comorbidities+ kidney transplant patients +COVID-19= any impact on the severity or outcome (odds 0.95x) *Hemodialysis patients:* Higher risk for COVID-19: (i) mortality: 12% to 26.2%	SR and meta-analysis: *Bansal et al.* [183]; SR and meta-analysis: *Chan et al.* [169] SR and meta-analysis: *Chen et al.* [182] ; SR and meta-analysis: *Corona et al. [116];* SR and meta-analysis: *Zhou et al.* [178]
Acute kidney disease (AKI)	Higher risk for COVID-19: (i) severity: 20% vs non severe patients (2%, odds 6.97 to 17.2x greater) (ii) mortality: 31% to 67% vs survivors (7%), odds 3.43 to 45.79x greater (iii) mortality AKI + comorbidities: odds 8.78x greater Prevalence in patients with COVID-19: 9.87% to 28.6% (-overall COVID-19 patients: 8.3%; - critically COVID-19 patients: 19.9%) Higher risk for COVID-19 + AKI+ - male: odds 3.43x greater - diabetes: odds 2.63x greater - COPD: odds 2.98x greater - CKD: odds 3.26x greater - CVD: odds 2.26x greater - cerebrovascular disease: odds 2.95x greater	SR: *Zhang et al.* [67]; Meta-analysis : *Brienza et al.* [105]; SR and meta-analysis: *Chan et al.* [169]; SR and meta-analysis: *Fabrizi et al.* [107]; SR and meta-analysis: *Fu et al.* [108]; Meta-analysis: *Hansrivijit et al.* [109]; SR and meta-analysis: *Katzenschlager et al. [86];* Meta-analysis: *Lin L et al.* [110]; SR and meta-analysis: *Liu YF et al.* [174]; SR and meta-analysis: *Vakhshoori et al.* [123]; Meta-analysis : *Vakili et al. [120];* Meta-analysis: *Wang et al.* [175]; Meta-analysis: *Yang Q et al.* [113]; SR and meta-analysis: *Zhang Z et al.* [114]; Meta-analysis: *Zhong et al. [130];* SR and meta-analysis: *Zhou et al.* [178] SR and meta-analysis: *Zhou Y et al.* [114]
Smoking	Higher risk to severe COVID-19: - current smokers: 21.2%, odds 1.34 to 2.06x greater, RR=1.80 - never-smokers: 10.7%, odds1.98x greater - previous smoking history (ex-smoking): odds 1.55 to 4.60x greater, RR 1.31 to 1.71 - Compared to never-smokers, patients with a smoking history: increased risk of severe COVID-19 (RR 1.26 to 1.79) Higher risk to ICU admission: odds 1.73x greater Higher risk to COVID-19 mortality: - current smokers: 29.4% to 44%, odds1.19 to 2.8x greater, RR= 2.07 - previous smoking history (ex-smoking): odds 2.58x greater - compared to former smokers, current smokers' patients: increased mortality COVID-19 (RR= 1.03) Prevalence: 7.63% to 23%	SR and meta-analysis: *Zhang et al.* [67]; SR and meta-analysis: *Reddy Charles et al.* [237]; SR and meta-analysis: *Del Sole et al. [77];* SR and meta-analysis: *Dorjee et al. [78];* SR and meta-analysis: *Emami et al. [81];* SR and meta-analysis: *Gülsen et al.*[238]; SR and meta-analysis: *Jimenez-Ruiz et al.* [239]; SR and meta-analysis: *Karanasos et al.* [240] ; SR and meta-analysis: *Katzenschlager et al. [86];* SR and meta-analysis: *Lansiaux et al.* [241] ; SR and meta-analysis: *Mesas et al. [94];* SR and meta-analysis: *Patanavanich et al.*[242]; SR and meta-analysis: *Patanavanich et al.* [243]; SR and meta-analysis: *Radwan et al.* [103]; Meta-analysis : *Rahman et al. [104];* Meta-analysis: *Salah et al.* [244] ; SR and meta-analysis: *Umnuaypornlert et al.* [245]; SR and meta-analysis: *2 Zhang et al.* [246]; SR and meta-analysis: *Zhao et al.* [145]
Obesity	Higher risk for COVID-19: (i) poor outcome: odds 1.29 to 2.09x greater (ii) severity: odds 1.72 to 4.17x greater (iii) ICU admission: odds 1.189 to 2.32x greater (iv) invasive mechanical ventilation: odds 1.59 to 2.63x greater	SR and meta-analysis: *Aghili et al.* [228]; SR and meta-analysis: *Hoong et al.* [229]; SR and meta-analysis: *Chu et al.* [230]; Meta-analysis : *Deng et al.* [231]; SR and meta-analysis: *Ho et al.* [232]; SR and meta-analysis: *Huang et al.* [233]; SR and meta-analysis: *Malik et al.* [234];SR and meta-analysis: *Ng et al.*

	(v) disease progression: odds 1.16 to 1.41x greater (vi) in younger patients: odds 3.30x greater (vii) associated to ARDS: odds 1.39x greater	*[100];* SR and meta-analysis: *Soreoto et al.* [235]; SR and meta-analysis: *Yang et al.* [190]; SR and meta-analysis: *Zhao X et al.* [236]; SR and meta-analysis: *Zhou Y et al.* [114]
	Chance of mortality COVID-19: (i) 58%, odds: 0.89 to 2.08 x greater Prevalence in patients with COVID-19: 27.6% to 42%	SR and meta-analysis: *Aghili et al.* [228]; SR and meta-analysis: *Chu et al.* [230]; Meta-analysis : *Deng et al.* [231]; SR and meta-analysis: *Hoong et al.* [229]; SR and meta-analysis: *Huang et al.* [233]; SR and meta-analysis: *Ho et al.* [232]; SR and meta-analysis: *Mesas et al. [94];* SR and meta-analysis: *Moazzami et al.* [96]; SR and meta-analysis: *Ng et al. [100];*; Meta-analysis: *Noor et al. [101];* SR and meta-analysis: *Poly et al. [142];* Meta-analysis: *Yang J et al.* [190]; SR and meta-analysis: *Zhao X et al.* [236]
	*Previous bariatric surgery (*associated with a lower rate of mortality and hospital admission): (i) risk of mortality: odds 0.22x greater (ii) hospitalization: odds 0.28x greater	SR and meta-analysis: *Aminian et al.* [247]
Liver diseases (general)	Higher chance for COVID-19: (i) severity: odds 0.81x to 4.48x greater. (ii) severity in males: odds 1.52x greater than in females (iii) mortality: odds 1.98x to 2.35x greater *Liver Transplanted patients:* Higher risk for COVID-19: (i) mild to moderate: 87% (ii) severity: 13% (iii) ICU admission: 41% (iv) mortality: 17.8% to 20% (v) elderly patients: odds 4.26x greater (vi) males: odds 1.58x greater	SR and meta-analysis: S. *Afra et al.* [196]; SR and meta-analysis: *Ampuero et al.* [197]; Meta-analysis: *Barek et al. [69];* Meta-analysis: *Wu ZH et al.* [198] ; SR and meta-analysis: *Zhou Y et al.* [114] SR and meta-analysis: *Jayant et al.* [199] ; Meta-analysis: *Waleed et al.* [200]
Chronic liver diseases	Higher chance for COVID-19: (i) severity: odds 0.97 to 0.99x greater (ii) ICU admission: odds 0.97x greater Prevalence in patients with COVID-19: 2.64% to 2.67%, RR=1.69	SR and meta-analysis: *Zhang et al.* [67]; SR and meta-analysis: *Kumar et al.* [201]; SR and meta-analysis: *Vancsa et al.* [202] ; SR and meta-analysis: *Yin et al.* [113]
Acute liver diseases	Prevalence in patients with COVID-19: 19%	SR and meta-analysis: *Merola et al.* [203]
Effect of age	High risk for severe COVID-19: (i) age of >=50 years (odds: 0.740x greater, RR = 3.36 in comparison with age below 50 years) (ii) age>=65 years are not associated to severity (RR: 0.79 to 3.59 compared to severe patients age below 65 years) (iii) associated to: - diabetes: odds 4.02x greater - hypertension: odds 4.60x greater - cardiovascular diseases: odds 8.24x greater - chronic Kidney disease: odds 1.94x greater	Meta-analysis: *Barek et al. [69];* SR and meta-analysis: *Bhattacharyya et al. [71];* SR and meta-analysis: *Li X et al.* [206]; Meta-analysis: *Noor et al. [101];* Meta-analysis: *Pijls et al.* [223]; SR and meta-analysis: *Yifan et al.* [224]

	- liver diseases: odds 1.25x greater	
	High risk for severe COVID-19 (ICU admissions): (i) age <40-50 years: 5.4% (ii) age 40-69 years: 52.6% (iii) age ≥60-70 years: 41.8%, odds 2.70x greater	SR and meta-analysis: *Cohen et al.* [225]; SR and meta-analysis: *Jain et al. [141];* Meta-analysis: *Pijls et al.* [223]
	High risk for COVID-19 mortality: (i) age <40 years: 0.1% (ii) age 40 to 69 years:13% (iii) age >=50 years: odds 1.378 to 1.86x greater, compared to patients with age <50 years (odds 15.44x) (iv) age ≥60 years: 66.6% to 85%, odds 3.12 to 11.99x greater, RR3.6 (v) age ≥70 years: 86.6%, odds 3.61x greater (vi) age >= 70 and < 70 years with Chronic Kidney Diseases and COVID-19 (odds 8.69x greater) than in the >= 70 years (odds 2.44x) (vii) age >= 80 years: 84.4%	SR and meta-analysis: *Biswas et al.* [72]; SR and meta-analysis: *Cai et al.* [180]; SR and meta-analysis: *Cohen et al.* [225]; SR and meta-analysis: *Borges do Nascimento et al.* [226]; SR and meta-analysis: *Dorjee et al. [78];* SR and meta-analysis: *Du et al. [79];* SR and meta-analysis: *Lim et al.* [227]; SR and meta-analysis: *Lu et al. [90];* Meta-analysis: *Pijls et al.* [223]; SR and meta-analysis : *Sepandi et al.* [105]; SR and meta-analysis: *Silverio et al.* [106]; SR and meta-analysis: *Taylor et al.* [109]; SR and meta-analysis: *Xiang et al.* [134]
Effect of sex difference	High risk for severe COVID-19: (i) male (odds 0.75 to 3.04x greater than female patients (male Vs. female 54% to 59.67% vs. 40.33%) (ii) male: RR=1.29 (iii) male with advanced age: odds 1.45x greater, RR=1.73 (iv) asymptomatic: 38% male vs 62% female (v) male ICU admission: odds 0.45 to 2.84x greater (vi) male mechanical ventilation: odds 1.05x greater	SR and meta-analysis: *Zhang et al.* [67]; Meta-analysis: *Barek et al. [69];* SR and meta-analysis: *Bhattacharyya et al. [71];* SR and meta-analysis: *Chidambaram et al. [73];* SR and meta-analysis: *Del Sole et al. [77];* SR and meta-analysis: *Borges do Nascimento et al.* [226]; SR and meta-analysis: *Du et al. [79];* SR and meta-analysis: *Jain et al. [141];* SR and meta-analysis: *Khamis et al. [87];* SR and meta-analysis: *Lakbar et al.* [248]; SR and meta-analysis: *Matsushita et al.* [92]; SR and meta-analysis: *Patel et al.* [249]; SR and meta-analysis: *Peckham et al.* [250]; Meta-analysis: *Pijls et al.* [223]; SR and meta-analysis: *Radwan et al.* [103]; Meta-analysis : *Rahman et al. [104];* Meta-analysis: *Zhong et al. [130]*
	High risk for COVID-19 mortality: (i) male: 66% (odds 1.15 to 1.86x greater, RR 1.3) (ii) female: 0.51x greater (iii) undergoing surgeries: males (63.05%) vs females (43%)	SR and meta-analysis: *Bhattacharyya et al. [71];* SR and meta-analysis: *Biswas et al.* [72]; SR and meta-analysis: *Dorjee et al. [78];* SR and meta-analysis: *Lakbar et al.* [248]; SR and meta-analysis: *Lu et al. [90];* Meta-analysis: *Noor et al. [101];* SR and meta-analysis: *Patel et al.* [249]; SR and meta-analysis: *Peckham et al.* [250]; SR and meta-analysis: *Perez-Lopez et al. [354];* Meta-analysis: *Pijls et al.* [223]; SR and meta-analysis: *Pranata et al.* [251]; SR and meta-analysis : *Sepandi et al.* [105]; SR and meta-analysis : *Wang K et al.* [252]
Effect of race	Higher risk for cases and mortality: 1- White Non- Hispanic (39%) 2- Hispanic/ Latino (31.6%)	SR and meta-analysis: *Bhattacharyya et al. [71];* Meta-analysis: *Pabalan et al.*

	3- Black Non- Hispanic (20%, RR=2.02) 4- Caucasian (odds 0.46x greater) 5- Asian (RR=1.50) 6- White vs Black (RR=0.96) 7- White vs Asian (RR=0.99) 8- White vs Hispanic (RR=0.69) Asian: Higher risk for COVID-19: (i) ICU admission: RR=1.97 (ii) mortality: RR=1.22	[253]; SR and meta-analysis: *Raharja et al.* [254]; SR and meta-analysis: *Sze et al.* [255] SR and meta-analysis: *Sze et al.* [255]
Effect of Blood Group	Higher risk for COVID-19: - Group A: 36.22%, odds 1.249x to 1.33x greater - Group B: 24.99%, odds 1.06x greater - Group AB: 9.29%, odds 1.07x greater - Group O: 29.67%, odds 0.699x greater - Rh-positive: odds 1.22x greater Higher risk for COVID-19 severity: - Group AB: odds 2.424x greater - Group O: odds 0.748x greater Higher risk for COVID-19 mortality: - Group A: 40%, 1.25x greater - Group B: 23% - Group AB: 8%, odds 1.348x greater - Group O: 29%	SR and meta-analysis: *Liu N et al.* [256]; Meta-analysis: *Pourali et al.* [257]; SR and meta-analysis: *Wu et al.* [258]
Arterial Thrombosis/ Coagulopathies	Higher risk for COVID-19: (i) severe: odds 3.623x greater (ii) ICU admission: odds 2.63x greater (iii) mechanical ventilation: odds 3.14x greater (iv) mortality: odds 1.93x greater, RR=0.56 to 10.86 (v) coagulopathies + ARDS: RR=16.52 Prevalence in patients with COVID-19: 33%	SR and meta-analysis: *Kamel et al.* [204]; SR and meta-analysis: *Kefale et al.* [205]; SR and meta-analysis: *Li X et al.* [206]; SR and meta-analysis: *Wang C et al.* [207]; SR and meta-analysis: *Xiang G et al.* [208]; Meta-analysis: *Zhu et al.* [209]; SR and meta-analysis:Zhu et al. [355]
Venous thromboembolism (VTE), Vein thrombosis (DVT) and/or Pulmonary Embolism (PE)	Prevalence in patients with COVID-19: - VTE: 21% to 31.3% - DVT: 14% to 27% - PE: 12% to 18.9% Higher prevalence in aged patients with COVID-19: - VTE: Z-score: 3.1 - DVT: Z-score: 2.33 - PE: Z-score: 3.03 Higher prevalence in patients with COVID-19 with obesity: - PE: Z-score = 2.01 Higher prevalence in patients with COVID-19: - female: odds 1.59x greater - males, PE: odds 1.98x greater Higher risk for patients with severe COVID-19: - VTE: 31% to 38%, odds 2.66x greater	Meta- analysis: *Di Minno et al.* [210] ; SR and meta-analysis: *Liu Y et al.* [211]; Meta-analysis: *Loomba et al.* [212]; Meta-analysis: *Lu YF et al.* [213]; SR and meta-analysis: *Malas et al.* [214]; SR and meta-analysis: *Mir et al.* [215]; Meta-analysis: *Nopp et al.* [216]; SR and meta-analysis: *Porfidia et al.* [217]; SR and meta-analysis: *Roncon et al.* [218]; SR and meta-analysis: *Sridharan et al.* [219]; SR and meta-analysis: *Wu T et al.* [220]; SR and meta-analysis: *Zhang R et al.* [221]; SR and meta-analysis: *Liu Yet al*. [211]

	- DVT:22.1% to 28% - PE: 21.7% - VTE+ embolism: 17% Higher risk for COVID-19, ICU admission: - VTE: 22.7% to 31% - DVT: 19% to 40% - PE: 7% to 37% Higher risk for COVID-19 mortality: - VTE: 17.2%, odds 1.74 to 2.02x greater, RR=0.86 - DVT: 22%	
Autoimmune diseases	Higher risk for: (i) severe COVID-19: odds 2.19x greater (ii) hospitalization: odds 0.35x greater (iii) ICU admission: odds 3.55x greater (iv) mortality: odds 0.066 to 2.46x greater	SR and meta-analysis: *Akiyama et al.* [222]; SR and meta-analysis: *Khan et al. [88];* SR and meta-analysis: *Ng et al. [100]*;
Pregnant women		
	Pregnant and recently pregnant women with covid-19 compared with non-pregnant women of reproductive age, higher risk for: (i) admission to ICU: less than 20%, odds 1.62x greater (ii) invasive ventilation: odds1.88x greater	SR and meta-analysis: *Allotey et al.* [259]; SR and meta-analysis: *Capobianco et al.* [260]; SR and meta-analysis: *Di Toro et al.* [261]; SR and meta-analysis: *Kadir et al.* [262]
	Higher risk for severe COVID-19: (i) increased maternal age: odds 1.78x greater (ii) high body mass index: 38.2%, odds 2.38x greater (iii) chronic hypertension: odds 2.0x greater (iv) pre-existing diabetes: 18%, odds 2.51x greater	SR and meta-analysis: *Allotey et al.* [259]; SR and meta-analysis: *Jafari et al.* [263]
	Higher risk for COVID-19 pregnant mortality: (i) 1% to 11.3%, odds 1.6x greater (ii) arterial/venous thrombosis: odds 0.66x (iii) coagulopathy: odds 0.28x	SR and meta-analysis: *Borges do Nascimento et al.* [226]; SR and meta-analysis: *Jafari et al.* [263]; SR and meta-analysis: *Allotey et al.* [259]; SR and meta-analysis: *Servante et al. [356]*
	Pre-existing maternal comorbidity, higher risk for: (i) admission to ICU: 7%, odds 4.21x greater (ii) invasive ventilation: 3.4%, odds 4.48x greater	
	Delivery in in pregnant women with covid-19: (i) spontaneous preterm birth: 6% to 29.7%, odds 1.45 to 2.5x (ii) compared with those without the disease: odds 3.01x greater (n=339) (iii) maternal complications: 45.0 % (iv) caesarean section: 48% to 88%, odds 1.54 to 3.0x	SR and meta-analysis: *Allotey et al.* [259]; SR and meta-analysis: *Bellos et al.* [267]; SR and meta-analysis: *Capobianco et al.* [260]; SR and meta-analysis: *Di Toro et al.* [261]; SR and meta-analysis: *Dube et al.* [265]; SR and meta-analysis: *Della-Gatta et al.[357];* SR and meta-analysis: *Abou Ghayda et al.* [266]; SR and meta-analysis: *Hassanipour et al. [358];* SR and meta-

	(v) fetal death: 4% to 4.8% (vi) abortion: 2.9% (vii) post-partum hemorrhage: 54.5% (viii) intrauterine fetal distress: 14%	analysis: *Jafari et al.* [263]; SR and meta-analysis : *Servante et al [356];* SR and meta-analysis: *Soheili et al.* [268]
Neonates		
	Higher risk for neonates born to mothers with covid-19: (i) admitted to the neonatal unit (2% to 30%) (ii) compared with those to mothers without covid-19: odds 3.13x greater (n=1121). (iii) vertical transmission: 1.4% to 8%, odds 1.94x (iv) low birth weight: 21% to 25%, odds 9.0x (v) fetal distress: 30%	SR and meta-analysis: *Allotey et al.* [259]; SR and meta-analysis: *Bhuiyan et al.* [264]; SR and meta-analysis: *Capobianco et al.* [260]; SR and meta-analysis: *Di Toro et al.* [261]; SR and meta-analysis: *Dube et al.* [265]; SR and meta-analysis: *Abou Ghayda et al.* [266]; SR and meta-analysis: *Jafari et al.* [263]; SR and meta-analysis: *Bellos et al.* [267]; SR and meta-analysis: *Soheili et al.* [268]
Children		
	Higher risk for COVID-19: (i) patient cases were non-severe or mild: 29 % to 33% (ii) patient cases were moderate:51% to 66% (iii) severity: 5 % (iv) ICU admission: 9.9% to 61% (v) mechanical ventilation: 25% (vi) mortality: 0.28% to 1%, RR=2.14 (vii) higher prevalence in adults than children and adolescents: odds 0.56x, RR=1.71 *Pediatric patients with cancer and COVI-19:* - survival rate: 99.4% - risk of hospitalization: no statistically significant differences in the between hematological malignancies and solid tumors (odds 2.94x). - risk of being admitted to the ICU: not different between hematological malignancies and other tumors (odds 1.42x). - need of ventilatory support: (odds 0.68x). *Pediatric patients with comorbidities and COVID-19:* Higher risk for: (i) severity: 5.1% (ii) severity in obese: RR=2.87 (iii) mortality: RR=2.81	SR and meta-analysis: *Cui et al.* [148]; SR and meta-analysis: *Irfan et al.* [269]; SR and meta-analysis: *Koh et al.* [270]; SR and meta-analysis: *Li B et al.* [271] ; SR and meta-analysis: *Viner et al.* [272]; Meta-analysis: *Wang JG et al.* [273]; SR and meta-analysis: *Williams et al.* [274] Meta-analysis: *Dorantes- Acosta et al.* [275] SR and meta-analysis: *Tsankov et al.* [276]
Limited to Moderate evidence		
Surgical procedures	Higher risk for COVID-19: (i) mortality: odds 7.9x greater in patients who underwent a surgical procedure while COVID-19 positive.	Meta-analysis: *Brown et al. [277]*
Tuberculosis	Higher risk for COVID-19: (i) severity: odds 4.50x greater (ii) mortality: RR=2.10	SR and meta-analysis: *Sarkar et al. [359];* SR and meta-analysis: *Tamuzi et al.[360]*
Influenza	Higher risk for COVID-19: (i) mortality: RR=2.04	SR and meta-analysis: *Sarkar et al. [359];*
Chronic Hepatitis	Higher risk for COVID-19: (i) mortality: RR=1.15	SR and meta-analysis: *Sarkar et al. [359];*

Immunosuppressed patients	Prevalence in patients with COVID-19: 0.637%	Meta-analysis: *Tassone et al. [361]*
HIV	Difference between patients with severe and non-severe COVID-19: odds 3.28x greater. Higher risk for COVID-19: RR=0.99	SR: *Zhang et al.* [67]; SR and meta-analysis : *Sarkar et al. [359];;* SR and meta-analysis: *Tamuzi et al. [360]*
Rheumatic diseases	Higher risk for COVID-19: (i) severity: odds 0.33x greater (ii) ICU admission: odds 0.09x greater (iii) mortality: 7%, odds 0.07x greater	SR and meta-analysis: *Xu et al.[362]*
Intestine diseases	Higher risk for COVID-19: (i) hospitalization: 27.29% (ii) ICU admission: 5.33% (iii) mortality: 4.27% *Inflammatory Bowel disease*: RR=4.02 *Ulcerative colitis and Crohn's disease*: RR=1.03	SR and meta-analysis: *Singh et al.[363]*
Dyslipidemia	Dyslipidemia potentially increases mortality and severity of COVID-19: odds 1.39x greater Association between dyslipidemia and poor outcome varies by: - age (coefficient: -0.04), -male gender (coefficient: -0.03), - hypertension (coefficient: -0.02), - diabetes (coefficient: -0.24, not associated), - cardiovascular diseases (coefficient: -0.01, not associated).	SR and meta-analysis: *Atmosudigdo et al.[364]; SR and meta-analysis: Vakhshoori et al. [365]*
Secondary infection	Difference between patients with severe and non-severe COVID-19: odds 9.21x greater	SR and meta-analysis: *Zhang et al.* [67]
Anemia \ iron metabolism\ Ferritin level	The ferritin level was significantly increased in patients with severe compared with those with non-severe COVID-19: 74.2%	SR and meta-analysis: *Xie et al.* [112]
Vitamin D insufficiency	Higher risk for COVID-19: (i) severe: 64%, odds 1.64x greater (ii) hospitalization: odds 1.81x greater (iii) mortality: odds 1.82x greater	SR and meta-analysis: *Pereira et al. [366]*

*SR: Systematic review
*RR: Risk Ratio

APPENDIX B – Key findings for topic b) clinical signs and symptoms of COVID-19

Sign/symptom	Frequency	Source
Strong evidence		
Fever	High risk for COVID-19: (i) severity: odds 1.68 to 1.89x greater, RR= 1.14 (ii) worst prognostic in elderly patients: odds 1.19x Prevalence in patients with COVID-19: 57% to 89%	SR and meta-analysis: *Zhang et al.* [67]; Meta-analysis: *Barek et al. [69];* Meta-analysis: *He et al. [367];* SR and meta-analysis: *Bhattacharyya et al. [71]* ; SR and meta-analysis: *Corona et al. [116];* SR and meta-analysis: *Borges do Nascimento et al.* [226]; SR and meta-analysis: *Ebrahimi et al.* [80]; SR and meta-analysis: *Fathi et al. [82];* SR and meta-analysis: *Gómez-Ochoa et al. [368];* SR and meta-analysis: *Khamis et al. [87];* SR and meta-analysis: *Miller et al.* [95]; Meta-analysis : *Rahman et al. [104];* Meta-analysis : *Vakili et al. [120];* SR and meta-analysis: *Wong et al.* [111]; SR and meta-analysis: *Xie et al.* [112]; SR and meta-analysis: *Xie Y et al.* [149]; SR and meta-analysis: *Yifan et al.* [224]; Meta-analysis: *Zhong et al. [130]*
Cough	High risk for COVID-19: (i) severity: odds 0.66 to 5.52x greater, RR=1.13 Prevalence in patients with COVID-19: 54.3% to 79% 12% of the asymptomatic patients developed cough during course of the infection.	SR and meta-analysis: *Zhang et al.* [67]; Meta-analysis: *Barek et al. [69];* Meta-analysis: *He et al. [367];* SR and meta-analysis: *Corona et al. [116];* SR and meta-analysis: *Borges do Nascimento et al.* [226]; SR and meta-analysis: *Ebrahimi et al.* [80]; SR and meta-analysis: *Fathi et al. [82];* SR and meta-analysis: *Gómez-Ochoa et al. [368];* SR and meta-analysis: *Khamis et al. [87];* SR and meta-analysis: *Miller et al.* [95]; SR and meta-analysis: *Mudatsir et al. [98];* Meta-analysis : *Rahman et al. [104];* Meta-analysis : *Vakili et al. [120];* SR and meta-analysis: *Wong et al.* [111]; SR and meta-analysis: *Xie et al.* [112]; SR and meta-analysis: *Xie Y et al.* [149]; SR and meta-analysis: *Yao et al. [369];* Meta-analysis: *Zhong et al. [130]*
Dyspnea/shortness of breath	High risk for COVID-19: (i) severity: 51%, odds 3.28 to 6.42x greater (ii) ICU admission: odds 5.35 to 17.8x greater (iii) mortality: odds 3.31 to 3.52x greater Prevalence in patients with COVID-19: 29% to 51%	SR and meta-analysis: *Zhang et al.* [67]; Meta-analysis: *Barek et al. [69];* SR and meta-analysis: *Borges do Nascimento et al.* [226]; SR and meta-analysis: *Bhattacharyya et al. [71];* SR and meta-analysis: *Corona et al. [116];* SR and meta-analysis: *Fathi et al. [82];* Meta-analysis: *He et al. [367];* SR and meta-analysis: *Jain et al. [141];* SR and meta-analysis: *Katzenschlager et al. [86];* SR and meta-analysis: *Li X et al.* [143]; SR and meta-analysis: *Mudatsir et al. [98]* ; Meta-analysis : *Vakili et al. [120];* SR and meta-analysis: *Xiang et al.* [134]; SR and meta-analysis: *Xie Y et al.* [149]; SR and meta-analysis: *Yang L et al.* [220]; Meta-analysis: *Zhong et al. [130]*
Myalgia or fatigue (muscle ache)	High risk for COVID-19: (i) severity: odds1.20 to 2.1x greater, RR=1.17 (ii) ICU admission: odds 1.63x greater (iii) mortality: odds 1.36x greater	SR and meta-analysis: *Zhang et al.* [67]; SR and meta-analysis: *Collantes et al. [370];* Meta-analysis: *Barek et al. [69];* Meta-analysis: *He et al. [367];* SR and meta-analysis: *Katzenschlager et al.*

	(iv) worst prognostic in elderly patients: odds 0.85x Prevalence in patients with COVID-19: 19.5% to 60%	*[86];* SR and meta-analysis: *Mudatsir et al. [98];* Meta-analysis : *Rahman et al. [104];* SR and meta-analysis: *Zhang et al.* [67]; Meta-analysis : *Vakili et al. [120];* SR and meta-analysis: *Yang L et al.* [220]; SR and meta-analysis: *Bhattacharyya et al. [71];* SR and meta-analysis: *Corona et al. [116];* SR and meta-analysis: *Ebrahimi et al.* [80]; SR and meta-analysis: *Fathi et al. [82];* SR and meta-analysis: *Gómez-Ochoa et al. [368];* SR and meta-analysis: *Khamis et al. [87]* ; SR and meta-analysis: *Xiang et al.* [134]; SR and meta-analysis: *Xie et al.* [112]; SR and meta-analysis: *Xie Y et al.* [149]; SR and meta-analysis: *Yifan et al.* [224]; Meta-analysis: *Zhong et al. [130]*
Headache	Difference between patients with severe and non-severe COVID-19: odds 0.12 to 3.57x greater Associated with dizziness: odds 0.09x greater Prevalence in patients with COVID-19: 8 to 15.49% 4% of the asymptomatic patients developed cough during course of the infection.	SR and meta-analysis: *Zhang et al.* [67]; SR and meta-analysis: *Collantes et al. [370];* SR and meta-analysis: *Borges do Nascimento et al.* [226]; SR and meta-analysis: *Khamis et al. [87];* SR and meta-analysis: *Xie Y et al.* [149]; SR and meta-analysis: *Yao et al.[369];* Meta-analysis: *Zhong et al. [130]*
Gastrointestinal symptoms	Higher chance for COVID-19: (i) (i) severity: odds 1.63 to 2.1x greater (ii) ICU admission: RR= 2.56 (iii) mechanical ventilation: RR=0.90 (iv) mortality: 15%; odds: 0.90x greater, RR=0.72 to 2.01 *Abdominal pain*: Difference between patients with severe and non-severe COVID-19: odds 2.35 to 7.6x greater, 4% Prevalence in patients with COVID-19: 15.47% to 20% Higher risk of complications: - acute respiratory distress syndrome (RR = 8.16) - acute cardiac injury (RR = 5.36) - acute kidney injury (RR = 5.52)	SR and meta-analysis: *Zhang et al.* [67]; Meta-analysis: *Barek et al. [69];* SR and meta-analysis: *Dorrell et al. [371];* Meta-analysis: *Elshazli et al. [372];* SR and meta-analysis: *Ghimire et al. [373];* Meta-analysis: *He et al. [367];* SR and meta-analysis: *Renelus et al.[374]*
Diarrhea	High risk for COVID-19: (i) severity: odds 1.35 to 2.6x greater, RR=0.75 to 1.14 Prevalence in patients with COVID-19: 6.11% to 17.2% First manifestation in patients with COVID-19: 4.3%	SR and meta-analysis: *Zhang et al.* [67]; Meta-analysis: *Barek et al. [69];* SR and meta-analysis: *Dorrell et al. [371];* SR and meta-analysis: *Corona et al. [116];* Meta- analysis: *Elshazli et al. [372];* SR and meta-analysis: *Fathi et al. [82];* SR and meta-analysis: *Ghimire et al. [373];* Meta-analysis: *He et al. [367];* SR and meta-analysis: *Maslennikov et al.[375];* Meta-analysis : *Rahman et al. [104];* SR and meta-analysis: *Renelus et al. [374];* Meta-analysis : *Vakili et al. [120];* Meta-analysis: *Zhong et al. [130]*

Nausea and vomiting	Difference between patients with severe and non-severe COVID-19: odds 0.06 to 1.73x greater Prevalence in patients with COVID-19: 5.9% to 11.1%	SR and meta-analysis: *Zhang et al.* [67]; SR and meta-analysis: *Collantes et al. [370];*;SR and meta-analysis: *Corona et al. [116];* SR and meta-analysis: *Dorrell et al. [371];* Meta- analysis: *Elshazli et al. [372];* SR and meta-analysis: *Ghimire et al. [373];* Meta-analysis: *Zhong et al. [130]*
Hemoptysis	High risk for COVID-19: (i) severity: odds 3.76 to 4.93x greater	SR and meta-analysis: *Zhang et al.* [67]; Meta-analysis: *Barek et al. [69];* Meta-analysis: *He et al. [367];* SR and meta-analysis: *Yang L et al.* [294]
Oral mucosal lesions	- white and erythematous plaques; - irregular ulcers; - small blisters; - petechiae - desquamative gingivitis. Tongue, palate, lips, gingiva, and buccal mucosa were affected. In mild cases: oral mucosal lesions developed before or at the same time as the initial respiratory symptoms. In cases requiring medication and hospitalization: the lesions developed approximately 7 to 24 days after onset symptoms.	SR: *Amorim dos Santos [296]*
Anosmia/ Hyposmia	Prevalence in patients with COVID-19: 50%, odds 11.76x, RR=4.56	Meta-analysis: *Hariyanto et al. [376];* SR and meta-analysis: *Hoang et al. [377]*
Gustatory impairment	The most common oral manifestation associated with COVID-19: 45% (odds: 12.68 x greater). Associated with mild/moderate severity for COVID-19: odds: 2.09x greater Associated with female patients for COVID-19: odds: 1.64x greater *Dysgeusia:* Prevalence in patients with COVID-19: 15.4% to 38% - *Hypogeusia:* Prevalence in patients with COVID-19: 35% - *Ageusia:* Prevalence in patients with COVID-19: 15.4% to 24%	SR: *Amorim dos Santos [296];* SR and meta -analysis: *Hoang et al. [377]* SR: *Amorim dos Santos [296];* Meta-analysis: *Elshazli et al. [372]* SR: *Amorim dos Santos [296]* SR: *Amorim dos Santos [296];* Meta-analysis: *Elshazli et al. [372]*
Anorexia /loss of appetite	Difference between patients with severe and non-severe COVID-19: odds 1.77x greater High risk for COVID-19: (i) severity: odds 1.83 to 2.8x greater Prevalence in patients with COVID-19: 19.9% to 21%	SR and meta-analysis: *Zhang et al.* [67]; Meta-analysis: *Barek et al. [69];* SR and meta-analysis: *Dorrell et al. [371];* Meta-analysis: *Elshazli et al. [372];* Meta-analysis: *He et al. [367];* SR and meta-analysis: *Mudatsir et al. [98]*
Impairment of consciousness (also termed “confusion” or “agitation”)	High risk for COVID-19: (i) severity: odds 0.05x greater	SR and meta-analysis: *Collantes et al. [370]*

Stroke	The most common manifestation was acute ischemic stroke (87.4%) The patients with COVID-19 and stroke were younger (pooled median difference = -6.0 years) Higher chance for COVID-19: (i) severity: in patients with previous comorbid conditions (46.9%, odds 1.95x greater, RR=4.18) (ii) mortality: 34.4% to 46.7%, odds 5.60x greater. (iii) mortality was 31.76% to 67% lower in patients <50 years of age relative to those >70 years of age (odds 0.33x) (iv) mortality: in patients with previous comorbid conditions (58.6%, odds 3.52x); (v) mortality: associated to diabetes odds 1.39x greater (vi) mortality associated to males: 65.5% Prevalence in patients with COVID-19: 29% to 87.4%	SR and meta-analysis: *Nannoni et al.* [115]; SR and meta-analysis: *Fridman et al.* [289]; SR and meta-analysis: *Gao et al. [164];* Meta-analysis: *Katsanos et al.* [290]; Meta-analysis: *Siepmann et al.* [291]; SR and meta-analysis: *Siow et al.* [292]; SR and meta-analysis: *Yamakawa et al.* [293]
Dizziness	Difference between patients with severe and non-severe COVID-19: odds 0.08 to 3.17x greater Prevalence in patients with COVID-19: 6.1% to 11.5%	SR and meta-analysis: *Zhang et al.* [67]; SR and meta-analysis: *Collantes et al. [370];* SR and meta-analysis: *Mudatsir et al. [98];* SR and meta-analysis: *Yao et al. [369];* Meta-analysis: *Zhong et al. [130]*
Chest pain/ chest tightness	High risk for COVID-19: (i) severity: odds 2.11 to 4.39x greater (ii) mortality: odds2.50x greater Prevalence in patients with COVID-19: 37.4%	SR and meta-analysis: *Zhang et al.* [67]; Meta-analysis: *Barek et al. [69];* SR and meta-analysis: *Yang L et al.* [220]; Meta-analysis: *Zhong et al. [130]*
Sputum	Difference between patients with severe and non-severe COVID-19: odds 1.33 to 5.10x greater Prevalence in patients with COVID-19: 17.85% to 66%	SR and meta-analysis: *Zhang et al.* [67]; SR and meta-analysis: *Bhattacharyya et al. [71];* SR and meta-analysis: *Khamis et al. [87];* SR and meta-analysis: *Xie Y et al.* [149]; SR and meta-analysis: *Yao et al. [369]*
Sore throat	Prevalence in patients with COVID-19: 8% to 21.7%	SR and meta-analysis: *Corona et al. [116];* SR and meta-analysis: *Borges do Nascimento et al.* [226]; SR and meta-analysis: *Khamis et al. [87];* SR and meta-analysis: *Xie Y et al.* [149]
Expectoration	Prevalence in patients with COVID-19: 31.9%, odds 1.52x greater	Meta-analysis: *Zhong et al. [130]; SR and meta-analysis : Yang L et al.* [220]
Rhinorrhea	Difference between patients with severe and non-severe COVID-19: odds 1.67x greater	SR and meta-analysis: *Zhang et al.* [67]
Pharyngalgia	Difference between patients with severe and non-severe COVID-19: odds 1.25x greater Prevalence in patients with COVID-19: 11%	SR and meta-analysis: *Zhang et al.* [67]; Meta-analysis: *Zhong et al. [130]*
Pneumonia	Prevalence in patients with COVID-19: (i) 87% (ii) bilateral pneumonia: 70.9%	SR and meta-analysis: *Borges do Nascimento et al.* [226]; SR and meta-analysis: *Khamis et al. [87]*

	62% of the asymptomatic patients developed cough during course of the infection.	
Ocular manifestations	Prevalence in patients with COVID-19: 7% The most common: Conjunctival symptoms	SR and meta-analysis: *Ling et al.* [295]
Laboratory abnormalities	- Hypocalcemia: 26%, odds 3.19x greater - D-dimer (elevated) Higher risk for COVID-19: (i) severity: odds 3.780 to 6.19x greater, RR=1.58 (ii) mortality: odds 3.7x greater, RR= 1.82 to 4.77 Prevalence in patients with COVID-19: 29.3% to 73.3% - Lymphopenia/ Lymphadenopathy: 18.9% High risk for COVID-19: (i) severity: odds 3.19 to 8.34x greater (ii) mortality: odds 3.71x greater Prevalence in patients with COVID-19: 70.3% - Neutrophilia: High risk for COVID-19: (i) severity: odds 7.99x greater (ii) mortality: odds 7.87x greater - Thrombocytopenia High risk for COVID-19: (i) severity: RR= 1.90 (ii) poor outcomes: RR= 1.90 Prevalence in patients with COVID-19: 18% to 19%	SR and meta-analysis: *Martha et al.[378]* SR and meta-analysis: *Duz et al.[379];* SR and meta-analysis: *Gungor et al. [380];* Meta-analysis: *Jin et al. [381];* SR and meta-analysis: *Li X et al.* [143]; SR and meta-analysis: *Lin et al.[382];* SR and meta-analysis: *Mudatsir et al. [98]*; Meta-analysis: *Nugroho et al.[383];* SR and meta-analysis : *Shah et al. [384];* SR and meta-analysis: *Simadibrata et al.[385];* Meta-analysis: *Zhong et al. [130]* SR and meta-analysis: *Bhattacharyya et al. [71];* SR and meta-analysis: *Chidambaram et al. [73];* Meta-analysis: *Henry et al. [386];* SR and meta-analysis: *Li X et al.* [143]; SR and meta-analysis: *Mudatsir et al. [98];* Meta-analysis: *Zhong et al. [130]* Meta-analysis: *Henry et al. [386]* SR and meta-analysis: *Pranata et al.[387];* Meta-analysis: *Zhong et al. [130]*
Radiological features	- Ground glass: 60.7% - Vascular enlargement: 64.3%	SR and meta-analysis: *Xie et al.* [112]
Asymptomatic	- Prevalence in COVID-19 patients: 20% - Higher prevalence the symptomatic patients than asymptomatic: RR=3.23	SR and meta-analysis: *Buitrago-Garcia et al.[388];* SR and meta-analysis: *Koh et al.* [270]
Long-term symptoms	Prevalence in patients post-COVID-19 infection: 80% - fatigue: 80% - headache: 44% - attention disorder: 27% - hair loss: 25% - dyspnea: 24%	SR and meta-analysis: *Lopez-Leon et al.[389]*
Pregnant women		
General considerations	The mean duration from the first symptoms to the hospital admission and to labour were 5.5 and 9.5 days, respectively	SR and meta-analysis: *Capobianco et al.* [260]
Fever	Common (40%- 76%) Fever in postpartum period: 23%- 37.1% The most frequent maternal symptom. Pregnant and recently pregnant women with COVID-19: less likely to report fever (odds 0.43x greater), compared with non-pregnant women of reproductive age.	SR and meta-analysis: *Allotey et al.* [259]; SR and meta-analysis: *Della-Gatta et al.* [263]; SR and meta-analysis: *Abou Ghayda et al.* [266]; SR and meta-analysis: *Hassanipour et al.* [264]; SR and meta-analysis: *Jafari et al.* [263]; SR and meta-analysis: *Soheili et al.* [268]; SR and meta-analysis: *Capobianco et al.*

		[260]; SR and meta-analysis: *Bellos et al.* [267]
Cough	Common (29% - 70%) Higher risk for COVID-19 severity: odds 0.7x greater	SR and meta-analysis: *Capobianco et al.* [260]; SR and meta-analysis: *Borges do Nascimento et al.* [226]; SR and meta-analysis: *Della-Gatta et al.* [263]; SR and meta-analysis: *Abou Ghayda et al.* [266]; SR and meta-analysis: *Hassanipour et al.* [264]; SR and meta-analysis: *Jafari et al.* [263]; SR and meta-analysis: *Soheili et al.* [268]
Dyspnea	Common (3%- 34.4%) Higher risk for COVID-19 severity: odds 2.55x greater	SR and meta-analysis: *Chidambaram et al. [73];* SR and meta-analysis: *Abou Ghayda et al.* [266]; SR and meta-analysis: *Hassanipour et al.* [264]; SR and meta-analysis: *Soheili et al.* [268]
Myalgia or fatigue	Common (11.4%- 26.5%) Pregnant and recently pregnant women with COVID-19: less likely to report myalgia (odds 0.48x greater) and fatigue (odds 0.58x greater), compared with non-pregnant women of reproductive age.	SR and meta-analysis: *Allotey et al.* [259]; SR and meta-analysis: *Hassanipour et al.* [264]; SR and meta-analysis: *Jafari et al.* [263]
Diarrhea	Common (7.6% to 9%) Higher risk for COVID-19 severity: odds 0.46x greater	SR and meta-analysis: *Hassanipour et al.* [264]; SR and meta-analysis: *Jafari et al.*[263]; SR and meta-analysis: *Soheili et al.* [268]
Chest discomfort	Common (3.9%)	SR and meta-analysis: *Abou Ghayda et al.* [266]
Headache	Higher risk for COVID-19 severity: odds 0.55xgreater	SR and meta-analysis: *Jafari et al.* [263]
Chill	Common (25%)	SR and meta-analysis: *Jafari et al.* [263]
Sputum	1%	SR and meta-analysis: *Abou Ghayda et al.* [266]
Sore throat	Common (2.9%- 11.5%) Higher risk for COVID-19 severity: odds 0.66xgreater	SR and meta-analysis: *Abou Ghayda et al.* [266]; SR and meta-analysis: *Hassanipour et al.* [264]; SR and meta-analysis: *Jafari et al.* [263]
Nasal obstruction	1%	SR and meta-analysis: *Abou Ghayda et al.* [266]
Laboratory abnormalities	- leukocytosis: 27% - thrombocytopenia: 18% - procalcitonin: 54.0% - lymphopenia: 34.2% - elevated transaminases: 16.0%	SR and meta-analysis: *Jafari et al.* [263]
Radiological features	Ground glass image: 57%	SR and meta-analysis: *Jafari et al.* [263]
Neonates		
	- fever (40%) - shortness of breath (28 %) - vomiting (24 %) - asymptomatic (20%) - breathing difficulty (1.79%) The most frequent neonatal complications were pneumonia and respiratory distress syndrome.	SR and meta-analysis: *Bellos et al.* [267]; SR and meta-analysis: *Capobianco et al.* [260]; SR and meta-analysis: *Dube et al.* [265]
Children		
Multisystem Inflammatory Syndrome (MIS-C)	Common: - fever (82.4% to 97%) - gastrointestinal symptoms (78% to 87.3%) - skin rashes (60%) - shock (49% to 55%), - conjunctivitis (54%)	SR and meta-analysis: *Baradaran et al. [390];* SR and meta-analysis: *Irfan et al.* [269]; SR and meta-analysis: *Sood et al.[391];* Meta-analysis: *Toraih et al. [392];* Meta-analysis: *Wang JG et al.* [273]; SR and meta-analysis: *Yasuhara et al.[393]*

	- respiratory symptoms (39% to 55.3%) - neurologic problems (33%) - skin desquamation (30%) - cardiovascular symptoms (55.3% to 75.5%) - myocarditis (32% to 55.1%) - coronary vessel abnormalities (18% to 21.7%) - congestive cardiac failure (9%) - polymorphous maculopapular exanthema (63.7%) - oral mucosal changes (58.1%) - conjunctival injections (56.0%) - edematous extremities (40.7%) - cervical lymphadenopathy (28.5%) - neurocognitive symptoms (31.8%) - hypotension (77%) -shock (65.8% to 68.1%) Prevalence in COVID-19 patients: 6.2% - more prevalent in males (53.7%) compared to females (46.3%) - prevalence in Hispanic patients: 34.6% - prevalence in Black patients: 31.5% High risk for: (i) ICU admission: 19% to 73.7% (ii) mechanical ventilation: 37.9% (iii) mortality: 1.9% to 4.8%	
Fever	Common (46% to 63.3%)	SR and meta-analysis: *Badal et al. [394];* SR and meta-analysis: *Cui et al.* [148] SR and meta-analysis: *Irfan et al.* [269]; SR and meta-analysis: *Li et al.[271];* SR and meta-analysis: *Mansourian et al.[395];* Meta-analysis: *Wang JG et al.* [273]
Cough	Common (33.7% to 50%)	SR and meta-analysis: *Badal et al. [394];* SR and meta-analysis: *Cui et al.* [148]; SR and meta-analysis: *Irfan et al.* [269]; SR and meta-analysis: *Li et al. [271];* SR and meta-analysis: *Mansourian et al. [395]*
Headache	Common (67%)	SR and meta-analysis: *Badal et al. [394];*
Gastro-intestinal Symptoms	Common (14.4%)	Meta-analysis: *Wang JG et al.* [273]
Vomiting	Common (33%)	SR and meta-analysis: *Cui et al.* [148]
Diarrhea	Common (19%)	SR and meta-analysis: *Mansourian et al. [395]*
Nervous System symptoms	Common (6.7%)	Meta-analysis: *Wang JG et al.* [273]
Pharyngalgia	Common (13%)	SR and meta-analysis: *Mansourian et al. [395]*
Respiratory symptoms	Common (56.8%)	Meta-analysis: *Wang JG et al.* [273]
Chest tightness	Common (6.1%)	Meta-analysis: *Wang JG et al.* [273]
Laboratory abnormalities	Common: - leukopenia (8.8% to 12%) - lymphopenia (12% to 26%) - elevated Ferritin (26 %) - normal white blood cell (69%) - elevated creatine-kinase (37%) - neutropenia (34%) - D-dimer (36%)	SR and meta-analysis: *Badal et al. [394];* SR and meta-analysis: *Cui et al.* [148]; SR and meta-analysis: *Li et al. [271]* SR and meta-analysis: *Mansourian et al. [395];* Meta-analysis: *Wang JG et al.* [273]
Radiological features	Common: - ground-glass opacities (36 %) - normal finding (33 % to 41%)	SR and meta-analysis: *Badal et al. [394];* SR and meta-analysis: *Cui et al.* [148]; Meta-analysis: *Wang JG et al.* [273]

General considerations	- 13% to 23% (RR=0.17) were asymptomatic *Children younger than five years with laboratory-confirmed COVID-19 infection (n=1,214):* (i) 50% young COVID-19 cases were infants; (ii) 53% were male; (iii) 43% were asymptomatic (iv) 7% had severe disease (ICU admission)	SR and meta-analysis: *Badal et al. [394];*;SR and meta-analysis: *Bhuiyan et al.* [264] SR and meta-analysis: *Cui et al.* [148]; SR and meta-analysis: *Koh et al.* [270]; Meta-analysis: *Wang JG et al.* [273]; Meta-analysis: *Zhu et al.[209]*

*SR: Systematic Review
*RR: Risk Ratio

APPENDIX C: Key findings for topic c) non disease-specific approaches to assist with non-treatment patient management measures for in-person oral health care.

Approach	Main findings	Source*
Moderate evidence		
Teledentistry	Teledentistry is a solution as dental health services and is very useful in this COVID-19 pandemic situation.	SR: *Achmad et al.* [302]; Scoping review :*Bastani et al.* [303]
	In the provision of oral care in *elderly people*: (i) Minimizing the risk of contamination, avoiding unnecessary appointments and triaging dental visits; (ii) Accurate diagnosis way as traditional face-to-face dental examinations; cost-effective; and well accepted among patients, patients' families, and caregivers. (iii) Implementing in residential aged care facilities and in home-assistance programs: viable tool for the management of oral care in people who cannot access dental care.	SR: *Aquilanti et al.* [304]
Telehealth	Telehealth is a beneficial way to evaluate patients with *Cleft lip and Cleft palate*. The proper care and follow-up reduce complications and to improve health outcomes.	*SR: Bedi et al.* [305]
	The application of Telehealth and e-health systems plays a critical role to ensure continuous access to healthcare in lockdown scenarios in the combat to COVID-19.	*SR: Alonso et al.* [306]
	Management of *chronic pain* during COVID-19: - use of telemedicine, screening for painful intensity, and the use of color-signaled intervention packages according to severity (green, yellow, and red).	SR: *de Moraes et al.* [307]
	Telehealth is certainly appropriate in minimizing the risk of COVID-19 transmission: -potential to prevent any sort of direct physical contact; -provide continuous care to the community,; - reduce morbidity and mortality in COVID-19 outbreak.	SR: *Monaghesh et al.* [301]
Mobile apps	Have been implemented for: - training; - information sharing; - risk assessment; - self-management of symptoms; - contact tracing; - home monitoring; - decision making for managing the COVID-19 pandemic.	SR: *Kondylakis et al.* [308]
Dental office		

Before entering a Dental office	(i)Patient triage (identification of possible suspects using a questionnaire);	*SR: Mahdi et al.* [309]*; SR: Turkistani et al.* [310]
	(ii) Most important Ethical concerns for oral and DHP during the COVID-19 outbreak: the obligation for restricting dental health services to the emergency conditions at the expense of preventive procedures.	Scoping review: *Bastani et al.* [303]
	Emergency Dental Conditions: 1. Pulpal inflammation, resulting in pain. 2. Inflammation of tissue surrounding an impacted third molar (pericoronitis). 3. Postoperative osteitis or dry socket dressing changes. 4. Localized pain associated with swelling as a result of localized abscess or localized infection. 5. Pain or soft tissue trauma, as a result of a broken tooth. 6.Dental traumatology related to an avulsed/luxated tooth. 7. Loss of temporary restoration, as a result of soft tissue trauma or a broken tooth. **Non-Emergency Dental Conditions:** 1. Initial or regular oral examinations and follow-up appointments with or without routine radiographs. 2. Regular hygienist appointment (scaling and root planning) and other preventive therapies. 3. Orthodontic treatments other than those to address acute issues (eg, pain, infection, trauma). 4. Elective tooth removal procedures. 5. Restorative treatments related to asymptomatic carious teeth or crown preparation. 6. Aesthetic dental treatments. Any other dental treatments that require a face-face approach without generating aerosol should be managed as minimally invasive as possible.	SR : *Bordea et al.* [396]
	(iii) Management of *paediatric dental emergencies* applicable to the COVID-19 pandemic: - Children with congenital heart disease high risk for endocarditis; - Only one Clinical Practice Guidelines was classified as "highly recommended" to support DHP in decision-making to adopt specific dental procedures in the current COVID-19 pandemic.	SR: *Arieta-Miranda et al.* [397]
	(iv) Quarantine, contact tracing, screening, and isolation are effective measures of COVID-19 prevention, particularly whenever integrated together.	*SR: Girum et al.* [398]

	(v) For *orthodontic treatment*: careful patient screening and collection of records; minimal physical visits; utilizing technology at its best; virtual consultations; clear aligner therapy (CAT) to minimize the AGPs.	*Scoping Review: Kaur et al. [399]*
At the Dental office	(I) Active screening of patients (the temperature of the patient should be taken and for patients coming with a temperature >100.4 ^{o}F or 38 ^{o}C should be postponed if possible or performed in an airborne infection isolation room (AIIR) or negative-pressure room); (ii) limiting the number of patients and displaying cough etiquette in the waiting area; (iii) waiting area with proper ventilation; (iv) keeping the physical distancing; (v) removing the shared objects from waiting area; Management of patients: (i) Unsuspected asymptomatic patients: treat only ER following a standard regime. (ii) Suspected asymptomatic patients: reschedule appointment and instruct to self-quarantine at home for 14 days. (iii) Suspected symptomatic or body temperature higher than 37.3^{o}C: register patient information, refer to hospital, and clean reception area ASAP. In case of dental ER, follow the highest level of personal protection. (iv) COVID-19 confirmed patients: treat only ER and follow the highest level of personal protection. Any suspected case that needs urgent treatment: last appointment of the day. COVID-19 diagnostics with a particular focus on the methods which can be utilized in an outpatient and dental care setting: -Reverse transcription polymerase chain reaction: utilization in outpatient care is limited; -Serological enzyme-linked immunosorbent: not give sufficient information about the acute infection; -Rapid serological assays: to facilitate testing especially in dental offices. Not recommended by the World Health Organization to be used outside research settings and frequent false-negative results. -The best methods to ensure the occupational safety: epidemiological interview, temperature measurement to rule out patients with an active infection, and the implementation of strict infection control procedures.	*SR: Mahdi et al.* [309]*; SR: Turkistani et al.* [310]*;* SR: *Delikhoon et al.* [311]*;* Scoping Review : *Kathree et al.* [312] *SR: Turkistani et al.* [310] SR : *Tysiąc-Miśta et al.* [313]
Post dental treatment	(I) Cleaning and Disinfection of the treatment room and waiting area,	*SR: Mahdi et al.* [309]

	including doorknobs, chairs, floor, desks, restrooms, and elevators between patients; (ii) Dental chair needs to be wiped after every patient and the operatory surfaces needs to be wiped minimally twice a day. (iii) Dentists are recommended to keep their belongings aside and refrain from using jewelry while treating confirmed cases.	*SR: Turkistani et al.* [310]
Specific precautions		
Frequent handwashing	Before and after contact with every patient. High chances of SARS-Cov-2 infection via faecal-oral transmission. (commonly present in stool samples or anal swabs in which the virus can persist long after respiratory testing has become negative and that the virus may be viable). Attention to person-to-person transmission and to hand and sanitation hygiene.	*SR: Turkistani et al.* [310] SR: *Van Doorn et al.* [330]
	Use of Alcohols: (i) Lower risk of skin irritation for n-propanol and isopropanol. (ii) The combination of n-propanol or isopropanol with detergents (such as sodium lauryl sulfate): increase the potential irritants. (iii) Repeated exposure to 60% n-propanol: significant barrier damage effects as atopic skin.	SR: *Tasar et al. [400]*
Masks or respirators worn by HCP	HCP must be provided with N95, FFP2, or FFP3 masks combined with gowns and goggles.	SR: *Delikhoon et al.* [311]
Specific settings, general precautions		
	Nosocomial transmission (through aerosols, droplets, and direct contact) of COVID-19 patients to HCW can be controlled by social distancing, wearing masks, personal hygiene, and avoiding crowds.	SR: *Rahman et al.* [104]
	Proportion of reported global SARS-CoV-2 infections (n=5): - occurred outdoors: <10%; - indoor transmission was very high compared to outdoors: odds of 18.7 times.	SR: *Bulfone et al.* [401]
	Asymptomatic patients: Studies from seven countries that tested 21,708 at-risk people, of which 663 were positive and 111 asymptomatic. Meta-analysis (fixed effects) found: -asymptomatic cases was 17% (95% CI 14% to 20%); - overall and higher in aged care (20%; 95% CI 14% to 27%); - in non-aged care (16%; 95% CI 13% to 20%).	SR and meta-analysis: *Byambasuren et al.* [402]

	The relative risk of transmission: - asymptomatic 42% lower than that for symptomatic transmission (combined RR 0.58)	
	Transmission of viruses was lower with physical distancing: -1 m or more, compared with a distance of less than 1 m (n=10 736, pooled adjusted odds: 0·18); - protection was increased as distance was lengthened (change in relative risk [RR] 2·02 per m).	SR and meta-analysis: *Chu et al.* [322]

*SR: systematic review.
*DHP: Dental Health Professionals
* HCP: Health Care Professionals

APPENDIX D: Key findings for topic d) PPE for providing in-person healthcare.

Approach	Main findings	Source*
Limited to moderate evidence for COVID-19 (including strong evidence for other diseases)		
Risk factors for HCW	Recommendation to replace the mask every 2 h with non-aerosol procedures and every 4 h with aerosol generating procedures.	SR: *Turkistani et al.* [310]
	Strong reduction of infection risk in frontline HCWs (odds:-1.04) using gloves, gown, surgical mask, N95 respirator, face protection, and infection training.	SR and meta-analysis: *Tian et al.* [403]
	(i) Proper donning and doffing is critical for the safety of both the DHCP and the patient. (ii) Following Guidance for doffing PPE compared to no guidance may reduce self-contamination (MD −5.44). (iii) Face-to-face training may reduce non-compliance with doffing guidance (odds ratio 0.45) compared to solely providing folders or videos.	Scoping Review : *Bradford et al.* [319]*;* SR and meta-analysis: *Hegde [318]*
	Medical interventions: Higher risk of droplet contamination: -osteotomies: indicating that these types of surgeries warrant the most advanced PPE, Lowest risk of droplet contamination: -transoral robotic surgeries: suggesting that less stringent PPE is sufficient for providers during these procedures.	SR: *McCarty et al.* [334]
	HCW masks and probability to carry virus and increase the risk of viral transmission: low chance and weak evidence to support when HCW treating patients with clinical respiratory illness.	SR: *Jones et al.* [404]
	Prolonged PPE usage led to: - headaches (1 of 27 studies).	SR*: Gross et al.* [320]
Face shields and eye protection	(i) Should only be used in combination with an underlying facemask (mask or respirator and, if necessary, a surgical cap) for all procedures in which copious fluid quantities are expected in close proximity to the user's face. (ii) Larger face shields that offer lateral facial protection should be selected.	Scoping Review : *Bradford et al.* [319]*;* SR: *Griswold et al.* [321]

Googles	DHCPs should consider using goggles in supplement to a face mask: when performing procedures that are likely to produce small-sized aerosolized particles directed towards the practitioner.	Scoping Review: *Bradford et al.* [319]
Respirators	A higher-level respirator such as EU FFP3 conforming to European Standard 149 (EN149): recommended when treating COVID-19 suspected patients. High-performance filtering masks: - FFP1: high filtration efficiency of 80%; - FFP2: high filtration efficiency of 94%; - FFP3: high filtration efficiency of 99%; - Thus, the FFP3 is likely to be twice as effective as the FFP2 mask, and broadly both are equivalent or superior to an N95 mask.	SR: *Turkistani et al.* [310] SR : *Rahman et al. [405]*
Face masks	Wearing face masks may reduce primary respiratory infection risk, probably by 6-15% (odds: 0.85 to 0.94). COVID-19-specific studies are required. Wearing face masks vs. no mask: not at statistically significant levels (odds: 0.90). Mathematical models: important decrease in mortality when the population mask coverage is near-universal, regardless of mask efficacy. Weak evidence for scientific studies that have investigated the effectiveness or ineffectiveness use of face masks to limit the spread of COVID-19 among "healthy individuals". Contamination can be reduced amongst HCW: - added tabs to facilitate doffing of masks (RR 0.33).	Scoping Review : *Brainard et al.* [325] SR : *Coclite et al.* [324] SR : *Marasinghe* [406] SR and meta-analysis: *Hegde [318]*
Surgical masks	Especially a Type 3 mask, should be standard protocol within the dental operatory. Medical masks provided similar protection against other viruses, including coronavirus (RR = 0.74). Levels of mask filtration efficiency: depending on the materials used (45–97%).	Scoping Review : *Bradford et al.* [319] SR and meta-analysis: *Barycka et al.* [323] SR : *Coclite et al.* [324]
N95 masks	Should only be worn by a DHCP when there is a high likelihood of small-sized	Scoping Review : *Bradford et al.* [319]

	aerosolized particles directed to- wards the DHCP and there are no engineering safeguards (high- volume evacuation, etc.) in place. The use of N95 respirators or air supplying respirators and adherence to the principles of personal hygiene, frequent hand washing and the use of disinfectants can reduce the prevalence of COVID-19 in HCP.	 SR: *Fouladi et al.* [407]
N95 masks *vs* surgical masks	Wearing surgical mask is the standard, *vs* FFP2/N95 (or higher) for aerosol-generating procedures or for all procedures. Use for both clinical and nonclinical staff (clinicians and assistants). In clinical settings: indicate the non-superiority of N95 mask use *vs* surgical masks in moderate and high-risk clinical situations (5.7% vs. 7.9%; RR = 1.12) (i) The use could result in a large reduction in risk of COVID-19 infection in moderate to high-risk environments; (ii) stronger association of protection from COVID-19, SARS, or MERS with N95 or similar respirators versus other face masks (posterior probability for RR <1, 100% and 95%, respectively).	SR: *Mahdi et al.* [309]*; SR: Turkistani et al.* [310] Scoping Review: *Bradford et al.* [319] SR and meta-analysis: *Barycka et al.* [323] SR: *Griswold et al.* [321]
Powered air-purifying respirator (PAPR)	(i) PAPR with coverall may protect against the risk of contamination better than a N95 mask and gown (RR 0.27); (ii) PAPR with coverall: more difficult to donning (RR 7.5).	SR and meta-analysis: *Hegde* [318]
Gowns	(i) Compared to aprons: protect better against contamination (MD) -10.28). (ii) Contamination can be reduced: - using a sealed gown and glove combination so that they can be removed together and cover the wrist area (RR 0.27); - tight fitting gown around the neck, wrist area and hands (RR 0.08); - added tabs to facilitate doffing of masks (RR 0.33, 95%nCI 0.14 to 0.80) or gloves (RR 0.22, 95% CI 0.15 to 0.31).	SR and meta-analysis: *Hegde* [318]
Gloves	(i) Reducing contamination: - added tabs to facilitate doffing of gloves (RR 0.22);	SR and meta-analysis: *Hegde* [318]

	- one-step removal of gloves and gown compared to separate removal (RR 0.20); -double gloving compared to single gloving (RR 0.34); -sanitising gloves before doffing with quaternary ammonium or bleach (but not alcohol-based hand rub).	

*SR – Systematic Review
*RCT - Randomized Controlled Trial
* DHCP- Dental Health Care Professionals
*HCW- Health Care Worker
*RR- Risk Ratio (statistical analysis)
*MD- Mean Deviation (statistical analysis)

APPENDIX E: Key findings for topic e) decontamination and re-use of PPE.

Approach	Main findings	Source*
Limited evidence		
N95 respirators		
Considerations	Current sterilization measures are not sufficient to permit routine re- use of facemasks. All facemasks should be treated as single use only to prevent cross-contamination. In an emergency shortage situation, were masks must be reused, masks should be stored in a paper bag, paying strict attention to doffing protocols, until sterilized.	Scoping Review : *Bradford et al.* [319]
Ultraviolet C radiation (UV-C)	Some efficacy of using UV-C to inactivate coronaviruses, including SARS-CoV-2 and MERS, as well as H1N1 influenza viruses. N95 2FFR for 60–70 s at 17 mW/cm	Scoping Review : *Bradford et al.* [319]
Hydrogen peroxide vapor (H_2O_2)	Relatively novel sterilizing technique. May be a viable solution when respirators are in short supply. After 50 cycles: respirator function was excellent, with no impairment of aerosol collection efficiency or air flow resistance.	Scoping Review : *Bradford et al.* [319]

*SR: systematic review.

APPENDIX F: Key findings for topic f) the provision of aerosol-generating procedures (AGP)

Condition	Main findings	Source*
Limited evidence in relation to COVID-19/SARS-CoV-2		
Water contamination	SARS-CoV-2 in wastewater from households with infection: High risk chances of SARS-Cov-2 infection via faecal-oral transmission from gastrointestinal AGPs. Clean drinking water provision, proper sanitation, food safety and hygiene could be critical in the current fight against COVID-19.	SR: *Van Doorn et al.* [313]*;* Scoping Review: *Rahimi et al.* [331] SR: *Gwenzi* [332]
Droplet transmission	Occurency: (i) From particles >5 μm, which can settle on surfaces under gravitational settling and do not move more than 1 m. (ii) Particles <5 μm: can stay suspended for an extended period of time (≥2 h) and travel longer distances (up to 8 m) through simple diffusion and convection mechanisms. (iii) The droplets <10 μm: can be transferred larger distant when the weather is cold and humid. (iv) The persistence of the SARS-CoV-2 is remarkable at a low temperature (4 ^{o}C), and, by raising the temperature to 70 ^{o}C, the virus was no longer detectable after 5 min. A PCS was designed to investigate blood viral load of COVID-19 in 52 patients (median age, 62 years; 31 [59.6%] male): The viral loads in critical patients were significantly higher than those in their general and severe counterparts. Meanwhile, none of their close contacts had evidence of infection.	SR: *Delikhoon et al.* [311] Prospective Cohort Study*: Chen et al.[408]*
Bio-aerosol transmission/ Contamination	Higher aerosol levels for AGP contamination: oral-maxillofacial surgeries that utilize lasers, or pneumatic or electric tools, such as rotary drills and saws. ***Medical interventions:*** droplet contamination was highest and most widespread during osteotomies, while transoral robotic surgeries have the lowest risk of droplet contamination. Creative solutions to minimize the risk of COVID-19 transmission on AGP: - application of topical viricidal agents; - make-shift mask filters; - three-dimensional (3-D) printable adapters for headlights;	SR: *Zhang et al.* [315] SR: *McCarty et al.* [334]

	-aerosol containing separation boxes.	
Consensus of AGP on oral and dental procedures	Evidence of microbiological and blood contamination during oral surgery procedures using: - drills of variable speeds, with/without reported irrigation, - suction (high/low/none stated).	SR: *Gallagher et al.* [335]
Limited evidence for SARS, MERS, H1N1, Influenza and bacteria		
Consensus of AGP on oral and dental procedures	Hierarchy of procedure contamination risk: (i) Higher: Ultrasonic scaler, highspeed air-rotor, air-water syringe, air polishing, extractions using motorized handpieces; (ii) Moderate: slow-speed handpieces, prophylaxis, extractions; (iii) Lower: air-water syringe [water only] and hand scaling. During oral surgery procedures: the use of standard reagents for the presumptive identification of blood revealed more extensive contamination (aerosol) than indicated by visible blood (splatter), particularly where all disposable PPE were examined.	SR: *Innes et al.* [333] SR: *Gallagher et al.* [335]

* SR: Systematic review.
*PCS: Prospective Cohort Study

APPENDIX G: Key findings for topic g) mitigation strategies (e.g. rubber dam, mouth rinses etc.) during the provision of in-person oral health care.

Intervention	Main findings*	Source*
Limited evidence in Dental Procedures		
Minimal invasive procedures	(i) As an alternative to AGP: use of CariSolv for caries removal; extraoral radiographs; the use of a hand scaler where a rubber dam is unavailable.	SR: *Mahdi et al.* [309]
High-volume evacuator (HVE)	(i) The use reduces contamination in aerosols during dental procedures particularly in combination with four-handed dentistry during every procedure will allow for better control over evacuating systems and limit the production of aerosolized particles at the source. (ii) A review of a total of 17 clinical studies indicates that HVE is an obligatory requirement to reduce bio-aerosols in dentistry. (iii) Significantly higher reduction in the quantity of mean CFUs. (iv) Air polisher without HVE generated a significantly higher number of CFUs on the face mask plate. ***HVE vs CDS (conventional dental suction) :*** HVE: Mean Aerobic microbes 0.9 (1.3) Mean Anaerobic microbes 1.1 (1.2) *vs* CDS: Mean Aerobic microbes 1.0 (1.2) Mean Anaerobic microbes 3.3 (2.7)	SR: *Mahdi et al.* [309]; Scoping Review : *Bradford et al.* [319]; Scoping Review : *Kathree et al.* [312] SR : *Samaranayake et al.* [341]
Rubber dam	(i) During dental treatment: is essential to reduce the risk of cross-transmission through saliva and minimize droplet spatter. (ii) A review of a total of 17 clinical studies indicates that while rubber dam application must be utilized when opportune to reduce bio- aerosols in dentistry; (iii) The use reduces microorganisms in 90 to 98%; (iv) Bacterial reduction at 1m: 98.8% and increased when antiseptic mouth rinse was used together (99.4%).	*SR: Turkistani et al.* [310]; Scoping Review : *Bradford et al.* [319]; Scoping Review : *Kathree et al.* [312] SR : *Samaranayake et al.* [341]
Mouth Rinse solutions		

Different types of solution	(i) The use of a patient pre-procedural mouth rinse with an antimicrobial agent reduces contamination in aerosols and bacterial challenges to the mask and must be utilized when opportune to reduce bio- aerosols in dentistry. (ii) Unable to ascertain the relative benefits and harms of the use of antimicrobial mouthwashes and nasal sprays by individuals with COVID-19. (iii) Nonsurgical periodontal therapy: by the use of laser and ozone therapy, air polishing, probiotics and chlorhexidine: reduction of microorganism load present in aerosols.	SR: *Mahdi et al.* [309]; SR : *Samaranayake et al.* [341]; Scoping Review : *Bradford et al.* [319] SR: *Burton et al.* [343] Scoping Review : *Butera et al.* [342]
Povidone- iodine (PVP-I)	RCT proposed to assess the ability of regular gargling to eliminate SARS-CoV-2 in the oropharynx and nasopharynx (n=5 confirmed Stage 1 COVID-19 patients). Effect of 30 sec, 3 times/day gargling: - Day 4: SARS-CoV-2 was not detected (n=5) - Day 6: SARS-CoV-2 was not detected (n=5) - Day 12: SARS-CoV-2 was not detected (n=5) - Viral clearance was achieved in 100% for 1%PVP-I. PVP-I solution for mouthwash for virucidal action on the SARS-CoV and MERS-CoV: - 1%PVP-I without dilution/15 s exposure: viral reduction of ≥99.99%; - 7%PVP-I with 1:30 dilution/15 s exposure: viral reduction of ≥ 99.99%; - 1% and 7%PVP-I: appears to be the most effective mouthwash for reducing the viral load of COVID-19 present in human saliva.	RCT: *Mohamed et al.* [344] SR: *Cavalcante-Leão et al.* [345]
Essential Oil (EO)	(i) 94.1% reduction in CFUs; (ii) Significantly reduce the level of viable bacteria in an aerosol produced via ultrasonic scaling 40 min later. RCT proposed to to assess the ability of regular gargling to eliminate SARS-CoV-2 in the oropharynx and nasopharynx (n=5 confirmed Stage 1 COVID-19 patients). Effect of 30 sec, 3 times/day gargling: - Day 4: SARS-CoV-2 was not detected (n=4) - Day 6: SARS-CoV-2 was not detected (n=4)	SR : *Samaranayake et al.* [341] RCT: *Mohamed et al.* [344]

	- Day 12: SARS-CoV-2 was not detected (n=4) - Viral clearance was achieved in 80% for EO.	
Chlorhexidine (CHX)	(i) Reduce most of the bacterial aerosols generated via the use of the air-polishing device; (ii) reduces aerosol as far as 9 feet from the patients' head; (iii) reduces the dissemination of bacteria; (iv) 0.12% CHX is effective in reducing the levels of spatter containing microbes generated during ultrasonic scaling; (v) 0.2% CHX mouth rinse increases in the numbers and diversity of airbone microbes.	SR : *Samaranayake et al.* [341]
Dipotassium Glycyrrhizinate	The use of mouthwash was used 3x/day for 7 to 10 days after Implant Placement (n=16) inhibited propagation of the bacteria, especially for total G [-] anaerobes (reduction of CFUs).	RCT: *Taninokuchi et al.* [346]
Tranexamic Acid-based	The use of mouthwash was used 3x/day for 7 to 10 days after Implant Placement (n=16) inhibited propagation of the bacteria, especially for total G [-] anaerobes (reduction of CFUs).	RCT: *Taninokuchi et al.* [346]
Chlorine dioxide, Sodium chlorite or Chlorine derivatives	There is no scientific evidence to support the use of chlorine dioxide or chlorine derivatives to prevent or treat COVID-19.	SR: *Burela et al.* [347]
Cetylpyridinium chloride (CPC)	(i) 0.05% CPC and 0.12% CHX and are equally effective in reducing the levels of spatter containing microbes generated during ultrasonic scaling. The use of mouthwash was used 3x/day for 7 to 10 days after Implant Placement (n=16) inhibited propagation of the bacteria, especially for total G [-] anaerobes (reduction of CFUs).	SR : *Samaranayake et al.* [341] RCT: *Taninokuchi et al.* [346]

*SR: Systematic review.
*CFUs: colony-forming unit (count of viable bacteria)
*RCT: Randomized Clinical Trial

APPENDIX H: Key findings for topic h) space ventilation strategies to reduce the risk of transmission

Ventilation setting	Main findings	Source*
Limited evidence in relation to SARS-CoV and MERS-CoV and microorganisms		
Air cleaning systems in Dental office	May reduce the risk of infection: (i) Using a UVC light, a HEPA filter air purifier, or room ventilation for 30 min prior to surface disinfection after treatment or between patients. (ii) Using HEPA14 filters or higher, where the filtration efficiency is ≥99.995%, for particles ≥0.01 μm, is highly recommended while the patient is undergoing, and immediately after, an AGP. If patient is not suspect of being infected with COVID-19: - the standard ventilation rate of ≥1.5 air change/h, during and after the visit, should be provided. If patient is suspect of being infected with COVID-19: -mechanical ventilation with a constant 6 air change/h, during and after the visit, is recommended. If patient is positive for COVID-19 and emergency treatment required: -highest level of PPE; -negative pressure room should be utilized (min 12 air changes per hour or at least 160 L/s per patient). -mechanical ventilation used before treating next patient.	SR: *Madhi et al*. [309]; SR : Turkistani et al. [310] SR: *Tysiac-Mista* [348] SR: *Tysiac-Mista* [348] SR: *Tysiac-Mista* [348] Scoping review: *Kathree et al.* [312]
	Airborne SARS-CoV-2 can be transmissible in 4 m in closed spaces. Is highly recommended to use air conditioning systems with extra persuasions, especially when the air is possibly infected.	SR: *Rahimi et al.* [331]
Air-conditioning systems disinfection	Some viral aerosols remaining in the dental clinic, after a working day that is why air-conditioning systems should be periodically cleaned and disinfected. The methods for air-conditioning disinfection are: ***By by fogging with hydrogen peroxide*** - Hydrogen peroxide is a widely recommended agent for daily use in enclosed areas (bactericidal, fungicidal, virucidal and sporicidal activity) - safe for humans, medical materials, and the environment	SR: *Tysiac-Mista* [348]

	- Disadvantage: the rooms must be vacated and pre-cleaned to remove the visible dirt; the Vapors must be moved around as they are irritating to the eyes, mucous membrane and skin; they may cause lung irritation if inhaled. - There is no data on the use of such a disinfection method in the dentistry setting, but due to the decades of a successful use of vaporized hydrogen peroxide in other clinical settings, this method can certainly be recommended as an effective way to meet the new hygienic demands in dentistry. ***<u>By UVGI Ultraviolet (UV) radiation</u>*** - has been used for almost half a century to annihilate airborne microorganisms in hospitals, laboratories, and dental offices -the susceptibility of SARS-CoV-2 to UV has not been fully investigated yet, studies of other coronaviruses (SARS-CoV and MERS-CoV), have proven their liability to this type of radiation - only the UV-C light can exterminate viruses by disrupting their DNA base pairing and halting their reproductive capability - **UV-C flow germicidal lamps:** infection control protocol in the dental office should imply thorough cleaning between patients with the addition of UV-C radiation for 20–30 min. ***<u>By Ozone generators:</u>*** - has shown the inactivation of influenza viruses, herpes simplex viruses, coronaviruses, rhinoviruses and polioviruses after exposure to 100 ppm of ozone for 30 min. - could easily penetrate into all areas of the room, furniture and other objects - disavantage: causes some materials (e.g., natural rubber) corrosion and for the virus to be inactivated; ≥80% air humidity is required; is toxic for humans (can only be carried out in a sealed room, without any people inside) - safe ozone concentration for humans as 0.1 ppm for 8 h or 0.3 ppm for 15 min. - the optimal virucidal effect: ozone concentration to 25 ppm for 15 min, maintaining this concentration for 10 min, and then increasing the relative humidity to 95% and leaving it for additional 5 min. ***<u>By Plasma:</u>*** - the non-thermal plasma disinfection method is environmentally friendly as it does not generate waste or toxic by-products and does not use toxic	

	chemicals. It is also easy and safe in handling. ***<u>By Photocatalytic disinfection with titanium oxide</u>***: - relative effectiveness against SARS-CoV-1, which also gives a high probability of the virucidal effect on SARS-CoV-2. - filters made of silver and titanium dioxide activated by the UV light are a very interesting alternative for air disinfection - disadvantages: high relative humidity decreases the effectiveness of the devices. - the surface coating with a thin layer of titanium dioxide nanoparticles can also be utilized in the dental setting, where UV radiation is often used for surface disinfection. It is advised to apply ceramic wall tiles coated with a layer of titanium oxide	

SR: Systematic review.

APPENDIX I: Key findings for topic i) disinfection of surfaces in spaces in which oral health care is provided

Approaching/Intervention	Main findings	Source*
Moderate evidence in relation to SARS-CoV		
Disinfectants	*Effects on prosthetic surfaces:* - Prosthodontic material (e.g.impressions): disinfected by intermediate level disinfectant. - Salivary suction carefully done, use topical anaesthesia when choosing size/ modifying impression trays to prevent gag reflex. **Chlorine** - 1%NaOCl solution for 1 minute: reduce SARS-CoV infectivity and to minimize the risk of cross-contamination through prosthetic materials; - 1%NaOCl solution: increase in surface roughness and color alteration on acrylic resin (not clinically significant); - 1% NaOCl solution: decrease in bonding strength on lithium disilicate. **Alcohols** - 96% isopropanol and 80% ethanol solutions decrease in bonding strength on lithium disilicate.	Scoping Review: *Kathree et al.* [312] SR: *di Fiore et al.* [350]
Limited evidence in relation to different virus		
Disinfectants	**Chlorine** Strict cleaning protocol of the surfaces including door handles, chairs and room desks using a solution containing hospital-grade disinfectants, including 0.1% sodium hypochlorite, have proven to be effective against coronaviruses. The various coronaviruses survive on surfaces for up to nine days, and they can be eliminated by disinfection with 0.1% sodium hypochlorite for at least 1 min. In sewage, sodium hypochlorite had better action than chlorine dioxide.	SR: *Mahdi et al.* [309]; *SR: Turkistani et al.* [310]; SR: *Shimabukuro et al.* [351] SR: *Delikhoon et al. [311]; SR: Rahimi et al.* [331] SR: *Shimabukuro et al.* [351]
	Alcohols Strict cleaning protocol of the surfaces including door handles, chairs and room desks using a solution containing hospital-grade disinfectants, including alcohol-based products such as 62 to	SR: *Mahdi et al.* [309]; *SR: Turkistani et al.* [310]; SR: *Shimabukuro et al.* [351]

	70% isopropyl alcohol, have proven to be effective against coronaviruses. The various coronaviruses survive on surfaces for up to nine days, and they can be eliminated by disinfection with 62–72% ethanol for 1 min. 70% alcohol showed efficient immediate activity.	SR: *Delikhoon et al.* [311]; *SR: Rahimi et al.* [331] SR: *Shimabukuro et al.* [351]
	Hydrogen Peroxide Strict cleaning protocol of the surfaces including door handles, chairs and room desks using a solution containing hospital-grade disinfectants, including 0.5% hydrogen peroxide, have proven to be effective against coronaviruses. Viral inactivation was achieved using UV-C. The various coronaviruses survive on surfaces for up to nine days, and they can be eliminated by disinfection with 0.5% hydrogen peroxide for 1 min.	*SR: Turkistani et al.* [310] SR: *Shimabukuro et al.* [351] *SR: Rahimi et al.* [331]
	Glutaraldehyde Viral inactivation was achieved.	SR: *Shimabukuro et al.* [351]
	Iodine-containing detergents Viral inactivation was achieved.	SR: *Shimabukuro et al.* [351]
	Benzalkonium Chloride The use of 0.05–0.2% were found to be less successful for inactivating the various coronaviruses.	*SR: Rahimi et al.* [331]
	Chlorhexidine Digluconate The use of 0.02% were found to be less successful for inactivating the various coronaviruses.	*SR: Rahimi et al.* [331]
Ultraviolet-C (UV-C)	(i) Germicidal effect against microorganisms including viruses, methicillin-resistant Staphylococcus aureus, and vancomycin-resistant enterococci. Lower evidence for COVID-19. (ii) Advantages: - useful in high-traffic, high-touch places, and surfaces where bioburden is high; - takes up less time and less manpower; - UV-C can be utilized as an adjunct to terminal manual cleaning as disinfectants. (iii) UV-C light devices used as a disinfecting tool utilize 254 nm UV-C newer studies suggest that the 222 nm wavelength has the same bactericidal without the hazardous effects.	SR: *Ramos et al.* [352]

	Viral inactivation was achieved using UV-C.	SR: *Shimabukuro et al.* [351]

* SR: Systematic review.

APPENDIX J: Methods used to identify and include relevant literature

This report was structured as a rapid review of the evidence to support safe provision of oral health care during the COVID-19 pandemic. Different search strategies were tailored for nine key areas ("a" to "i"); available evidence was divided according to those key areas.

J.1. Eligibility criteria

J.1.1. Study types and design

This report and subsequent updates included studies in the field of COVID-19/SARS-CoV-2, but extended inclusion to studies on closely related respiratory viruses (key areas "c" to "i"), comprising SARS, MERS, H1N1, influenza, common cold and sometimes other pathogens. For questions with a robust body of evidence about COVID-19, we did not update evidence about other respiratory diseases or viruses (key areas "a" and "b"). Eligible study designs were: systematic reviews (SR) (with meta-analysis or not), scoping reviews, randomized controlled trials (RCT) and prospective cohort studies. We considered only manuscripts written in English as potential sources of study data.

The large number of included studies for key areas "a" and "b" led us to stricter criteria, as detailed at session J.3.2.1. The paucity of literature on SARS-CoV-2 infection control has led us to extend inclusion criteria for key areas "f", "g", "h" and "i". Therefore, studies related to airborne bacterial contamination were also included for those areas.

J.1.2. Types of conditions and interventions

Each key review area approached a distinct set of conditions and/or interventions of relevance for oral health care. In brief, those were conditions leading to higher risk of morbidity or mortality by COVID-19, approaches to protect healthcare professionals and patients from infection in different moments (i.e. physical distancing, aerosol-generating procedures, asepsis/disinfection and PPE). We expect conditions and interventions of relevance for the viruses mentioned above to be potentially relevant for COVID-19/SARS-CoV-2, even if as with poorer generalizability – studies reporting them would be considered as weaker sources of evidence.

Specific conditions and interventions were:

a. Comorbidities and other health conditions able to increase the risk of COVID-19-related complications, including death;
b. Clinical signs and symptoms expected with COVID-19 and observable by dental professionals before rendering in-person care;
c. Non-treatment approaches to provide in-person dental care, including patient scheduling, waiting and others (for example, teledentistry-based interventions);
d. Different PPE for in-person dental care, based on studies from different areas of health (not restricted to dental professions);
e. Decontamination of PPE, aiming at their possible reuse;
f. Aerosols generated by dental procedures, and their relevance for the transmission of COVID-19;
g. Methods to mitigate cross-infection by aerosols during in-person provision of oral health care, including rubber dam and pre-operatory mouthwashes;
h. Spatial ventilation strategies to reduce the risk of transmission;
i. Disinfection of surfaces where oral health care is provided.

Since, at the time of preparing this review, there is no available vaccine for COVID-19, we have not considered that kind of intervention. We did not include prophylactic antiviral regimens for the same reason, for either patients or health care professionals. Since there is potential for vaccines and antivirals to become parts of dental professionals' routine after their development, we may consider including them in future updates.

J.1.2. Outcomes

This review considered any outcome related to the severity of COVID-19 as relevant, including signs/symptoms, complications and incident comorbidities, disease-specific severity indexes, and survival/death. Whenever relevant, measures of contamination (for example, % contaminated per group, or microbial counts on disinfected surfaces) and adverse effects (for example, rash caused by prolonged mask wearing) were considered.

Whenever relevant for each study key area, a brief description of patient and professional perception was provided. This would be done quantitatively (by numbers, for example, % of dentists who disinfect impressions before sending to the laboratory) or qualitatively (by a concise narrative of key perceptions).

J.2. Search strategy

J.2.1. Electronic searches

We performed systematic literature searches separated by key areas in the following databases: CINAHL, Embase (Ovid), MEDLINE (Ovid) and SCOPUS, restricting our search to a period of 4 months (November 1 2020 and February 28 2021). Different search strategies were prepared for key areas “a” to “i” and adapted for each database. Given their similar nature, some pairs of key areas employed a single search (i.e, “a”+”b”; “c”; “d”+”e”; “f”+“g”; “h” and “I”), totalling six searches.

Please refer to Table J1 at the end of this Appendix for the terms used in the electronic searches.

J.2.2. Researching other resources

We reviewed the list of references of all papers included in the report to identify other potentially relevant studies (“reference mining”).

J.3. Data collection and analysis

J.3.1. Selection of studies

Two researchers (L.A. and R.S.) examined the titles and abstracts from each search to decide on their exclusion. A third researcher (P.A.) tackled any disagreement between the two reviewers during the selection of titles and abstracts.

Potential inclusion (including cases of insufficient information for exclusion) led to the revision of full text versions by two researchers (R.S. and P.A.). For full text selection, any disagreement was decided by a consensus meeting with a third researcher (L.A.). Although we always reached consensus, the third researcher would have the final decision in cases of persisting disagreement.

In the case of having two or more manuscripts describing the same study, those references would count as a single included study.

J.3.2 Data extraction/management, and quality of studies

Studies were classified according to the level of evidence provided: SR>RCT>prospective cohort. Scoping reviews were considered due to the breadth of information rather than strength of evidence. Since this is a rapid review on a vast range of key areas, no in-depth quality assessment was performed – instead, we classified sources of evidence as “strong”, “limited” or “none” for each specific condition/intervention.

J.3.2.1 Eligibility Criteria for Key areas A and B

Our search yielded several redundant studies for key areas A and B. That led us to restrict our eligibility criteria, by including only systematic reviews, with meta-analyses or not. As decision criteria for inclusion, this report considered as a systematic review just those studies with:

(a) a well-defined goal and/or research question, based on participant/patient type, exposure and outcome variables;

(b) systematic study selection, by using reproducible methods (including clear search strategy and eligibility criteria);

(c) quality assessment of reviewed literature (for example, application of standard quality assessment questionnaires for clinical studies);

(d) any strategy to synthetize obtained data (including meta-analysis) or at least a critical description primary study data, if studies cannot be pooled.

Primary studies for key area A were restricted to prospective ones. This enabled us to focus on high-level evidence. The latter restriction was not applied to key area B, given the non-analytical nature of the question.

Scoping reviews were still eligible for key areas C to I, to achieve broader information for those areas with more scarce evidence. Retrospective studies were excluded from this update, however.

J.2. Description of studies

J.2.1. Results of the search

The search strategy retrieved 6,232 study titles and abstracts. After examining those references, 5,861 clearly did not meet the inclusion criteria and were excluded. Three hundred and seventy-one full text reports of potentially relevant studies were obtained for further evaluation. After excluding 53 full reports, our sample totaled 318 study reports.

According to each section, articles were included. Appendix Table J2 shows the selection of the publication for inclusion in the systematic review.

Appendix Table J2. Yield of the six electronic search strategies, in terms of the number of reports.

Key areas	Total	Excluded	Included
A + B	1,790	1,504	305
C	903	891	25
D + E	708	696	16
F + G	2,241	2,193	13
H	85	79	5
I	505	499	8
No data	No data	No data	Total =372*

* Several articles were included for more than one topic (e.g.: 39 articles were identified for topics A and B; 16 articles for two or more different topics) hence the total in the table surpasses 100% of the included articles (n = 372 and 318, respectively).

J.2.2. Included Studies

Regarding study design, the majority of our inclusions were SR and/or meta-analyses (n=311, 97.8%). We have also included seven scoping reviews (n=5, 1.6%), as well two RCT (0.6%).

J.2.3. Measures of treatment effect and Unit of analysis issues

Included studies underwent qualitative analysis and separate data extraction, without further efforts for quantitative synthesis. Please refer to the main document and Appendices A to I for the description and results of included studies.

Appendix Table J1. Search strategies used for each key area of the present report.

Searches A/B

1. exp Severe Acute Respiratory Syndrome/
2. "severe acute respiratory syndrome coronavirus 2".mp.
3. (covid-19 or "covid 19" or 2019 ncov or 2019nCoV or "sars cov 2").mp.
4. coronavirus/ or exp betacoronavirus/
5. or/1-4
6. exp Risk Factors/
7. exp Risk Assessment/
8. (risk? adj3 (at or assess* or factor?)).tw,kf.
9. (complication? or mortality or sequela? or comorbid* or consequence?).tw,kf.
10. or/6-9
11. 5 and 10
12. meta-analysis.pt.
13. meta-analysis/ or systematic review/ or meta-analysis as topic/ or "meta analysis (topic)"/ or "systematic review (topic)"/ or exp technology assessment, biomedical/
14. ((systematic* adj3 (review* or overview*)).tw,kf.
15. (meta-analy* or metaanaly* or systematic review* or biomedical technology assessment* or bio-medical technology assessment*).mp,hw.
16. (cochrane).tw,kw,jw.
17. or/12-16
18. 11 and 17

Search C

1. exp Stomatognathic Diseases/
2. exp Dentistry/
3. exp Oral Health/
4. exp Dental Facilities/
5. (dentist* or endodont* or orthodo
nti* or periodont* or prosthodont* or apicoectom* or gingivectom* or gingivoplast* or glossectom* or "mandibular advancement" or alveolectom* or alveoloplast* or vestibuloplast* or "root canal" or oral or oropharyng* or temporomandibular or TMJ or jaw or jaws or mandibular or maxillofacial or mandible* or maxilla* or "alveolar ridge" or dental or orthognathic or tooth or teeth or occlusion or malocclusion or mal-occlusion or odontolog* or tongue* or glossal or buccal or palatal or palate or palates or labial or lip or lips or gingiva* or gingiviti*).tw,kw.
6. or/1-5
7. exp Viruses/
8. exp Virus Diseases/
9. (viridae or COVID-19 or AIDS or HIV or ebola or zika or "west nile" or shingles or SARS or MERS or chickenpox or smallpox or Chikungunya or epstein-barr or erythema or exanthum or influenza? or flu or HFMD or "heartland virus" or HFRS or hepatitis or herpes or cmeasles or mumps or "nipah virus" or Poliomyelitis or yersiniosis or rubella or salmonellosis or rabies).tw,kw.
10. (aalivirus* or ab18virus* or abouovirus* or abyssovirus* or acadianvirus* or ag3virus* or agatevirus* or agrican357virus* or aichivirus* or albetovirus* or alefpapillomavirus* or alfamovirus* or allexivirus* or allolevivirus* or almendravirus* or alpha3microvirus* or alphaabyssovirus* or alphaarterivirus* or alphabaculovirus* or alphacarmotetravirus* or alphacarmovirus* or alphacoronavirus* or alphaendornavirus* or alphaentomopoxvirus* or alphafusellovirus* or alphaguttavirus* or alphaherpesvirus* or alphainfluenzavirus* or alphaletovirus* or alphamesonivirus* or alphamononivirus* or alphanecrovirus* or alphanodavirus* or alphanudivirus* or alphapapillomavirus* or alphapartitivirus* or alphapermutotetravirus* or alphapleolipovirus* or alphapolyomavirus* or alphaportoglobovirus* or alpharetrovirus* or alphasphaerolipovirus* or alphaspiravirus* or alphatectivirus* or alphatorquevirus* or alphatristromavirus* or alphaturrivirus* or alphavirus* or amalgavirus* or ambidensovirus* or amdoparvovirus* or amigovirus* or ampelovirus* or ampivirus* or ampobartevirus* or ampullavirus* or anatolevirus* or andecovirus* or andromedavirus* or anphevirus* or anulavirus* or ap22virus* or aparavirus* or aphthovirus* or aplyccavirus* or aquabirnavirus* or aquamavirus* or aquaparamyxovirus* or aquareovirus* or arlivirus* or arv1virus* or ascovirus* or asfivirus* or atadenovirus* or attisvirus* or aumaivirus* or aureusvirus* or aurivirus* or avastrovirus* or avenavirus* or aveparvovirus* or aviadenovirus* or avibirnavirus* or avihepadnavirus* or avihepatovirus* or avipoxvirus* or avisivirus* or avulavirus* or b4virus* or babuvirus* or bacillarnavirus* or badnavirus* or bafinivirus* or balbicanovirus* or banyangvirus* or barnavirus* or barnyardvirus* or bastillevirus* or batrachovirus* or baxtervirus* or bc431virus* or bcep22virus* or bcep78virus* or bcepmuvirus* or bdellomicrovirus* or becurtovirus* or begomovirus* or behecravirus* or beidivirus* or benyvirus* or berhavirus* or bernal13virus* or betaarterivirus* or betabaculovirus* or betacarmovirus* or betacoronavirus* or betaendornavirus* or betaentomopoxvirus* or betafusellovirus* or betaguttavirus* or betaherpesvirus* or betainfluenzavirus* or betalipothrixvirus* or betanecrovirus* or betanodavirus* or betanudivirus* or betapapillomavirus* or betapartitivirus* or betapleolipovirus* or betapolyomavirus* or betaretrovirus* or betasphaerolipovirus* or betatectivirus* or betatetravirus* or betatorquevirus* or beturrivirus* or bevemovirus* or bicaudavirus* or bidensovirus* or bignuzvirus* or biquartavirus* or biseptimavirus* or blosnavirus* or blunervirus* or bocaparvovirus* or bolenivirus* or bongovirus* or bopivirus* or bostovirus* or botrexvirus* or botybirnavirus* or bovismacovirus* or bovispumavirus* or bpp1virus* or bracovirus* or brambyvirus* or brevidensovirus* or bromovirus* or bronvirus* or brujitavirus* or buldecovirus* or buttersvirus* or bxz1virus* or bymovirus* or c2virus* or c5virus* or cadicivirus* or cafeteriavirus* or calicivirus* or camvirus* or capillovirus* or capripoxvirus* or capulavirus* or carbovirus* or cardiovirus* or cardoreovirus* or carlavirus* or casualivirus* or caulimovirus* or cavemovirus* or cba120virus* or cba181virus* or cba41virus* or cbastvirus* or cc31virus* or cd119virus* or cecivirus* or cegacovirus* or centapoxvirus* or cervidpoxvirus* or charlievirus* or charybnivirus* or che8virus* or che9cvirus* or cheravirus* or chibartevirus* or chipapillomavirus* or chipolycivirus* or chivirus* or chlamydiamicrovirus* or chloriridovirus* or chlorovirus* or chordovirus* or chrysovirus* or cilevirus* or circovirus* or citrivirus* or cjw1virus* or clavavirus* or closterovirus* or coccolithovirus* or colacovirus* or coltivirus* or comovirus* or coopervirus* or copiparvovirus* or corndogvirus* or coronavirus* or corticovirus* or cosavirus* or cosmacovirus* or cp1virus* or cp220virus* or cp51virus* or cp8virus* or cr3virus* or cradenivirus* or crinivirus* or cripavirus* or crocodylidpoxvirus* or crohivirus* or cronusvirus* or crustavirus* or cryspovirus* or cucumovirus* or cuevavirus* or curiovirus* or curtovirus* or cvm10virus* or cyclovirus* or cypovirus* or cyprinivirus* or cystovirus* or cytomegalovirus* or cytorhabdovirus* or d3112virus* or d3virus* or debiartevirus* or decacovirus* or decronivirus* or decurrovirus* or deltaarterivirus* or deltabaculovirus* or deltacoronavirus* or deltaflexivirus* or deltainfluenzavirus* or deltalipothrixvirus* or deltapapillomavirus* or deltapartitivirus* or deltapolyomavirus* or deltaretrovirus* or deltatorquevirus* or deltavirus* or demosthenesvirus* or densovirus* or dependoparvovirus* or dfl12virus* or dianthovirus* or diatodnavirus* or dichorhavirus* or dicipivirus* or dinodnavirus* or dinornavirus* or dinovernavirus* or divavirus* or doucettevirus* or dragsmacovirus* or drosmacovirus* or drosmacovirus*2 or dumedivirus* or duvinacovirus* or dyochipapillomavirus* or dyodeltapapillomavirus* or dyoepsilonpapillomavirus* or dyoetapapillomavirus* or dyoiotapapillomavirus* or dyokappapapillomavirus* or dyolambdapapillomavirus* or dyomupapillomavirus* or dyonupapillomavirus* or dyoomegapapillomavirus* or dyoomikronpapillomavirus* or dyophipapillomavirus* or dyopipapillomavirus* or dyopsipapillomavirus* or dyorhopapillomavirus* or dyosigmapapillomavirus* or dyotaupapillomavirus* or dyothetapapillomavirus* or dyoupsilonpapillomavirus* or dyoxipapillomavirus* or dyozetapapillomavirus* or e125virus* or ea214virus* or ea92virus* or eah2virus* or ebolavirus* or eiauvirus* or elvirus* or emaravirus* or embecovirus* or enamovirus* or enselivirus* or enterovirus* or entomobirnavirus* or entomopoxvirus* or ephemerovirus* or

epsilon15virus* or epsilonarterivirus* or epsilonpapillomavirus* or epsilonretrovirus* or epsilontorquevirus* or equispumavirus* or eragrovirus* or erbovirus* or errantivirus* or erythroparvovirus* or etaarterivirus* or etapapillomavirus* or etatorquevirus* or eurpobartevirus* or f116virus* or fabavirus* or felispumavirus* or felixo1virus* or feravirus* or ferlavirus* or ff47virus* or fibrovirus* or fijivirus* or fishburnevirus* or flavivirus* or foveavirus* or fri1virus* or furovirus* or g4microvirus* or g7cvirus* or gaiavirus* or gallantivirus* or gallivirus* or gammaarterivirus* or gammabaculovirus* or gammacarmovirus* or gammacoronavirus* or gammaentomopoxvirus* or gammaherpesvirus* or gammainfluenzavirus* or gammalipothrixvirus* or gammapapillomavirus* or gammapartitivirus* or gammapleolipovirus* or gammapolyomavirus* or gammaretrovirus* or gammasphaerolipovirus* or gammatorquevirus* or gemycircularvirus* or gemyduguivirus* or gemygorvirus* or gemykibivirus* or gemykolovirus* or gemykrogvirus* or gemykroznavirus* or gemytondvirus* or gemyvongvirus* or giardiavirus* or gilesvirus* or globulovirus* or glossinavirus* or goravirus* or gordonvirus* or gordtnkvirus* or goukovirus* or grablovirus* or granulovirus* or gyrovirus* or habenivirus* or hanalivirus* or hapavirus* or hapunavirus* or harkavirus* or harrisonvirus* or hartmanivirus* or hawkeyevirus* or hedartevirus* or hemivirus* or henipavirus* or hepacivirus* or hepandensovirus* or hepatovirus* or herbevirus* or herdecovirus* or herpesvirus* or hibecovirus* or higrevirus* or hk578virus* or hk97virus* or hordeivirus* or horwuvirus* or hp1virus* or hubavirus* or huchismacovirus* or hudivirus* or hudovirus* or hunnivirus* or hupolycivirus* or hypovirus* or hytrovirus* or ichnovirus* or ichtadenovirus* or ictalurivirus* or idaeovirus* or idnoreovirus* or iflavirus* or igacovirus* or ilarvirus* or iltovirus* or infratovirus* or inovirus* or inshuvirus* or invictavirus* or iotaarterivirus* or iotapapillomavirus* or iotatorquevirus* or ipomovirus* or iridovirus* or isavirus* or iteradensovirus* or jd18virus* or jenstvirus* or jerseyvirus* or jimmervirus* or jonvirus* or js98virus* or jwalphavirus* or jwxvirus* or k1gvirus* or kadilivirus* or kaftartevirus* or kappaarterivirus* or kappapapillomavirus* or kappatorquevirus* or karsalivirus* or kayvirus* or kelleziovirus* or kf1virus* or kieseladnavirus* or kigiartevirus* or kobuvirus* or korravirus* or kp15virus* or kp32virus* or kp34virus* or kp36virus* or kpp10virus* or kpp25virus* or kunsagivirus* or l5virus* or labyrnavirus* or lagovirus* or lambdaarterivirus* or lambdapapillomavirus* or lambdatorquevirus* or lambdavirus* or laroyevirus* or lausannevirus* or ledantevirus* or leishmaniavirus* or lentivirus* or leporipoxvirus* or letovirus* or levivirus* or liefievirus* or likavirus* or limestonevirus* or limnipivirus* or lincruvirus* or lineavirus* or lit1virus* or lmd1virus* or loanvirus* or lolavirus* or luchacovirus* or luteovirus* or luz24virus* or luz7virus* or lymphocryptovirus* or lymphocystivirus* or lyssavirus* or m12virus* or macanavirus* or macavirus* or machinavirus* or machlomovirus* or macluravirus* or macronovirus* or maculavirus* or mamastrovirus* or mammarenavirus* or mandarivirus* or marafivirus* or marburgvirus* or mardivirus* or marnavirus* or marseillevirus* or marthavirus* or marvinvirus* or mastadenovirus* or mastrevirus* or mavirus* or megabirnavirus* or megalocytivirus* or megrivirus* or menolivirus* or merbecovirus* or metapneumovirus* or metavirus* or milecovirus* or mimivirus* or mimoreovirus* or minacovirus* or minunacovirus* or mischivirus* or mitartevirus* or mitovirus* or mivirus* or mobatvirus* or mobuvirus* or molluscipoxvirus* or mooglevirus* or moonvirus* or moordecovirus* or morbillivirus* or mosavirus* or msw3virus* or muarterivirus* or mudcatvirus* or mupapillomavirus* or muromegalovirus* or muscavirus* or muvirus* or mycoflexivirus* or mycoreovirus* or myohalovirus* or myotacovirus* or n15virus* or n4virus* or namcalivirus* or nanovirus* or narnavirus* or nebovirus* or nepovirus* or nidovirus* or nit1virus* or nobecovirus* or nona33virus* or nonagvirus* or nonanavirus* or norovirus* or novirhabdovirus* or np1virus* or nucleopolyhedrovirus* or nucleorhabdovirus* or nudivirus* or nupapillomavirus* or nyavirus* or nyctacovirus* or nyfulvavirus* or nymphadoravirus* or ofalivirus* or okavirus* or oleavirus* or omegapapillomavirus* or omegatetravirus* or omegavirus* or omikronpapillomavirus* or oncotshavirus* or oncovirus* or ophiovirus* or orbivirus* or orinovirus* or orivirus* or orthobornavirus* or orthobunyavirus* or orthohantavirus* or orthohepadnavirus* or orthohepevirus* or orthonairovirus* or orthophasmavirus* or orthopneumovirus* or orthopoxvirus* or orthoreovirus* or oryzavirus* or oscivirus* or ostreavirus* or ourmiavirus* or p100virus* or p12002virus* or p12024virus* or p1virus* or p22virus* or p23virus* or p2virus* or p68virus* or p70virus* or pa6virus* or pagevirus* or paguronivirus* or pakpunavirus* or pamx74virus* or panicovirus* or papanivirus* or parapoxvirus* or parechovirus* or partitivirus* or pasivirus* or passerivirus* or patiencevirus* or pbi1virus* or pbunavirus* or pecluvirus* or pedacovirus* or pedartevirus* or pegivirus* or pelarspovirus* or penstyldensovirus* or pepy6virus* or percavirus* or perhabdovirus* or peropuvirus* or pestivirus* or petuvirus* or pfr1virus* or pg1virus* or phaeovirus* or phasivirus* or phayoncevirus* or phi29virus* or phic31virus* or phicbkvirus* or phieco32virus* or phietavirus* or phifelvirus* or phijl1virus* or phikmvvirus* or phikzvirus* or phipapillomavirus* or phix174microvirus* or phlebovirus* or phytoreovirus* or picobirnavirus* or pidchovirus* or pipapillomavirus* or pipefishvirus* or pis4avirus* or piscihepevirus* or planidovirus* or plasmavirus* or platypuvirus* or plectrovirus* or plotvirus* or poacevirus* or pocjvirus* or polemovirus* or polerovirus* or polyomavirus* or pomovirus* or porprismacovirus* or potamipivirus* or potexvirus* or potyvirus* or pradovirus* or prasinovirus* or pregotovirus* or proboscivirus* or prosimiispumavirus* or protobacilladnavirus* or protoparvovirus* or prtbvirus* or prunevirus* or prymnesiovirus* or psavirus* or pseudovirus* or psimunavirus* or psipapillomavirus* or quadrivirus* or quaranjavirus* or r4virus* or rabovirus* or ranavirus* or raphidovirus* or rb49virus* or rb69virus* or rdjlvirus* or redivirus* or renitovirus* or reovirus* or reptarenavirus* or rer2virus* or respirovirus* or retrovirus* or reyvirus* or rhadinovirus* or rheph4virus* or rhinacovirus* or rhinovirus* or rhizidiovirus* or rhopapillomavirus* or robigovirus* or rogue1virus* or rosadnavirus* or rosavirus* or rosebushvirus* or roseolovirus* or rotavirus* or roymovirus* or rsl2virus* or rslunavirus* or rtpvirus* or rubivirus* or rubulavirus* or rudivirus* or rymovirus* or s16virus* or sadwavirus* or saetivirus* or sakobuvirus* or salivirus* or salmonivirus* or salterprovirus* or sap6virus* or sapelovirus* or sapovirus* or sarbecovirus* or schizot4virus* or sclerodarnavirus* or sclerotimonavirus* or scutavirus* or se1virus* or seadornavirus* or sectovirus* or secunda5virus* or semotivirus* or send513virus* or senecavirus* or senegalvirus* or sep1virus* or septima3virus* or sequivirus* or setracovirus* or seuratvirus* or sextaecvirus* or sfi11virus* or sfi21dt1virus* or shanbavirus* or shangavirus* or shaspivirus* or sheartevirus* or siadenovirus* or sicinivirus* or sigmapapillomavirus* or sigmavirus* or silviavirus* or simiispumavirus* or simplexvirus* or sinaivirus* or sirevirus* or sitaravirus* or sk1virus* or slashvirus* or smoothievirus* or sobemovirus* or socyvirus* or solendovirus* or sopolycivirus* or soupsvirus* or soymovirus* or sp18virus* or sp31virus* or sp58virus* or sp6virus* or spbetavirus* or spiromicrovirus* or spn3virus* or spo1virus* or sprivivirus* or sputnikvirus* or sripuvirus* or ssp2virus* or striwavirus* or suipoxvirus* or sunshinevirus* or suspvirus* or svunavirus* or t1virus* or t4virus* or t5virus* or t7virus* or tankvirus* or tapwovirus* or taupapillomavirus* or tegacovirus* or tenuivirus* or tepovirus* or teschovirus* or tetraparvovirus* or tg1virus* or thetaarterivirus* or thetapapillomavirus* or thetatorquevirus* or thogotovirus* or thottimvirus* or tibrovirus* or tilapinevirus* or tin2virus* or tipravirus* or tiruvirus* or titanvirus* or tl2011virus* or tlsvirus* or tm4virus* or tobamovirus* or tobravirus* or tombusvirus* or topocuvirus* or torchivirus* or torovirus* or torradovirus* or tospovirus* or totivirus* or toursvirus* or tp21virus* or tp84virus* or treisdeltapapillomavirus* or treisepsilonpapillomavirus* or treisetapapillomavirus* or treisiotapapillomavirus* or treiskappapapillomavirus* or treisthetapapillomavirus* or treiszetapapillomavirus* or tremovirus* or triatovirus* or triavirus* or trichomonasvirus* or trichovirus* or trigintaduovirus* or tritimovirus* or tsarbombavirus* or tungrovirus* or tunisvirus* or tupavirus* or turncurtovirus* or turrinivirus* or twortvirus* or tymovirus* or umbravirus* or una4virus* or una961virus* or upsilonpapillomavirus* or v5virus* or varicellovirus* or varicosavirus* or vegasvirus* or velarivirus* or vendettavirus* or vesiculovirus* or vesivirus* or vespertiliovirus* or vhmlvirus* or vi1virus* or victorivirus* or virtovirus* or virus* or vitivirus* or vp5virus* or waikavirus* or wbetavirus* or wenilivirus* or whispovirus* or wildcatvirus* or wizardvirus* or woesvirus* or wphvirus* or wubeivirus* or wuhivirus* or wumivirus* or xipapillomavirus* or xp10virus* or yatapoxvirus* or ydn12virus* or yingvirus* or yuavirus* or yuyuevirus* or zeavirus* or zetaarterivirus* or zetapapillomavirus* or zetatorquevirus*).mp.

11. ("2019 ncov" or "2019nCoV" or "covid 19" or "severe acute respiratory syndrome coronavirus 2" or "sars cov 2").mp.
12. or/7-11
13. 6 and 12
14. (schedul* or timetable* or waiting or appointment? or e-mail or telephone? or electronic mail).tw,kw.
15. (triage or triaging or self-triage or screening or telescreening or tele-screen* or remote or telephone*).tw,kw.
16. (pre-arrival or remote* or check-in or checked in).tw,kw.
17. (visitor? or bathroom? or tele-health or telehealth or videoconf* or video-conf*).tw,kw.
18. exp "Appointments and Schedules"/ or exp Triage/ or exp Telephone/ or exp Electronic Mail/ or exp Videoconferencing/ or exp Telemedicine/
19. or/14-18
20. 13 and 19
21. meta-analysis.pt.
22. meta-analysis/ or systematic review/ or meta-analysis as topic/ or "meta analysis (topic)"/ or "systematic review (topic)"/ or exp technology assessment, biomedical/
23. ((systematic* adj3 (review* or overview*)) or (methodologic* adj3 (review* or overview*))).ti,ab,kw.

24. ((quantitative adj3 (review* or overview* or synthes*)) or (research adj3 (integrati* or overview*))).ti,ab,kw.
25. ((integrative adj3 (review* or overview*)) or (collaborative adj3 (review* or overview*)) or (pool* adj3 analy*)).ti,ab,kf,kw.
26. (data synthes* or data extraction* or data abstraction*).ti,ab,kf,kw.
27. (handsearch* or hand search*).ti,ab,kf,kw.
28. (mantel haenszel or peto or der simonian or dersimonian or fixed effect* or latin square*).ti,ab,kf,kw.
29. (met analy* or metanaly* or technology assessment* or HTA or HTAs or technology overview* or technology appraisal*).ti,ab,kf,kw.
30. (meta regression* or metaregression*).ti,ab,kf,kw.
31. (meta-analy* or metaanaly* or systematic review* or biomedical technology assessment* or bio-medical technology assessment*).mp,hw.
32. (medline or cochrane or pubmed or medlars or embase or cinahl).ti,ab,hw.
33. (cochrane or (health adj2 technology assessment) or evidence report).jw.
34. (comparative adj3 (efficacy or effectiveness)).ti,ab,kf,kw.
35. (outcomes research or relative effectiveness).ti,ab,kf,kw.
36. ((indirect or indirect treatment or mixed-treatment) adj comparison*).ti,ab,kf,kw.
37. or/21-36
38. (Randomized Controlled Trial or Controlled Clinical Trial or Pragmatic Clinical Trial or Equivalence Trial or Clinical Trial, Phase III).pt.
39. Randomized Controlled Trial/
40. exp Randomized Controlled Trials as Topic/
41. "Randomized Controlled Trial (topic)"/
42. Controlled Clinical Trial/ or exp Controlled Clinical Trials as Topic/ or "Controlled Clinical Trial (topic)"/ or Randomization/ or Random Allocation/ or Double-Blind Method/ or Double Blind Procedure/ or Double-Blind Studies/ or Single-Blind Method/ or Single Blind Procedure/ or Single-Blind Studies/ or Placebos/ or Placebo/ or Control Groups/ or Control Group/
43. (random* or sham or placebo*).ti,ab,hw,kf,kw.
44. ((singl* or doubl*) adj (blind* or dumm* or mask*)).ti,ab,hw,kf,kw.
45. ((tripl* or trebl*) adj (blind* or dumm* or mask*)).ti,ab,hw,kf,kw. 46. (control* adj3 (study or studies or trial* or group*)).ti,ab,kf,kw. 47. (Nonrandom* or non random* or non-random* or quasi-random* or quasirandom*).ti,ab,hw,kw.
48. allocated.ti,ab,hw.
49. ((open label or open-label) adj5 (study or studies or trial*)).ti,ab,hw,kw.
50. ((equivalence or superiority or non-inferiority or noninferiority) adj3 (study or studies or trial*)).ti,ab,hw,kw.
51. (pragmatic study or pragmatic studies).ti,ab,hw,kw.
52. ((pragmatic or practical) adj3 trial*).ti,ab,hw,kw.
53. ((quasiexperimental or quasi-experimental) adj3 (study or studies or trial*)).ti,ab,hw,kw.
54. (phase adj3 (III or "3") adj3 (study or studies or trial*)).ti,hw,kw.
55. or/38-54
56. Epidemiologic Studies/ or exp Case Control Studies/ or exp Cohort Studies/
57. (case control or (cohort adj (study or studies)) or cohort analy$ or (follow up adj (study or studies)) or longitudinal or retrospective or cross sectional).tw.
58. Cross-Sectional Studies/
59. or/56-58
60. 37 or 55 or 59
61. 6 and 12 and 19 and 60
62. 20 not 61
63. limit 62 to last 25 years

Key area D/E

1. exp Personal Protective Equipment/
2. (PPE or ((personal or respiratory) adj1 protective equipment)).tw,kf.
3. ((face or mouth or surgical or membrane) adj3 (mask? or guard? or piece? or protector? or protection or mouthpiece? or shield? or respirator?)).tw,kf.
4. (gas mask? or gasmask? or mouthpiece? or facemask?).tw,kf.
5. ((air-purifying or industrial or protective) adj3 respirator?).tw,kf.
6. ((safety adj1 (glasses or lenses)) or goggles).tw,kf.
7. ((eye or mouth or head or clothing or gear) adj3 protect*).tw,kf.
8. (scrubs or gown? or glove?).tw,kf.
9. (N95 or visor?).tw,kf.
10. space suit?.tw,kf.
11. infection control.tw,kf.
12. pc.fs.
13. or/1-12
14. exp Stomatognathic Diseases/
15. exp Dentistry/
16. exp Oral Health/
17. exp Dental Facilities/
18. (dentist* or endodont* or orthodonti* or periodont* or prosthodont* or apicoectom* or gingivectom* or gingivoplast* or glossectom* or "mandibular advancement" or alveolectom* or alveoloplast* or vestibuloplast* or "root canal" or oral or oropharyng* or temporomandibular or TMJ or jaw or jaws or mandibular or maxillofacial or mandible* or maxilla* or "alveolar ridge" or dental or orthognathic or tooth or teeth or occlusion or malocclusion or mal-occlusion or odontolog* or tongue* or glossal or buccal or palatal or palate or palates or labial or lip or lips or gingiva* or gingiviti*).tw,kf.
19. or/14-18
20. 13 and 19
21. exp Viruses/
22. exp Virus Diseases/
23. (viridae or COVID-19 or AIDS or HIV or ebola or zika or "west nile" or shingles or SARS or MERS or chickenpox or smallpox or Chikungunya or epstein-barr or erythema or exanthum or influenza? or flu or HFMD or "heartland virus" or HFRS or hepatitis or herpes or cmeasles or mumps or "nipah virus" or Poliomyelitis or yersiniosis or rubella or salmonellosis or rabies).tw,kf.
24. (aalivirus* or ab18virus* or abouovirus* or abyssovirus* or acadianvirus* or ag3virus* or agatevirus* or agrican357virus* or aichivirus* or albetovirus* or alefpapillomavirus* or alfamovirus* or allexivirus* or allolevivirus* or almendravirus* or alpha3microvirus* or alphaabyssovirus* or alphaarterivirus* or alphabaculovirus* or alphacarmotetravirus* or alphacarmovirus* or alphacoronavirus* or alphaendornavirus* or alphaentomopoxvirus* or alphafusellovirus* or

alphaguttavirus* or alphaherpesvirus* or alphainfluenzavirus* or alphaletovirus* or alphamesonivirus* or alphamononivirus* or alphanecrovirus* or alphanodavirus* or alphanudivirus* or alphapapillomavirus* or alphapartitivirus* or alphapermutotetravirus* or alphapleolipovirus* or alphapolyomavirus* or alphaportoglobovirus* or alpharetrovirus* or alphasphaerolipovirus* or alphaspiravirus* or alphatectivirus* or alphatorquevirus* or alphatristromavirus* or alphaturrivirus* or alphavirus* or amalgavirus* or ambidensovirus* or amdoparvovirus* or amigovirus* or ampelovirus* or ampivirus* or ampobartevirus* or ampullavirus* or anatolevirus* or andecovirus* or andromedavirus* or anphevirus* or anulavirus* or ap22virus* or aparavirus* or aphthovirus* or aplyccavirus* or aquabirnavirus* or aquamavirus* or aquaparamyxovirus* or aquareovirus* or arlivirus* or arv1virus* or ascovirus* or asfivirus* or atadenovirus* or attisvirus* or aumaivirus* or aureusvirus* or aurivirus* or avastrovirus* or avenavirus* or aveparvovirus* or aviadenovirus* or avibirnavirus* or avihepadnavirus* or avihepatovirus* or avipoxvirus* or avisivirus* or avulavirus* or b4virus* or babuvirus* or bacillarnavirus* or badnavirus* or bafinivirus* or balbicanovirus* or banyangvirus* or barnavirus* or barnyardvirus* or bastillevirus* or batrachovirus* or baxtervirus* or bc431virus* or bcep22virus* or bcep78virus* or bcepmuvirus* or bdellomicrovirus* or becurtovirus* or begomovirus* or behecravirus* or beidivirus* or benyvirus* or berhavirus* or bernal13virus* or betaarterivirus* or betabaculovirus* or betacarmovirus* or betacoronavirus* or betaendornavirus* or betaentomopoxvirus* or betafusellovirus* or betaguttavirus* or betaherpesvirus* or betainfluenzavirus* or betalipothrixvirus* or betanecrovirus* or betanodavirus* or betanudivirus* or betapapillomavirus* or betapartitivirus* or betapleolipovirus* or betapolyomavirus* or betaretrovirus* or betasphaerolipovirus* or betatectivirus* or betatetravirus* or betatorquevirus* or beturrivirus* or bevemovirus* or bicaudavirus* or bidensovirus* or bignuzvirus* or biquartavirus* or biseptimavirus* or blosnavirus* or blunervirus* or bocaparvovirus* or bolenivirus* or bongovirus* or bopivirus* or bostovirus* or botrexvirus* or botybirnavirus* or bovismacovirus* or bovispumavirus* or bpp1virus* or bracovirus* or brambyvirus* or brevidensovirus* or bromovirus* or bronvirus* or brujitavirus* or buldecovirus* or buttersvirus* or bxz1virus* or bymovirus* or c2virus* or c5virus* or cadicivirus* or cafeteriavirus* or calicivirus* or camvirus* or capillovirus* or capripoxvirus* or capulavirus* or carbovirus* or cardiovirus* or cardoreovirus* or carlavirus* or casualivirus* or caulimovirus* or cavemovirus* or cba120virus* or cba181virus* or cba41virus* or cbastvirus* or cc31virus* or cd119virus* or cecivirus* or cegacovirus* or centapoxvirus* or cervidpoxvirus* or charlievirus* or charybnivirus* or che8virus* or che9cvirus* or cheravirus* or chibartevirus* or chipapillomavirus* or chipolycivirus* or chivirus* or chlamydiamicrovirus* or chloriridovirus* or chlorovirus* or chordovirus* or chrysovirus* or cilevirus* or circovirus* or citrivirus* or cjw1virus* or clavavirus* or closterovirus* or coccolithovirus* or colacovirus* or coltivirus* or comovirus* or coopervirus* or copiparvovirus* or corndogvirus* or coronavirus* or corticovirus* or cosavirus* or cosmacovirus* or cp1virus* or cp220virus* or cp51virus* or cp8virus* or cr3virus* or cradenivirus* or crinivirus* or cripavirus* or crocodylidpoxvirus* or crohivirus* or cronusvirus* or crustavirus* or cryspovirus* or cucumovirus* or cuevavirus* or curiovirus* or curtovirus* or cvm10virus* or cyclovirus* or cypovirus* or cyprinivirus* or cystovirus* or cytomegalovirus* or cytorhabdovirus* or d3112virus* or d3virus* or debiartevirus* or decacovirus* or decronivirus* or decurrovirus* or deltaarterivirus* or deltabaculovirus* or deltacoronavirus* or deltaflexivirus* or deltainfluenzavirus* or deltalipothrixvirus* or deltapapillomavirus* or deltapartitivirus* or deltapolyomavirus* or deltaretrovirus* or deltatorquevirus* or deltavirus* or demosthenesvirus* or densovirus* or dependoparvovirus* or dfl12virus* or dianthovirus* or diatodnavirus* or dichorhavirus* or dicipivirus* or dinodnavirus* or dinornavirus* or dinovernavirus* or divavirus* or doucettevirus* or dragsmacovirus* or drosmacovirus* or drosmacovirus*2 or dumedivirus* or duvinacovirus* or dyochipapillomavirus* or dyodeltapapillomavirus* or dyoepsilonpapillomavirus* or dyoetapapillomavirus* or dyoiotapapillomavirus* or dyokappapapillomavirus* or dyolambdapapillomavirus* or dyomupapillomavirus* or dyonupapillomavirus* or dyoomegapapillomavirus* or dyoomikronpapillomavirus* or dyophipapillomavirus* or dyopipapillomavirus* or dyopsipapillomavirus* or dyorhopapillomavirus* or dyosigmapapillomavirus* or dyotaupapillomavirus* or dyothetapapillomavirus* or dyoupsilonpapillomavirus* or dyoxipapillomavirus* or dyozetapapillomavirus* or e125virus* or ea214virus* or ea92virus* or eah2virus* or ebolavirus* or eiauvirus* or elvirus* or emaravirus* or embecovirus* or enamovirus* or enselivirus* or enterovirus* or entomobirnavirus* or entomopoxvirus* or ephemerovirus* or epsilon15virus* or epsilonarterivirus* or epsilonpapillomavirus* or epsilonretrovirus* or epsilontorquevirus* or equispumavirus* or eragrovirus* or erbovirus* or errantivirus* or erythroparvovirus* or etaarterivirus* or etapapillomavirus* or etatorquevirus* or eurpobartevirus* or f116virus* or fabavirus* or felispumavirus* or felixo1virus* or feravirus* or ferlavirus* or ff47virus* or fibrovirus* or fijivirus* or fishburnevirus* or flavivirus* or foveavirus* or fri1virus* or furovirus* or g4microvirus* or g7cvirus* or gaiavirus* or gallantivirus* or gallivirus* or gammaarterivirus* or gammabaculovirus* or gammacarmovirus* or gammacoronavirus* or gammaentomopoxvirus* or gammaherpesvirus* or gammainfluenzavirus* or gammalipothrixvirus* or gammapapillomavirus* or gammapartitivirus* or gammapleolipovirus* or gammapolyomavirus* or gammaretrovirus* or gammasphaerolipovirus* or gammatorquevirus* or gemycircularvirus* or gemyduguivirus* or gemygorvirus* or gemykibivirus* or gemykolovirus* or gemykrogvirus* or gemykroznavirus* or gemytondvirus* or gemyvongvirus* or giardiavirus* or gilesvirus* or globulovirus* or glossinavirus* or goravirus* or gordonvirus* or gordtnkvirus* or goukovirus* or grablovirus* or granulovirus* or gyrovirus* or habenivirus* or hanalivirus* or hapavirus* or hapunavirus* or harkavirus* or harrisonvirus* or hartmanivirus* or hawkeyevirus* or hedartevirus* or hemivirus* or henipavirus* or hepacivirus* or hepandensovirus* or hepatovirus* or herbevirus* or herdecovirus* or herpesvirus* or hibecovirus* or higrevirus* or hk578virus* or hk97virus* or hordeivirus* or horwuvirus* or hp1virus* or hubavirus* or huchismacovirus* or hudivirus* or hudovirus* or hunnivirus* or hupolycivirus* or hypovirus* or hytrovirus* or ichnovirus* or ichtadenovirus* or ictalurivirus* or idaeovirus* or idnoreovirus* or iflavirus* or igacovirus* or ilarvirus* or iltovirus* or infratovirus* or inovirus* or inshuvirus* or invictavirus* or iotaarterivirus* or iotapapillomavirus* or iotatorquevirus* or ipomovirus* or iridovirus* or isavirus* or iteradensovirus* or jd18virus* or jenstvirus* or jerseyvirus* or jimmervirus* or jonvirus* or js98virus* or jwalphavirus* or jwxvirus* or k1gvirus* or kadilivirus* or kaftartevirus* or kappaarterivirus* or kappapapillomavirus* or kappatorquevirus* or karsalivirus* or kayvirus* or kelleziovirus* or kf1virus* or kieseladnavirus* or kigiartevirus* or kobuvirus* or korravirus* or kp15virus* or kp32virus* or kp34virus* or kp36virus* or kpp10virus* or kpp25virus* or kunsagivirus* or l5virus* or labyrnavirus* or lagovirus* or lambdaarterivirus* or lambdapapillomavirus* or lambdatorquevirus* or lambdavirus* or laroyevirus* or lausannevirus* or ledantevirus* or leishmaniavirus* or lentivirus* or leporipoxvirus* or letovirus* or levivirus* or liefievirus* or likavirus* or limestonevirus* or limnipivirus* or lincruvirus* or lineavirus* or lit1virus* or lmd1virus* or loanvirus* or lolavirus* or luchacovirus* or luteovirus* or luz24virus* or luz7virus* or lymphocryptovirus* or lymphocystivirus* or lyssavirus* or m12virus* or macanavirus* or macavirus* or machinavirus* or machlomovirus* or macluravirus* or macronovirus* or maculavirus* or mamastrovirus* or mammarenavirus* or mandarivirus* or marafivirus* or marburgvirus* or mardivirus* or marnavirus* or marseillevirus* or marthavirus* or marvinvirus* or mastadenovirus* or mastrevirus* or mavirus* or megabirnavirus* or megalocytivirus* or megrivirus* or menolivirus* or merbecovirus* or metapneumovirus* or metavirus* or milecovirus* or mimivirus* or mimoreovirus* or minacovirus* or minunacovirus* or mischivirus* or mitartevirus* or mitovirus* or mivirus* or mobatvirus* or mobuvirus* or molluscipoxvirus* or moogievirus* or moonvirus* or moordecovirus* or morbillivirus* or mosavirus* or msw3virus* or muarterivirus* or mudcatvirus* or mupapillomavirus* or muromegalovirus* or muscavirus* or muvirus* or mycoflexivirus* or mycoreovirus* or myohalovirus* or myotacovirus* or n15virus* or n4virus* or namcalivirus* or nanovirus* or narnavirus* or nebovirus* or nepovirus* or nidovirus* or nit1virus* or nobecovirus* or nona33virus* or nonagvirus* or nonanavirus* or norovirus* or novirhabdovirus* or np1virus* or nucleopolyhedrovirus* or nucleorhabdovirus* or nudivirus* or nupapillomavirus* or nyavirus* or nyctacovirus* or nyfulvavirus* or nymphadoravirus* or ofalivirus* or okavirus* or oleavirus* or omegapapillomavirus* or omegatetravirus* or omegavirus* or omikronpapillomavirus* or oncotshavirus* or oncovirus* or ophiovirus* or orbivirus* or orinovirus* or orivirus* or orthobornavirus* or orthobunyavirus* or orthohantavirus* or orthohepadnavirus* or orthohepevirus* or orthonairovirus* or orthophasmavirus* or orthopneumovirus* or orthopoxvirus* or orthoreovirus* or oryzavirus* or oscivirus* or ostreavirus* or ourmiavirus* or p100virus* or p12002virus* or p12024virus* or p1virus* or p22virus* or p23virus* or p2virus* or p68virus* or p70virus* or pa6virus* or pagevirus* or paguronivirus* or pakpunavirus* or pamx74virus* or panicovirus* or papanivirus* or parapoxvirus* or parechovirus* or partitivirus* or pasivirus* or passerivirus* or patiencevirus* or pbi1virus* or pbunavirus* or pecluvirus* or pedacovirus* or pedartevirus* or pegivirus* or pelarspovirus* or penstyldensovirus* or pepy6virus* or percavirus* or perhabdovirus* or peropuvirus* or pestivirus* or petuvirus* or pfr1virus* or pg1virus* or phaeovirus* or phasivirus* or phayoncevirus* or phi29virus* or phic31virus* or phicbkvirus* or phieco32virus* or phietavirus* or phifelvirus* or phijl1virus* or phikmvvirus* or phikzvirus* or phipapillomavirus* or phix174microvirus* or phlebovirus* or phytoreovirus* or picobirnavirus* or pidchovirus* or pipapillomavirus* or pipefishvirus* or pis4avirus* or piscihepevirus* or planidovirus* or plasmavirus* or platypuvirus* or plectrovirus* or plotvirus* or poacevirus* or pocjvirus* or polemovirus* or polerovirus* or polyomavirus* or pomovirus* or porprismacovirus* or potamipivirus* or potexvirus* or potyvirus* or pradovirus* or prasinovirus* or pregotovirus* or proboscivirus* or prosimiispumavirus* or protobacilladnavirus* or protoparvovirus* or prtbvirus* or prunevirus* or prymnesiovirus* or psavirus* or pseudovirus* or psimunavirus* or psipapillomavirus* or quadrivirus* or quaranjavirus* or r4virus* or rabovirus* or ranavirus* or raphidovirus* or rb49virus* or rb69virus* or rdjlvirus* or redivirus* or renitovirus* or reovirus* or reptarenavirus* or rer2virus* or respirovirus* or retrovirus* or reyvirus* or rhadinovirus* or rheph4virus* or rhinacovirus* or rhinovirus* or rhizidiovirus* or rhopapillomavirus* or robigovirus* or rogue1virus* or rosadnavirus* or

rosavirus* or rosebushvirus* or roseolovirus* or rotavirus* or roymovirus* or rsl2virus* or rslunavirus* or rtpvirus* or rubivirus* or rubulavirus* or rudivirus* or rymovirus* or s16virus* or sadwavirus* or saetivirus* or sakobuvirus* or salivirus* or salmonivirus* or salterprovirus* or sap6virus* or sapelovirus* or sapovirus* or sarbecovirus* or schizot4virus* or sclerodarnavirus* or sclerotimonavirus* or scutavirus* or se1virus* or seadornavirus* or sectovirus* or secunda5virus* or semotivirus* or send513virus* or senecavirus* or senegalvirus* or sep1virus* or septima3virus* or sequivirus* or setracovirus* or seuratvirus* or sextaecvirus* or sfi11virus* or sfi21dt1virus* or shanbavirus* or shangavirus* or shaspivirus* or sheartevirus* or siadenovirus* or sicinivirus* or sigmapapillomavirus* or sigmavirus* or silviavirus* or simiispumavirus* or simplexvirus* or sinaivirus* or sirevirus* or sitaravirus* or sk1virus* or slashvirus* or smoothievirus* or sobemovirus* or socyvirus* or solendovirus* or sopolycivirus* or soupsvirus* or soymovirus* or sp18virus* or sp31virus* or sp58virus* or sp6virus* or spbetavirus* or spiromicrovirus* or spn3virus* or spo1virus* or sprivivirus* or sputnikvirus* or sripuvirus* or ssp2virus* or striwavirus* or suipoxvirus* or sunshinevirus* or suspvirus* or svunavirus* or t1virus* or t4virus* or t5virus* or t7virus* or tankvirus* or tapwovirus* or taupapillomavirus* or tegacovirus* or tenuivirus* or tepovirus* or teschovirus* or tetraparvovirus* or tg1virus* or thetaarterivirus* or thetapapillomavirus* or thetatorquevirus* or thogotovirus* or thottimvirus* or tibrovirus* or tilapinevirus* or tin2virus* or tipravirus* or tiruvirus* or titanvirus* or tl2011virus* or tlsvirus* or tm4virus* or tobamovirus* or tobravirus* or tombusvirus* or topocuvirus* or torchivirus* or torovirus* or torradovirus* or tospovirus* or totivirus* or toursvirus* or tp21virus* or tp84virus* or treisdeltapapillomavirus* or treisepsilonpapillomavirus* or treisetapapillomavirus* or treisiotapapillomavirus* or treiskappapapillomavirus* or treisthetapapillomavirus* or treiszetapapillomavirus* or tremovirus* or triatovirus* or triavirus* or trichomonasvirus* or trichovirus* or trigintaduovirus* or tritimovirus* or tsarbombavirus* or tungrovirus* or tunisvirus* or tupavirus* or turncurtovirus* or turrinivirus* or twortvirus* or tymovirus* or umbravirus* or una4virus* or una961virus* or upsilonpapillomavirus* or v5virus* or varicellovirus* or varicosavirus* or vegasvirus* or velarivirus* or vendettavirus* or vesiculovirus* or vesivirus* or vespertiliovirus* or vhmlvirus* or vi1virus* or victorivirus* or virtovirus* or virus* or vitivirus* or vp5virus* or waikavirus* or wbetavirus* or wenilivirus* or whispovirus* or wildcatvirus* or wizardvirus* or woesvirus* or wphvirus* or wubeivirus* or wuhivirus* or wumivirus* or xipapillomavirus* or xp10virus* or yatapoxvirus* or ydn12virus* or yingvirus* or yuavirus* or yuyuevirus* or zeavirus* or zetaarterivirus* or zetapapillomavirus* or zetatorquevirus*).mp.
25. ("2019 ncov" or "2019nCoV" or "covid 19" or "severe acute respiratory syndrome coronavirus 2" or "sars cov 2").mp.
26. or/21-25
27. 20 and 26
28. or/1-10
29. 19 and 26 and 28
30. limit 29 to last 25 years

Key area F

1. exp Stomatognathic Diseases/
2. exp Dentistry/
3. exp Oral Health/
4. exp Dental Facilities/
5. (dentist* or endodont* or orthodonti* or periodont* or prosthodont* or apicoectom* or gingivectom* or gingivoplast* or glossectom* or "mandibular advancement" or alveolectom* or alveoloplast* or vestibuloplast* or "root canal" or oral or oropharyng* or temporomandibular or TMJ or jaw or jaws or mandibular or maxillofacial or mandible* or maxilla* or "alveolar ridge" or dental or orthognathic or tooth or teeth or occlusion or malocclusion or mal-occlusion or odontolog* or tongue* or glossal or buccal or palatal or palate or palates or labial or lip or lips or gingiva* or gingiviti*).tw,kw.
6. or/1-5
7. exp Viruses/
8. exp Virus Diseases/
9. (viridae or COVID-19 or AIDS or HIV or ebola or zika or "west nile" or shingles or SARS or MERS or chickenpox or smallpox or Chikungunya or epstein-barr or erythema or exanthum or influenza? or flu or HFMD or "heartland virus" or HFRS or hepatitis or herpes or cmeasles or mumps or "nipah virus" or Poliomyelitis or yersiniosis or rubella or salmonellosis or rabies).tw,kw.
10. (aalivirus* or ab18virus* or abouovirus* or abyssovirus* or acadianvirus* or ag3virus* or agatevirus* or agrican357virus* or aichivirus* or albetovirus* or alefpapillomavirus* or alfamovirus* or allexivirus* or allolevivirus* or almendravirus* or alpha3microvirus* or alphaabyssovirus* or alphaarterivirus* or alphabaculovirus* or alphacarmotetravirus* or alphacarmovirus* or alphacoronavirus* or alphaendornavirus* or alphaentomopoxvirus* or alphafusellovirus* or alphaguttavirus* or alphaherpesvirus* or alphainfluenzavirus* or alphaletovirus* or alphamesonivirus* or alphamononivirus* or alphanecrovirus* or alphanodavirus* or alphanudivirus* or alphapapillomavirus* or alphapartitivirus* or alphapermutotetravirus* or alphapleolipovirus* or alphapolyomavirus* or alphaportoglobovirus* or alpharetrovirus* or alphasphaerolipovirus* or alphaspiravirus* or alphatectivirus* or alphatorquevirus* or alphatristromavirus* or alphaturrivirus* or alphavirus* or amalgavirus* or ambidensovirus* or amdoparvovirus* or amigovirus* or ampelovirus* or ampivirus* or ampobartevirus* or ampullavirus* or anatolevirus* or andecovirus* or andromedavirus* or anphevirus* or anulavirus* or ap22virus* or aparavirus* or aphthovirus* or aplyccavirus* or aquabirnavirus* or aquamavirus* or aquaparamyxovirus* or aquareovirus* or arlivirus* or arv1virus* or ascovirus* or asfivirus* or atadenovirus* or attisvirus* or aumaivirus* or aureusvirus* or aurivirus* or avastrovirus* or avenavirus* or aveparvovirus* or aviadenovirus* or avibirnavirus* or avihepadnavirus* or avihepatovirus* or avipoxvirus* or avisivirus* or avulavirus* or b4virus* or babuvirus* or bacillarnavirus* or badnavirus* or bafinivirus* or balbicanovirus* or banyangvirus* or barnavirus* or barnyardvirus* or bastillevirus* or batrachovirus* or baxtervirus* or bc431virus* or bcep22virus* or bcep78virus* or bcepmuvirus* or bdellomicrovirus* or becurtovirus* or begomovirus* or behecravirus* or beidivirus* or benyvirus* or berhavirus* or bernal13virus* or betaarterivirus* or betabaculovirus* or betacarmovirus* or betacoronavirus* or betaendornavirus* or betaentomopoxvirus* or betafusellovirus* or betaguttavirus* or betaherpesvirus* or betainfluenzavirus* or betalipothrixvirus* or betanecrovirus* or betanodavirus* or betanudivirus* or betapapillomavirus* or betapartitivirus* or betapleolipovirus* or betapolyomavirus* or betaretrovirus* or betasphaerolipovirus* or betatectivirus* or betatetravirus* or betatorquevirus* or beturrivirus* or bevemovirus* or bicaudavirus* or bidensovirus* or bignuzvirus* or biquartavirus* or biseptimavirus* or blosnavirus* or blunervirus* or bocaparvovirus* or bolenivirus* or bongovirus* or bopivirus* or bostovirus* or botrexvirus* or botybirnavirus* or bovismacovirus* or bovispumavirus* or bpp1virus* or bracovirus* or brambyvirus* or brevidensovirus* or bromovirus* or bronvirus* or brujitavirus* or buldecovirus* or buttersvirus* or bxz1virus* or bymovirus* or c2virus* or c5virus* or cadicivirus* or cafeteriavirus* or calicivirus* or camvirus* or capillovirus* or capripoxvirus* or capulavirus* or carbovirus* or cardiovirus* or cardoreovirus* or carlavirus* or casualivirus* or caulimovirus* or cavemovirus* or cba120virus* or cba181virus* or cba41virus* or cbastvirus* or cc31virus* or cd119virus* or cecivirus* or cegacovirus* or centapoxvirus* or cervidpoxvirus* or charlievirus* or charybnivirus* or che8virus* or che9cvirus* or cheravirus* or chibartevirus* or chipapillomavirus* or chipolycivirus* or chivirus* or chlamydiamicrovirus* or chloriridovirus* or chlorovirus* or chordovirus* or chrysovirus* or cilevirus* or circovirus* or citrivirus* or cjw1virus* or clavavirus* or closterovirus* or coccolithovirus* or colacovirus* or coltivirus* or comovirus* or coopervirus* or copiparvovirus* or corndogvirus* or coronavirus* or corticovirus* or cosavirus* or cosmacovirus* or cp1virus* or cp220virus* or cp51virus* or cp8virus* or cr3virus* or cradenivirus* or crinivirus* or cripavirus* or crocodylidpoxvirus* or crohivirus* or cronusvirus* or crustavirus* or cryspovirus* or cucumovirus* or cuevavirus* or curiovirus* or curtovirus* or cvm10virus* or cyclovirus* or cypovirus* or cyprinivirus* or cystovirus* or cytomegalovirus* or cytorhabdovirus* or d3112virus* or d3virus* or debiartevirus* or decacovirus* or decronivirus* or decurrovirus* or deltaarterivirus* or deltabaculovirus* or deltacoronavirus* or deltaflexivirus* or deltainfluenzavirus* or deltalipothrixvirus* or deltapapillomavirus* or deltapartitivirus* or deltapolyomavirus* or deltaretrovirus* or deltatorquevirus* or deltavirus* or demosthenesvirus* or densovirus* or dependoparvovirus* or dfl12virus* or dianthovirus* or diatodnavirus* or dichorhavirus* or dicipivirus* or dinodnavirus* or dinornavirus* or dinovernavirus* or divavirus* or doucettevirus* or dragsmacovirus* or drosmacovirus* or drosmacovirus*2 or dumedivirus* or duvinacovirus* or dyochipapillomavirus* or dyodeltapapillomavirus* or dyoepsilonpapillomavirus* or dyoetapapillomavirus* or dyoiotapapillomavirus* or dyokappapapillomavirus* or dyolambdapapillomavirus* or dyomupapillomavirus* or dyonupapillomavirus* or dyoomegapapillomavirus* or dyoomikronpapillomavirus* or dyophipapillomavirus*

or dyopipapillomavirus* or dyopsipapillomavirus* or dyorhopapillomavirus* or dyosigmapapillomavirus* or dyotaupapillomavirus* or dyothetapapillomavirus* or dyoupsilonpapillomavirus* or dyoxipapillomavirus* or dyozetapapillomavirus* or e125virus* or ea214virus* or ea92virus* or eah2virus* or ebolavirus* or eiauvirus* or elvirus* or emaravirus* or embecovirus* or enamovirus* or enselivirus* or enterovirus* or entomobirnavirus* or entomopoxvirus* or ephemerovirus* or epsilon15virus* or epsilonarterivirus* or epsilonpapillomavirus* or epsilonretrovirus* or epsilontorquevirus* or equispumavirus* or eragrovirus* or erbovirus* or errantivirus* or erythroparvovirus* or etaarterivirus* or etapapillomavirus* or etatorquevirus* or eurpobartevirus* or f116virus* or fabavirus* or felispumavirus* or felixo1virus* or feravirus* or ferlavirus* or ff47virus* or fibrovirus* or fijivirus* or fishburnevirus* or flavivirus* or foveavirus* or fri1virus* or furovirus* or g4microvirus* or g7cvirus* or gaiavirus* or gallantivirus* or gallivirus* or gammaarterivirus* or gammabaculovirus* or gammacarmovirus* or gammacoronavirus* or gammaentomopoxvirus* or gammaherpesvirus* or gammainfluenzavirus* or gammalipothrixvirus* or gammapapillomavirus* or gammapartitivirus* or gammapleolipovirus* or gammapolyomavirus* or gammaretrovirus* or gammasphaerolipovirus* or gammatorquevirus* or gemycircularvirus* or gemyduguivirus* or gemygorvirus* or gemykibivirus* or gemykolovirus* or gemykrogvirus* or gemykroznavirus* or gemytondvirus* or gemyvongvirus* or giardiavirus* or gilesvirus* or globulovirus* or glossinavirus* or goravirus* or gordonvirus* or gordtnkvirus* or goukovirus* or grablovirus* or granulovirus* or gyrovirus* or habenivirus* or hanalivirus* or hapavirus* or hapunavirus* or harkavirus* or harrisonvirus* or hartmanivirus* or hawkeyevirus* or hedartevirus* or hemivirus* or henipavirus* or hepacivirus* or hepandensovirus* or hepatovirus* or herbevirus* or herdecovirus* or herpesvirus* or hibecovirus* or higrevirus* or hk578virus* or hk97virus* or hordeivirus* or horwuvirus* or hp1virus* or hubavirus* or huchismacovirus* or hudivirus* or hudovirus* or hunnivirus* or hupolycivirus* or hypovirus* or hytrovirus* or ichnovirus* or ichtadenovirus* or ictalurivirus* or idaeovirus* or idnoreovirus* or iflavirus* or igacovirus* or ilarvirus* or iltovirus* or infratovirus* or inovirus* or inshuvirus* or invictavirus* or iotaarterivirus* or iotapapillomavirus* or iotatorquevirus* or ipomovirus* or iridovirus* or isavirus* or iteradensovirus* or jd18virus* or jenstvirus* or jerseyvirus* or jimmervirus* or jonvirus* or js98virus* or jwalphavirus* or jwxvirus* or k1gvirus* or kadilivirus* or kaftartevirus* or kappaarterivirus* or kappapapillomavirus* or kappatorquevirus* or karsalivirus* or kayvirus* or kelleziovirus* or kf1virus* or kieseladnavirus* or kigiartevirus* or kobuvirus* or korravirus* or kp15virus* or kp32virus* or kp34virus* or kp36virus* or kpp10virus* or kpp25virus* or kunsagivirus* or l5virus* or labyrnavirus* or lagovirus* or lambdaarterivirus* or lambdapapillomavirus* or lambdatorquevirus* or lambdavirus* or laroyevirus* or lausannevirus* or ledantevirus* or leishmaniavirus* or lentivirus* or leporipoxvirus* or letovirus* or levivirus* or liefievirus* or likavirus* or limestonevirus* or limnipivirus* or lincruvirus* or lineavirus* or lit1virus* or lmd1virus* or loanvirus* or lolavirus* or luchacovirus* or luteovirus* or luz24virus* or luz7virus* or lymphocryptovirus* or lymphocystivirus* or lyssavirus* or m12virus* or macanavirus* or macavirus* or machinavirus* or machlomovirus* or macluravirus* or macronovirus* or maculavirus* or mamastrovirus* or mammarenavirus* or mandarivirus* or marafivirus* or marburgvirus* or mardivirus* or marnavirus* or marseillevirus* or marthavirus* or marvinvirus* or mastadenovirus* or mastrevirus* or mavirus* or megabirnavirus* or megalocytivirus* or megrivirus* or menolivirus* or merbecovirus* or metapneumovirus* or metavirus* or milecovirus* or mimivirus* or mimoreovirus* or minacovirus* or minunacovirus* or mischivirus* or mitartevirus* or mitovirus* or mivirus* or mobatvirus* or mobuvirus* or molluscipoxvirus* or mooglevirus* or moonvirus* or moordecovirus* or morbillivirus* or mosavirus* or msw3virus* or muarterivirus* or mudcatvirus* or mupapillomavirus* or muromegalovirus* or muscavirus* or muvirus* or mycoflexivirus* or mycoreovirus* or myohalovirus* or myotacovirus* or n15virus* or n4virus* or namcalivirus* or nanovirus* or narnavirus* or nebovirus* or nepovirus* or nidovirus* or nit1virus* or nobecovirus* or nona33virus* or nonagvirus* or nonanavirus* or norovirus* or novirhabdovirus* or np1virus* or nucleopolyhedrovirus* or nucleorhabdovirus* or nudivirus* or nupapillomavirus* or nyavirus* or nyctacovirus* or nyfulvavirus* or nymphadoravirus* or ofalivirus* or okavirus* or oleavirus* or omegapapillomavirus* or omegatetravirus* or omegavirus* or omikronpapillomavirus* or oncotshavirus* or oncovirus* or ophiovirus* or orbivirus* or orinovirus* or orivirus* or orthobornavirus* or orthobunyavirus* or orthohantavirus* or orthohepadnavirus* or orthohepevirus* or orthonairovirus* or orthophasmavirus* or orthopneumovirus* or orthopoxvirus* or orthoreovirus* or oryzavirus* or oscivirus* or ostreavirus* or ourmiavirus* or p100virus* or p12002virus* or p12024virus* or p1virus* or p22virus* or p23virus* or p2virus* or p68virus* or p70virus* or pa6virus* or pagevirus* or paguronivirus* or pakpunavirus* or pamx74virus* or panicovirus* or papanivirus* or parapoxvirus* or parechovirus* or partitivirus* or pasivirus* or passerivirus* or patiencevirus* or pbi1virus* or pbunavirus* or pecluvirus* or pedacovirus* or pedartevirus* or pegivirus* or pelarspovirus* or penstyldensovirus* or pepy6virus* or percavirus* or perhabdovirus* or peropuvirus* or pestivirus* or petuvirus* or pfr1virus* or pg1virus* or phaeovirus* or phasivirus* or phayoncevirus* or phi29virus* or phic31virus* or phicbkvirus* or phieco32virus* or phietavirus* or phifelvirus* or phijl1virus* or phikmvvirus* or phikzvirus* or phipapillomavirus* or phix174microvirus* or phlebovirus* or phytoreovirus* or picobirnavirus* or pidchovirus* or pipapillomavirus* or pipefishvirus* or pis4avirus* or piscihepevirus* or planidovirus* or plasmavirus* or platypuvirus* or plectrovirus* or plotvirus* or poacevirus* or pocjvirus* or polemovirus* or polerovirus* or polyomavirus* or pomovirus* or porprismacovirus* or potamipivirus* or potexvirus* or potyvirus* or pradovirus* or prasinovirus* or pregotovirus* or proboscivirus* or prosimiispumavirus* or protobacilladnavirus* or protoparvovirus* or prtbvirus* or prunevirus* or prymnesiovirus* or psavirus* or pseudovirus* or psimunavirus* or psipapillomavirus* or quadrivirus* or quaranjavirus* or r4virus* or rabovirus* or ranavirus* or raphidovirus* or rb49virus* or rb69virus* or rdjlvirus* or redivirus* or renitovirus* or reovirus* or reptarenavirus* or rer2virus* or respirovirus* or retrovirus* or reyvirus* or rhadinovirus* or rheph4virus* or rhinacovirus* or rhinovirus* or rhizidiovirus* or rhopapillomavirus* or robigovirus* or rogue1virus* or rosadnavirus* or rosavirus* or rosebushvirus* or roseolovirus* or rotavirus* or roymovirus* or rsl2virus* or rslunavirus* or rtpvirus* or rubivirus* or rubulavirus* or rudivirus* or rymovirus* or s16virus* or sadwavirus* or saetivirus* or sakobuvirus* or salivirus* or salmonivirus* or salterprovirus* or sap6virus* or sapelovirus* or sapovirus* or sarbecovirus* or schizot4virus* or sclerodarnavirus* or sclerotimonavirus* or scutavirus* or se1virus* or seadornavirus* or sectovirus* or secunda5virus* or semotivirus* or send513virus* or senecavirus* or senegalvirus* or sep1virus* or septima3virus* or sequivirus* or setracovirus* or seuratvirus* or sextaecvirus* or sfi11virus* or sfi21dt1virus* or shanbavirus* or shangavirus* or shaspivirus* or sheartevirus* or siadenovirus* or sicinivirus* or sigmapapillomavirus* or sigmavirus* or silviavirus* or simiispumavirus* or simplexvirus* or sinaivirus* or sirevirus* or sitaravirus* or sk1virus* or slashvirus* or smoothievirus* or sobemovirus* or socyvirus* or solendovirus* or sopolycivirus* or soupsvirus* or soymovirus* or sp18virus* or sp31virus* or sp58virus* or sp6virus* or spbetavirus* or spiromicrovirus* or spn3virus* or spo1virus* or sprivivirus* or sputnikvirus* or sripuvirus* or ssp2virus* or striwavirus* or suipoxvirus* or sunshinevirus* or suspvirus* or svunavirus* or t1virus* or t4virus* or t5virus* or t7virus* or tankvirus* or tapwovirus* or taupapillomavirus* or tegacovirus* or tenuivirus* or tepovirus* or teschovirus* or tetraparvovirus* or tg1virus* or thetaarterivirus* or thetapapillomavirus* or thetatorquevirus* or thogotovirus* or thottimvirus* or tibrovirus* or tilapinevirus* or tin2virus* or tipravirus* or tiruvirus* or titanvirus* or tl2011virus* or tlsvirus* or tm4virus* or tobamovirus* or tobravirus* or tombusvirus* or topocuvirus* or torchivirus* or torovirus* or torradovirus* or tospovirus* or totivirus* or toursvirus* or tp21virus* or tp84virus* or treisdeltapapillomavirus* or treisepsilonpapillomavirus* or treisetapapillomavirus* or treisiotapapillomavirus* or treiskappapapillomavirus* or treisthetapapillomavirus* or treiszetapapillomavirus* or tremovirus* or triatovirus* or triavirus* or trichomonasvirus* or trichovirus* or trigintaduovirus* or tritimovirus* or tsarbombavirus* or tungrovirus* or tunisvirus* or tupavirus* or turncurtovirus* or turrinivirus* or twortvirus* or tymovirus* or umbravirus* or una4virus* or una961virus* or upsilonpapillomavirus* or v5virus* or varicellovirus* or varicosavirus* or vegasvirus* or velarivirus* or vendettavirus* or vesiculovirus* or vesivirus* or vespertiliovirus* or vhmlvirus* or vi1virus* or victorivirus* or virtovirus* or virus* or vitivirus* or vp5virus* or waikavirus* or wbetavirus* or wenilivirus* or whispovirus* or wildcatvirus* or wizardvirus* or woesvirus* or wphvirus* or wubeivirus* or wuhivirus* or wumivirus* or xipapillomavirus* or xp10virus* or yatapoxvirus* or ydn12virus* or yingvirus* or yuavirus* or yuyuevirus* or zeavirus* or zetaarterivirus* or zetapapillomavirus* or zetatorquevirus*).mp.

11. ("2019 ncov" or "2019nCoV" or "covid 19" or "severe acute respiratory syndrome coronavirus 2" or "sars cov 2").mp.
12. or/7-11
13. exp Aerosols/
14. (aerosol or aerosols or aerosoli?ation).tw,kw. or bio-aerosol.mp. or bio-aerosols.tw,kw.
15. (droplet? or sneeze? or splatter or AGP).tw,kw.
16. (handpiece? or hand piece? or rotary or scaler? or respirator or respirators or suction? or drill*).tw,kw.
17. 14 or 15 or 16
18. 6 and 12 and 17

Key area G

1 exp Stomatognathic Diseases/
2 exp Dentistry/
3 exp Oral Health/
4 exp Dental Facilities/
5 (dentist* or endodont* or orthodonti* or periodont* or prosthodont* or apicoectom* or gingivectom* or gingivoplast* or glossectom* or "mandibular advancement" or alveolectom* or alveoloplast* or vestibuloplast* or "root canal" or oral or oropharyng* or temporomandibular or TMJ or jaw or jaws or mandibular or maxillofacial or mandible* or maxilla* or "alveolar ridge" or dental or orthognathic or tooth or teeth or occlusion or malocclusion or mal-occlusion or odontolog* or tongue* or glossal or buccal or palatal or palate or palates or labial or lip or lips or gingiva* or gingiviti*).tw,kw.
6 or/1-5
7 Coronaviridae Infections/ or exp Severe Acute Respiratory Syndrome/
8 ("2019 ncov" or "2019nCoV" or "covid 19" or "severe acute respiratory syndrome coronavirus 2" or "sars cov 2").mp.
9 7 or 8
10 meta-analysis.pt.
11 meta-analysis/ or systematic review/ or meta-analysis as topic/ or "meta analysis (topic)"/ or "systematic review (topic)"/ or exp technology assessment, biomedical/
12 ((systematic* adj3 (review* or overview*)) or (methodologic* adj3 (review* or overview*))).ti,ab,kw.
13 ((quantitative adj3 (review* or overview* or synthes*)) or (research adj3 (integrati* or overview*))).ti,ab,kw.
14 ((integrative adj3 (review* or overview*)) or (collaborative adj3 (review* or overview*)) or (pool* adj3 analy*)).ti,ab,kf,kw.
15 (data synthes* or data extraction* or data abstraction*).ti,ab,kf,kw.
16 (handsearch* or hand search*).ti,ab,kf,kw.
17 (mantel haenszel or peto or der simonian or dersimonian or fixed effect* or latin square*).ti,ab,kf,kw.
18 (met analy* or metanaly* or technology assessment* or HTA or HTAs or technology overview* or technology appraisal*).ti,ab,kf,kw.
19 (meta regression* or metaregression*).ti,ab,kf,kw.
20 (meta-analy* or metaanaly* or systematic review* or biomedical technology assessment* or bio-medical technology assessment*).mp,hw.
21 (medline or cochrane or pubmed or medlars or embase or cinahl).ti,ab,hw.
22 (cochrane or (health adj2 technology assessment) or evidence report).jw.
23 (comparative adj3 (efficacy or effectiveness)).ti,ab,kf,kw.
24 (outcomes research or relative effectiveness).ti,ab,kf,kw.
25 ((indirect or indirect treatment or mixed-treatment) adj comparison*).ti,ab,kf,kw.
26 or/10-25
27 (Randomized Controlled Trial or Controlled Clinical Trial or Pragmatic Clinical Trial or Equivalence Trial or Clinical Trial, Phase III).pt.
28 Randomized Controlled Trial/
29 exp Randomized Controlled Trials as Topic/
30 "Randomized Controlled Trial (topic)"/
31 Controlled Clinical Trial/ or exp Controlled Clinical Trials as Topic/ or "Controlled Clinical Trial (topic)"/ or Randomization/ or Random Allocation/ or Double-Blind Method/ or Double Blind Procedure/ or Double-Blind Studies/ or Single-Blind Method/ or Single Blind Procedure/ or Single-Blind Studies/ or Placebos/ or Placebo/ or Control Groups/ or Control Group/
32 (random* or sham or placebo*).ti,ab,hw,kf,kw.
33 ((singl* or doubl*) adj (blind* or dumm* or mask*)).ti,ab,hw,kf,kw.
34 ((tripl* or trebl*) adj (blind* or dumm* or mask*)).ti,ab,hw,kf,kw.
35 (control* adj3 (study or studies or trial* or group*)).ti,ab,kf,kw.
36 (Nonrandom* or non random* or non-random* or quasi-random* or quasirandom*).ti,ab,hw,kw.
37 allocated.ti,ab,hw.
38 ((open label or open-label) adj5 (study or studies or trial*)).ti,ab,hw,kw.
39 ((equivalence or superiority or non-inferiority or noninferiority) adj3 (study or studies or trial*)).ti,ab,hw,kw.
40 (pragmatic study or pragmatic studies).ti,ab,hw,kw.
41 ((pragmatic or practical) adj3 trial*).ti,ab,hw,kw.
42 ((quasiexperimental or quasi-experimental) adj3 (study or studies or trial*)).ti,ab,hw,kw.
43 (phase adj3 (III or "3") adj3 (study or studies or trial*)).ti,hw,kw.
44 or/27-43
45 Epidemiologic Studies/ or exp Case Control Studies/ or exp Cohort Studies/
46 (case control or (cohort adj (study or studies)) or cohort analy$ or (follow up adj (study or studies)) or longitudinal or retrospective or cross sectional).tw.
47 Cross-Sectional Studies/
48 or/45-47
49 26 or 44 or 48
50 pc.fs.
51 exp Infection Control, Dental/
52 (prevent* or control* or mitigat* or minimi?e or reduce or reduction or intervention?).ti,ab.
53 or/50-52
54 6 and 9 and 49 and 53

Key area H

1. exp Stomatognathic Diseases/
2. exp Dentistry/
3. exp Oral Health/
4. exp Dental Facilities/
5. (dentist* or endodont* or orthodonti* or periodont* or prosthodont* or apicoectom* or gingivectom* or gingivoplast* or glossectom* or "mandibular advancement" or alveolectom* or alveoloplast* or vestibuloplast* or "root canal" or oral or oropharyng* or temporomandibular or TMJ or jaw or jaws or mandibular or maxillofacial or mandible* or maxilla* or "alveolar ridge" or dental or orthognathic or tooth or teeth or occlusion or malocclusion or mal-occlusion or odontolog* or tongue* or glossal or buccal or palatal or palate or palates or labial or lip or lips or gingiva* or gingiviti*).tw,kf.
6. or/1-5
7. exp Viruses/

8. exp Virus Diseases/
9. (viridae or COVID-19 or AIDS or HIV or ebola or zika or "west nile" or shingles or SARS or MERS or chickenpox or smallpox or Chikungunya or epstein-barr or erythema or exanthum or influenza? or flu or HFMD or "heartland virus" or HFRS or hepatitis or herpes or cmeasles or mumps or "nipah virus" or Poliomyelitis or yersiniosis or rubella or salmonellosis or rabies).tw,kf.
10. (aalivirus* or ab18virus* or abouovirus* or abyssovirus* or acadianvirus* or ag3virus* or agatevirus* or agrican357virus* or aichivirus* or albetovirus* or alefpapillomavirus* or alfamovirus* or allexivirus* or allolevivirus* or almendravirus* or alpha3microvirus* or alphaabyssovirus* or alphaarterivirus* or alphabaculovirus* or alphacarmotetravirus* or alphacarmovirus* or alphacoronavirus* or alphaendornavirus* or alphaentomopoxvirus* or alphafusellovirus* or alphaguttavirus* or alphaherpesvirus* or alphainfluenzavirus* or alphaletovirus* or alphamesonivirus* or alphamononivirus* or alphanecrovirus* or alphanodavirus* or alphanudivirus* or alphapapillomavirus* or alphapartitivirus* or alphapermutotetravirus* or alphapleolipovirus* or alphapolyomavirus* or alphaportoglobovirus* or alpharetrovirus* or alphasphaerolipovirus* or alphaspiravirus* or alphatectivirus* or alphatorquevirus* or alphatristromavirus* or alphaturrivirus* or alphavirus* or amalgavirus* or ambidensovirus* or amdoparvovirus* or amigovirus* or ampelovirus* or ampivirus* or ampobartevirus* or ampullavirus* or anatolevirus* or andecovirus* or andromedavirus* or anphevirus* or anulavirus* or ap22virus* or aparavirus* or aphthovirus* or aplyccavirus* or aquabirnavirus* or aquamavirus* or aquaparamyxovirus* or aquareovirus* or arlivirus* or arv1virus* or ascovirus* or asfivirus* or atadenovirus* or attisvirus* or aumaivirus* or aureusvirus* or aurivirus* or avastrovirus* or avenavirus* or aveparvovirus* or aviadenovirus* or avibirnavirus* or avihepadnavirus* or avihepatovirus* or avipoxvirus* or avisivirus* or avulavirus* or b4virus* or babuvirus* or bacillarnavirus* or badnavirus* or bafinivirus* or balbicanovirus* or banyangvirus* or barnavirus* or barnyardvirus* or bastillevirus* or batrachovirus* or baxtervirus* or bc431virus* or bcep22virus* or bcep78virus* or bcepmuvirus* or bdellomicrovirus* or becurtovirus* or begomovirus* or behecravirus* or beidivirus* or benyvirus* or berhavirus* or bernal13virus* or betaarterivirus* or betabaculovirus* or betacarmovirus* or betacoronavirus* or betaendornavirus* or betaentomopoxvirus* or betafusellovirus* or betaguttavirus* or betaherpesvirus* or betainfluenzavirus* or betalipothrixvirus* or betanecrovirus* or betanodavirus* or betanudivirus* or betapapillomavirus* or betapartitivirus* or betapleolipovirus* or betapolyomavirus* or betaretrovirus* or betasphaerolipovirus* or betatectivirus* or betatetravirus* or betatorquevirus* or beturrivirus* or bevemovirus* or bicaudavirus* or bidensovirus* or bignuzvirus* or biquartavirus* or biseptimavirus* or blosnavirus* or blunervirus* or bocaparvovirus* or bolenivirus* or bongovirus* or bopivirus* or bostovirus* or botrexvirus* or botybirnavirus* or bovismacovirus* or bovispumavirus* or bpp1virus* or bracovirus* or brambyvirus* or brevidensovirus* or bromovirus* or bronvirus* or brujitavirus* or buldecovirus* or buttersvirus* or bxz1virus* or bymovirus* or c2virus* or c5virus* or cadicivirus* or cafeteriavirus* or calicivirus* or camvirus* or capillovirus* or capripoxvirus* or capulavirus* or carbovirus* or cardiovirus* or cardoreovirus* or carlavirus* or casualivirus* or caulimovirus* or cavemovirus* or cba120virus* or cba181virus* or cba41virus* or cbastvirus* or cc31virus* or cd119virus* or cecivirus* or cegacovirus* or centapoxvirus* or cervidpoxvirus* or charlievirus* or charybnivirus* or che8virus* or che9cvirus* or cheravirus* or chibartevirus* or chipapillomavirus* or chipolycivirus* or chivirus* or chlamydiamicrovirus* or chloriridovirus* or chlorovirus* or chordovirus* or chrysovirus* or cilevirus* or circovirus* or citrivirus* or cjw1virus* or clavavirus* or closterovirus* or coccolithovirus* or colacovirus* or coltivirus* or comovirus* or coopervirus* or copiparvovirus* or corndogvirus* or coronavirus* or corticovirus* or cosavirus* or cosmacovirus* or cp1virus* or cp220virus* or cp51virus* or cp8virus* or cr3virus* or cradenivirus* or crinivirus* or cripavirus* or crocodylidpoxvirus* or crohivirus* or cronusvirus* or crustavirus* or cryspovirus* or cucumovirus* or cuevavirus* or curiovirus* or curtovirus* or cvm10virus* or cyclovirus* or cypovirus* or cyprinivirus* or cystovirus* or cytomegalovirus* or cytorhabdovirus* or d3112virus* or d3virus* or debiartevirus* or decacovirus* or decronivirus* or decurrovirus* or deltaarterivirus* or deltabaculovirus* or deltacoronavirus* or deltaflexivirus* or deltainfluenzavirus* or deltalipothrixvirus* or deltapapillomavirus* or deltapartitivirus* or deltapolyomavirus* or deltaretrovirus* or deltatorquevirus* or deltavirus* or demosthenesvirus* or densovirus* or dependoparvovirus* or dfl12virus* or dianthovirus* or diatodnavirus* or dichorhavirus* or dicipivirus* or dinodnavirus* or dinornavirus* or dinovernavirus* or divavirus* or doucettevirus* or dragsmacovirus* or drosmacovirus* or drosmacovirus*2 or dumedivirus* or duvinacovirus* or dyochipapillomavirus* or dyodeltapapillomavirus* or dyoepsilonpapillomavirus* or dyoetapapillomavirus* or dyoiotapapillomavirus* or dyokappapapillomavirus* or dyolambdapapillomavirus* or dyomupapillomavirus* or dyonupapillomavirus* or dyoomegapapillomavirus* or dyoomikronpapillomavirus* or dyophipapillomavirus* or dyopipapillomavirus* or dyopsipapillomavirus* or dyorhopapillomavirus* or dyosigmapapillomavirus* or dyotaupapillomavirus* or dyothetapapillomavirus* or dyoupsilonpapillomavirus* or dyoxipapillomavirus* or dyozetapapillomavirus* or e125virus* or ea214virus* or ea92virus* or eah2virus* or ebolavirus* or eiauvirus* or elvirus* or emaravirus* or embecovirus* or enamovirus* or enselivirus* or enterovirus* or entomobirnavirus* or entomopoxvirus* or ephemerovirus* or epsilon15virus* or epsilonarterivirus* or epsilonpapillomavirus* or epsilonretrovirus* or epsilontorquevirus* or equispumavirus* or eragrovirus* or erbovirus* or errantivirus* or erythroparvovirus* or etaarterivirus* or etapapillomavirus* or etatorquevirus* or eurpobartevirus* or f116virus* or fabavirus* or felispumavirus* or felixo1virus* or feravirus* or ferlavirus* or ff47virus* or fibrovirus* or fijivirus* or fishburnevirus* or flavivirus* or foveavirus* or fri1virus* or furovirus* or g4microvirus* or g7cvirus* or gaiavirus* or gallantivirus* or gallivirus* or gammaarterivirus* or gammabaculovirus* or gammacarmovirus* or gammacoronavirus* or gammaentomopoxvirus* or gammaherpesvirus* or gammainfluenzavirus* or gammalipothrixvirus* or gammapapillomavirus* or gammapartitivirus* or gammapleolipovirus* or gammapolyomavirus* or gammaretrovirus* or gammasphaerolipovirus* or gammatorquevirus* or gemycircularvirus* or gemyduguivirus* or gemygorvirus* or gemykibivirus* or gemykolovirus* or gemykrogvirus* or gemykroznavirus* or gemytondvirus* or gemyvongvirus* or giardiavirus* or gilesvirus* or globulovirus* or glossinavirus* or goravirus* or gordonvirus* or gordtnkvirus* or goukovirus* or grablovirus* or granulovirus* or gyrovirus* or habenivirus* or hanalivirus* or hapavirus* or hapunavirus* or harkavirus* or harrisonvirus* or hartmanivirus* or hawkeyevirus* or hedartevirus* or hemivirus* or henipavirus* or hepacivirus* or hepandensovirus* or hepatovirus* or herbevirus* or herdecovirus* or herpesvirus* or hibecovirus* or higrevirus* or hk578virus* or hk97virus* or hordeivirus* or horwuvirus* or hp1virus* or hubavirus* or huchismacovirus* or hudivirus* or hudovirus* or hunnivirus* or hupolycivirus* or hypovirus* or hytrovirus* or ichnovirus* or ichtadenovirus* or ictalurivirus* or idaeovirus* or idnoreovirus* or iflavirus* or igacovirus* or ilarvirus* or iltovirus* or infratovirus* or inovirus* or inshuvirus* or invictavirus* or iotaarterivirus* or iotapapillomavirus* or iotatorquevirus* or ipomovirus* or iridovirus* or isavirus* or iteradensovirus* or jd18virus* or jenstvirus* or jerseyvirus* or jimmervirus* or jonvirus* or js98virus* or jwalphavirus* or jwxvirus* or k1gvirus* or kadilivirus* or kaftartevirus* or kappaarterivirus* or kappapapillomavirus* or kappatorquevirus* or karsalivirus* or kayvirus* or kelleziovirus* or kf1virus* or kieseladnavirus* or kigiartevirus* or kobuvirus* or korravirus* or kp15virus* or kp32virus* or kp34virus* or kp36virus* or kpp10virus* or kpp25virus* or kunsagivirus* or l5virus* or labyrnavirus* or lagovirus* or lambdaarterivirus* or lambdapapillomavirus* or lambdatorquevirus* or lambdavirus* or laroyevirus* or lausannevirus* or ledantevirus* or leishmaniavirus* or lentivirus* or leporipoxvirus* or letovirus* or levivirus* or liefievirus* or likavirus* or limestonevirus* or limnipivirus* or lincruvirus* or lineavirus* or lit1virus* or lmd1virus* or loanvirus* or lolavirus* or luchacovirus* or luteovirus* or luz24virus* or luz7virus* or lymphocryptovirus* or lymphocystivirus* or lyssavirus* or m12virus* or macanavirus* or macavirus* or machinavirus* or machlomovirus* or macluravirus* or macronovirus* or maculavirus* or mamastrovirus* or mammarenavirus* or mandarivirus* or marafivirus* or marburgvirus* or mardivirus* or marnavirus* or marseillevirus* or marthavirus* or marvinvirus* or mastadenovirus* or mastrevirus* or mavirus* or megabirnavirus* or megalocytivirus* or megrivirus* or menolivirus* or merbecovirus* or metapneumovirus* or metavirus* or milecovirus* or mimivirus* or mimoreovirus* or minacovirus* or minunacovirus* or mischivirus* or mitartevirus* or mitovirus* or mivirus* or mobatvirus* or mobuvirus* or molluscipoxvirus* or moogolevirus* or moonvirus* or moordecovirus* or morbillivirus* or mosavirus* or msw3virus* or muarterivirus* or mudcatvirus* or mupapillomavirus* or muromegalovirus* or muscavirus* or muvirus* or mycoflexivirus* or mycoreovirus* or myohalovirus* or myotacovirus* or n15virus* or n4virus* or namcalivirus* or nanovirus* or narnavirus* or nebovirus* or nepovirus* or nidovirus* or nit1virus* or nobecovirus* or nona33virus* or nonagvirus* or nonanavirus* or norovirus* or novirhabdovirus* or np1virus* or nucleopolyhedrovirus* or nucleorhabdovirus* or nudivirus* or nupapillomavirus* or nyavirus* or nyctacovirus* or nyfulvavirus* or nymphadoravirus* or ofalivirus* or okavirus* or oleavirus* or omegapapillomavirus* or omegatetravirus* or omegavirus* or omikronpapillomavirus* or oncotshavirus* or oncovirus* or ophiovirus* or orbivirus* or orinovirus* or orivirus* or orthobornavirus* or orthobunyavirus* or orthohantavirus* or orthohepadnavirus* or orthohepevirus* or orthonairovirus* or orthophasmavirus* or orthopneumovirus* or orthopoxvirus* or orthoreovirus* or oryzavirus* or oscivirus* or ostreavirus* or ourmiavirus* or p100virus* or p12002virus* or p12024virus* or p1virus* or p22virus* or p23virus* or p2virus* or p68virus* or p70virus* or pa6virus* or pagevirus* or paguronivirus* or pakpunavirus* or pamx74virus* or panicovirus* or papanivirus* or parapoxvirus* or parechovirus* or partitivirus* or pasivirus* or passerivirus* or patiencevirus* or pbi1virus* or pbunavirus* or pecluvirus* or pedacovirus* or pedartevirus* or pegivirus* or pelarspovirus* or penstyldensovirus* or pepy6virus* or percavirus* or perhabdovirus* or peropuvirus* or pestivirus* or petuvirus* or pfr1virus* or pg1virus* or phaeovirus* or phasivirus* or phayoncevirus* or phi29virus* or phic31virus* or phicbkvirus* or phieco32virus* or phietavirus* or phifelvirus* or

phijl1virus* or phikmvvirus* or phikzvirus* or phipapillomavirus* or phix174microvirus* or phlebovirus* or phytoreovirus* or picobirnavirus* or pidchovirus* or pipapillomavirus* or pipefishvirus* or pis4avirus* or piscihepevirus* or planidovirus* or plasmavirus* or platypuvirus* or plectrovirus* or plotvirus* or poacevirus* or pocjvirus* or polemovirus* or polerovirus* or polyomavirus* or pomovirus* or porprismacovirus* or potamipivirus* or potexvirus* or potyvirus* or pradovirus* or prasinovirus* or pregotovirus* or proboscivirus* or prosimiispumavirus* or protobacilladnavirus* or protoparvovirus* or prtbvirus* or prunevirus* or prymnesiovirus* or psavirus* or pseudovirus* or psimunavirus* or psipapillomavirus* or quadrivirus* or quaranjavirus* or r4virus* or rabovirus* or ranavirus* or raphidovirus* or rb49virus* or rb69virus* or rdjlvirus* or redivirus* or renitovirus* or reovirus* or reptarenavirus* or rer2virus* or respirovirus* or retrovirus* or reyvirus* or rhadinovirus* or rheph4virus* or rhinacovirus* or rhinovirus* or rhizidiovirus* or rhopapillomavirus* or robigovirus* or rogue1virus* or rosadnavirus* or rosavirus* or rosebushvirus* or roseolovirus* or rotavirus* or roymovirus* or rsl2virus* or rslunavirus* or rtpvirus* or rubivirus* or rubulavirus* or rudivirus* or rymovirus* or s16virus* or sadwavirus* or saetivirus* or sakobuvirus* or salivirus* or salmonivirus* or salterprovirus* or sap6virus* or sapelovirus* or sapovirus* or sarbecovirus* or schizot4virus* or sclerodarnavirus* or sclerotimonavirus* or scutavirus* or se1virus* or seadornavirus* or sectovirus* or secunda5virus* or semotivirus* or send513virus* or senecavirus* or senegalvirus* or sep1virus* or septima3virus* or sequivirus* or setracovirus* or seuratvirus* or sextaecvirus* or sfi11virus* or sfi21dt1virus* or shanbavirus* or shangavirus* or shaspivirus* or sheartevirus* or siadenovirus* or sicinivirus* or sigmapapillomavirus* or sigmavirus* or silviavirus* or simiispumavirus* or simplexvirus* or sinaivirus* or sirevirus* or sitaravirus* or sk1virus* or slashvirus* or smoothievirus* or sobemovirus* or socyvirus* or solendovirus* or sopolycivirus* or soupsvirus* or soymovirus* or sp18virus* or sp31virus* or sp58virus* or sp6virus* or spbetavirus* or spiromicrovirus* or spn3virus* or spo1virus* or sprivivirus* or sputnikvirus* or sripuvirus* or ssp2virus* or striwavirus* or suipoxvirus* or sunshinevirus* or suspvirus* or svunavirus* or t1virus* or t4virus* or t5virus* or t7virus* or tankvirus* or tapwovirus* or taupapillomavirus* or tegacovirus* or tenuivirus* or tepovirus* or teschovirus* or tetraparvovirus* or tg1virus* or thetaarterivirus* or thetapapillomavirus* or thetatorquevirus* or thogotovirus* or thottimvirus* or tibrovirus* or tilapinevirus* or tin2virus* or tipravirus* or tiruvirus* or titanvirus* or tl2011virus* or tlsvirus* or tm4virus* or tobamovirus* or tobravirus* or tombusvirus* or topocuvirus* or torchivirus* or torovirus* or torradovirus* or tospovirus* or totivirus* or toursvirus* or tp21virus* or tp84virus* or treisdeltapapillomavirus* or treisepsilonpapillomavirus* or treisetapapillomavirus* or treisiotapapillomavirus* or treiskappapapillomavirus* or treisthetapapillomavirus* or treiszetapapillomavirus* or tremovirus* or triatovirus* or triavirus* or trichomonasvirus* or trichovirus* or trigintaduovirus* or tritimovirus* or tsarbombavirus* or tungrovirus* or tunisvirus* or tupavirus* or turncurtovirus* or turrinivirus* or twortvirus* or tymovirus* or umbravirus* or una4virus* or una961virus* or upsilonpapillomavirus* or v5virus* or varicellovirus* or varicosavirus* or vegasvirus* or velarivirus* or vendettavirus* or vesiculovirus* or vesivirus* or vespertiliovirus* or vhmlvirus* or vi1virus* or victorivirus* or virtovirus* or virus* or vitivirus* or vp5virus* or waikavirus* or wbetavirus* or wenilivirus* or whispovirus* or wildcatvirus* or wizardvirus* or woesvirus* or wphvirus* or wubeivirus* or wuhivirus* or wumivirus* or xipapillomavirus* or xp10virus* or yatapoxvirus* or ydn12virus* or yingvirus* or yuavirus* or yuyuevirus* or zeavirus* or zetaarterivirus* or zetapapillomavirus* or zetatorquevirus*).mp.

11. ("2019 ncov" or "2019nCoV" or "covid 19" or "severe acute respiratory syndrome coronavirus 2" or "sars cov 2").mp.
12. or/7-11
13. 6 and 12
14. Ventilation/
15. Air Pollution, Indoor/
16. ((high-volume adj1 evacuat*) or HEPA).tw,kf.
17. ((high-volume adj3 (evacuat* or filter?)) or HEPA or HVE).tw,kf.
18. ventilat*.tw,kf.
19. air exchange.tw,kf.
20. filter?.tw,kf.
21. or/14-20
22. 13 and 21

Key area I

1. exp Stomatognathic Diseases/
2. exp Dentistry/
3. exp Oral Health/
4. exp Dental Facilities/
5. (dentist* or endodont* or orthodonti* or periodont* or prosthodont* or apicoectom* or gingivectom* or gingivoplast* or glossectom* or "mandibular advancement" or alveolectom* or alveoloplast* or vestibuloplast* or "root canal" or oral or oropharyng* or temporomandibular or TMJ or jaw or jaws or mandibular or maxillofacial or mandible* or maxilla* or "alveolar ridge" or dental or orthognathic or tooth or teeth or occlusion or malocclusion or mal-occlusion or odontolog* or tongue* or glossal or buccal or palatal or palate or palates or labial or lip or lips or gingiva* or gingiviti*).tw,kf.
6. or/1-5
7. exp Viruses/
8. exp Virus Diseases/
9. (viridae or COVID-19 or AIDS or HIV or ebola or zika or "west nile" or shingles or SARS or MERS or chickenpox or smallpox or Chikungunya or epstein-barr or erythema or exanthum or influenza? or flu or HFMD or "heartland virus" or HFRS or hepatitis or herpes or cmeasles or mumps or "nipah virus" or Poliomyelitis or yersiniosis or rubella or salmonellosis or rabies).tw,kf.
10. (aalivirus* or ab18virus* or abouovirus* or abyssovirus* or acadianvirus* or ag3virus* or agatevirus* or agrican357virus* or aichivirus* or albetovirus* or alefpapillomavirus* or alfamovirus* or allexivirus* or allolevivirus* or almendravirus* or alpha3microvirus* or alphaabyssovirus* or alphaarterivirus* or alphabaculovirus* or alphacarmotetravirus* or alphacarmovirus* or alphacoronavirus* or alphaendornavirus* or alphaentomopoxvirus* or alphafusellovirus* or alphaguttavirus* or alphaherpesvirus* or alphainfluenzavirus* or alphaletovirus* or alphamesonivirus* or alphamononivirus* or alphanecrovirus* or alphanodavirus* or alphanudivirus* or alphapapillomavirus* or alphapartitivirus* or alphapermutotetravirus* or alphapleolipovirus* or alphapolyomavirus* or alphaportogloboviruss* or alpharetrovirus* or alphasphaerolipovirus* or alphaspiravirus* or alphatectivirus* or alphatorquevirus* or alphatristromavirus* or alphaturrivirus* or alphavirus* or amalgavirus* or ambidensovirus* or amdoparvovirus* or amigovirus* or ampelovirus* or ampivirus* or ampobartevirus* or ampullavirus* or anatolevirus* or andecovirus* or andromedavirus* or anphevirus* or anulavirus* or ap22virus* or aparavirus* or aphthovirus* or aplyccavirus* or aquabirnavirus* or aquamavirus* or aquaparamyxovirus* or aquareovirus* or arlivirus* or arv1virus* or ascovirus* or asfivirus* or atadenovirus* or attisvirus* or aumaivirus* or aureusvirus* or aurivirus* or avastrovirus* or avenavirus* or aveparvovirus* or aviadenovirus* or avibirnavirus* or avihepadnavirus* or avihepatovirus* or avipoxvirus* or avisivirus* or avulavirus* or b4virus* or babuvirus* or bacillarnavirus* or badnavirus* or bafinivirus* or balbicanovirus* or banyangvirus* or barnavirus* or barnyardvirus* or bastillevirus* or batrachovirus* or baxtervirus* or bc431virus* or bcep22virus* or bcep78virus* or bcepmuvirus* or bdellomicrovirus* or becurtovirus* or begomovirus* or behecravirus* or beidivirus* or benyvirus* or berhavirus* or bernal13virus* or betaarterivirus* or betabaculovirus* or betacarmovirus* or betacoronavirus* or betaendornavirus* or betaentomopoxvirus* or betafusellovirus* or betaguttavirus* or betaherpesvirus* or betainfluenzavirus* or betalipothrixvirus* or betanecrovirus* or betanodavirus* or betanudivirus* or betapapillomavirus* or betapartitivirus* or betapleolipovirus* or betapolyomavirus* or betaretrovirus* or betasphaerolipovirus* or betatectivirus* or betatetravirus* or betatorquevirus* or beturrivirus* or bevemovirus* or bicaudavirus* or bidensovirus* or bignuzvirus* or biquartavirus* or biseptimavirus* or blosnavirus* or blunervirus* or bocaparvovirus* or bolenivirus* or bongovirus* or bopivirus* or bostovirus* or botrexvirus* or botybirnavirus* or bovismacovirus* or bovispumavirus* or bpp1virus* or bracovirus* or brambyvirus* or brevidensovirus* or bromovirus* or bronvirus* or brujitavirus* or buldecovirus* or buttersvirus* or bxz1virus* or bymovirus* or c2virus* or c5virus* or cadicivirus* or cafeteriavirus* or

calicivirus* or camvirus* or capillovirus* or capripoxvirus* or capulavirus* or carbovirus* or cardiovirus* or cardoreovirus* or carlavirus* or casualivirus* or caulimovirus* or cavemovirus* or cba120virus* or cba181virus* or cba41virus* or cbastvirus* or cc31virus* or cd119virus* or cecivirus* or cegacovirus* or centapoxvirus* or cervidpoxvirus* or charlievirus* or charybnivirus* or che8virus* or che9cvirus* or cheravirus* or chibartevirus* or chipapillomavirus* or chipolycivirus* or chivirus* or chlamydiamicrovirus* or chloriridovirus* or chlorovirus* or chordovirus* or chrysovirus* or cilevirus* or circovirus* or citrivirus* or cjw1virus* or clavavirus* or closterovirus* or coccolithovirus* or colacovirus* or coltivirus* or comovirus* or coopervirus* or copiparvovirus* or corndogvirus* or coronavirus* or corticovirus* or cosavirus* or cosmacovirus* or cp1virus* or cp220virus* or cp51virus* or cp8virus* or cr3virus* or cradenivirus* or crinivirus* or cripavirus* or crocodylidpoxvirus* or crohivirus* or cronusvirus* or crustavirus* or cryspovirus* or cucumovirus* or cuevavirus* or curiovirus* or curtovirus* or cvm10virus* or cyclovirus* or cypovirus* or cyprinivirus* or cystovirus* or cytomegalovirus* or cytorhabdovirus* or d3112virus* or d3virus* or debiartevirus* or decacovirus* or decronivirus* or decurrovirus* or deltaarterivirus* or deltabaculovirus* or deltacoronavirus* or deltaflexivirus* or deltainfluenzavirus* or deltalipothrixvirus* or deltapapillomavirus* or deltapartitivirus* or deltapolyomavirus* or deltaretrovirus* or deltatorquevirus* or deltavirus* or demosthenesvirus* or densovirus* or dependoparvovirus* or dfl12virus* or dianthovirus* or diatodnavirus* or dichorhavirus* or dicipivirus* or dinodnavirus* or dinornavirus* or dinovernavirus* or divavirus* or doucettevirus* or dragsmacovirus* or drosmacovirus* or drosmacovirus*2 or dumedivirus* or duvinacovirus* or dyochipapillomavirus* or dyodeltapapillomavirus* or dyoepsilonpapillomavirus* or dyoetapapillomavirus* or dyoiotapapillomavirus* or dyokappapapillomavirus* or dyolambdapapillomavirus* or dyomupapillomavirus* or dyonupapillomavirus* or dyoomegapapillomavirus* or dyoomikronpapillomavirus* or dyophipapillomavirus* or dyopipapillomavirus* or dyopsipapillomavirus* or dyorhopapillomavirus* or dyosigmapapillomavirus* or dyotaupapillomavirus* or dyothetapapillomavirus* or dyoupsilonpapillomavirus* or dyoxipapillomavirus* or dyozetapapillomavirus* or e125virus* or ea214virus* or ea92virus* or eah2virus* or ebolavirus* or eiauvirus* or elvirus* or emaravirus* or embecovirus* or enamovirus* or enselivirus* or enterovirus* or entomobirnavirus* or entomopoxvirus* or ephemerovirus* or epsilon15virus* or epsilonarterivirus* or epsilonpapillomavirus* or epsilonretrovirus* or epsilontorquevirus* or equispumavirus* or eragrovirus* or erbovirus* or errantivirus* or erythroparvovirus* or etaarterivirus* or etapapillomavirus* or etatorquevirus* or eurpobartevirus* or f116virus* or fabavirus* or felispumavirus* or felixo1virus* or feravirus* or ferlavirus* or ff47virus* or fibrovirus* or fijivirus* or fishburnevirus* or flavivirus* or foveavirus* or fri1virus* or furovirus* or g4microvirus* or g7cvirus* or gaiavirus* or gallantivirus* or gallivirus* or gammaarterivirus* or gammabaculovirus* or gammacarmovirus* or gammacoronavirus* or gammaentomopoxvirus* or gammaherpesvirus* or gammainfluenzavirus* or gammalipothrixvirus* or gammapapillomavirus* or gammapartitivirus* or gammapleolipovirus* or gammapolyomavirus* or gammaretrovirus* or gammasphaerolipovirus* or gammatorquevirus* or gemycircularvirus* or gemyduguivirus* or gemygorvirus* or gemykibivirus* or gemykolovirus* or gemykrogvirus* or gemykroznavirus* or gemytondvirus* or gemyvongvirus* or giardiavirus* or gilesvirus* or globulovirus* or glossinavirus* or goravirus* or gordonvirus* or gordtnkvirus* or goukovirus* or grablovirus* or granulovirus* or gyrovirus* or habenivirus* or hanalivirus* or hapavirus* or hapunavirus* or harkavirus* or harrisonvirus* or hartmanivirus* or hawkeyevirus* or hedartevirus* or hemivirus* or henipavirus* or hepacivirus* or hepandensovirus* or hepatovirus* or herbevirus* or herdecovirus* or herpesvirus* or hibecovirus* or higrevirus* or hk578virus* or hk97virus* or hordeivirus* or horwuvirus* or hp1virus* or hubavirus* or huchismacovirus* or hudivirus* or hudovirus* or hunnivirus* or hupolycivirus* or hypovirus* or hytrovirus* or ichnovirus* or ichtadenovirus* or ictalurivirus* or idaeovirus* or idnoreovirus* or iflavirus* or igacovirus* or ilarvirus* or iltovirus* or infratovirus* or inovirus* or inshuvirus* or invictavirus* or iotaarterivirus* or iotapapillomavirus* or iotatorquevirus* or ipomovirus* or iridovirus* or isavirus* or iteradensovirus* or jd18virus* or jenstvirus* or jerseyvirus* or jimmervirus* or jonvirus* or js98virus* or jwalphavirus* or jwxvirus* or k1gvirus* or kadilivirus* or kaftartevirus* or kappaarterivirus* or kappapapillomavirus* or kappatorquevirus* or karsalivirus* or kayvirus* or kelleziovirus* or kf1virus* or kieseladnavirus* or kigiartevirus* or kobuvirus* or korravirus* or kp15virus* or kp32virus* or kp34virus* or kp36virus* or kpp10virus* or kpp25virus* or kunsagivirus* or l5virus* or labyrnavirus* or lagovirus* or lambdaarterivirus* or lambdapapillomavirus* or lambdatorquevirus* or lambdavirus* or laroyevirus* or lausannevirus* or ledantevirus* or leishmaniavirus* or lentivirus* or leporipoxvirus* or letovirus* or levivirus* or liefievirus* or likavirus* or limestonevirus* or limnipivirus* or lincruvirus* or lineavirus* or lit1virus* or lmd1virus* or loanvirus* or lolavirus* or luchacovirus* or luteovirus* or luz24virus* or luz7virus* or lymphocryptovirus* or lymphocystivirus* or lyssavirus* or m12virus* or macanavirus* or macavirus* or machinavirus* or machlomovirus* or macluravirus* or macronovirus* or maculavirus* or mamastrovirus* or mammarenavirus* or mandarivirus* or marafivirus* or marburgvirus* or mardivirus* or marnavirus* or marseillevirus* or marthavirus* or marvinvirus* or mastadenovirus* or mastrevirus* or mavirus* or megabirnavirus* or megalocytivirus* or megrivirus* or menolivirus* or merbecovirus* or metapneumovirus* or metavirus* or milecovirus* or mimivirus* or mimoreovirus* or minacovirus* or minunacovirus* or mischivirus* or mitartevirus* or mitovirus* or mivirus* or mobatvirus* or mobuvirus* or molluscipoxvirus* or moogolevirus* or moonvirus* or moordecovirus* or morbillivirus* or mosavirus* or msw3virus* or muarterivirus* or mudcatvirus* or mupapillomavirus* or muromegalovirus* or muscavirus* or muvirus* or mycoflexivirus* or mycoreovirus* or myohalovirus* or myotacovirus* or n15virus* or n4virus* or namcalivirus* or nanovirus* or narnavirus* or nebovirus* or nepovirus* or nidovirus* or nit1virus* or nobecovirus* or nona33virus* or nonagvirus* or nonanavirus* or norovirus* or novirhabdovirus* or np1virus* or nucleopolyhedrovirus* or nucleorhabdovirus* or nudivirus* or nupapillomavirus* or nyavirus* or nyctacovirus* or nyfulvavirus* or nymphadoravirus* or ofalivirus* or okavirus* or oleavirus* or omegapapillomavirus* or omegatetravirus* or omegavirus* or omikronpapillomavirus* or oncotshavirus* or oncovirus* or ophiovirus* or orbivirus* or orinovirus* or orivirus* or orthobornavirus* or orthobunyavirus* or orthohantavirus* or orthohepadnavirus* or orthohepevirus* or orthonairovirus* or orthophasmavirus* or orthopneumovirus* or orthopoxvirus* or orthoreovirus* or oryzavirus* or oscivirus* or ostreavirus* or ourmiavirus* or p100virus* or p12002virus* or p12024virus* or p1virus* or p22virus* or p23virus* or p2virus* or p68virus* or p70virus* or pa6virus* or pagevirus* or paguronivirus* or pakpunavirus* or pamx74virus* or panicovirus* or papanivirus* or parapoxvirus* or parechovirus* or partitivirus* or pasivirus* or passerivirus* or patiencevirus* or pbi1virus* or pbunavirus* or pecluvirus* or pedacovirus* or pedartevirus* or pegivirus* or pelarspovirus* or penstyldensovirus* or pepy6virus* or percavirus* or perhabdovirus* or peropuvirus* or pestivirus* or petuvirus* or pfr1virus* or pg1virus* or phaeovirus* or phasivirus* or phayoncevirus* or phi29virus* or phic31virus* or phicbkvirus* or phieco32virus* or phietavirus* or phifelvirus* or phijl1virus* or phikmvvirus* or phikzvirus* or phipapillomavirus* or phix174microvirus* or phlebovirus* or phytoreovirus* or picobirnavirus* or pidchovirus* or pipapillomavirus* or pipefishvirus* or pis4avirus* or piscihepevirus* or planidovirus* or plasmavirus* or platypuvirus* or plectrovirus* or plotvirus* or poacevirus* or pocjvirus* or polemovirus* or polerovirus* or polyomavirus* or pomovirus* or porprismacovirus* or potamipivirus* or potexvirus* or potyvirus* or pradovirus* or prasinovirus* or pregotovirus* or proboscivirus* or prosimiispumavirus* or protobacilladnavirus* or protoparvovirus* or prtbvirus* or prunevirus* or prymnesiovirus* or psavirus* or pseudovirus* or psimunavirus* or psipapillomavirus* or quadrivirus* or quaranjavirus* or r4virus* or rabovirus* or ranavirus* or raphidovirus* or rb49virus* or rb69virus* or rdjlvirus* or redivirus* or renitovirus* or reovirus* or reptarenavirus* or rer2virus* or respirovirus* or retrovirus* or reyvirus* or rhadinovirus* or rheph4virus* or rhinacovirus* or rhinovirus* or rhizidiovirus* or rhopapillomavirus* or robigovirus* or rogue1virus* or rosadnavirus* or rosavirus* or rosebushvirus* or roseolovirus* or rotavirus* or roymovirus* or rsl2virus* or rslunavirus* or rtpvirus* or rubivirus* or rubulavirus* or rudivirus* or rymovirus* or s16virus* or sadwavirus* or saetivirus* or sakobuvirus* or salivirus* or salmonivirus* or salterprovirus* or sap6virus* or sapelovirus* or sapovirus* or sarbecovirus* or schizot4virus* or sclerodarnavirus* or sclerotimonavirus* or scutavirus* or se1virus* or seadornavirus* or sectovirus* or secunda5virus* or semotivirus* or send513virus* or senecavirus* or senegalvirus* or sep1virus* or septima3virus* or sequivirus* or setracovirus* or seuratvirus* or sextaecvirus* or sfi11virus* or sfi21dt1virus* or shanbavirus* or shangavirus* or shaspivirus* or sheartevirus* or siadenovirus* or sicinivirus* or sigmapapillomavirus* or sigmavirus* or silviavirus* or simiispumavirus* or simplexvirus* or sinaivirus* or sirevirus* or sitaravirus* or sk1virus* or slashvirus* or smoothievirus* or sobemovirus* or socyvirus* or solendovirus* or sopolycivirus* or soupsvirus* or soymovirus* or sp18virus* or sp31virus* or sp58virus* or sp6virus* or spbetavirus* or spiromicrovirus* or spn3virus* or spo1virus* or sprivivirus* or sputnikvirus* or sripuvirus* or ssp2virus* or striwavirus* or suipoxvirus* or sunshinevirus* or suspvirus* or svunavirus* or t1virus* or t4virus* or t5virus* or t7virus* or tankvirus* or tapwovirus* or taupapillomavirus* or tegacovirus* or tenuivirus* or tepovirus* or teschovirus* or tetraparvovirus* or tg1virus* or thetaarterivirus* or thetapapillomavirus* or thetatorquevirus* or thogotovirus* or thottimvirus* or tibrovirus* or tilapinevirus* or tin2virus* or tipravirus* or tiruvirus* or titanvirus* or tl2011virus* or tlsvirus* or tm4virus* or tobamovirus* or tobravirus* or tombusvirus* or topocuvirus* or torchivirus* or torovirus* or torradovirus* or tospovirus* or totivirus* or toursvirus* or tp21virus* or tp84virus* or treisdeltapapillomavirus* or treisepsilonpapillomavirus* or treisetapapillomavirus* or treisiotapapillomavirus* or treiskappapapillomavirus* or treisthetapapillomavirus* or treiszetapapillomavirus* or tremovirus* or triatovirus* or triavirus* or trichomonasvirus* or trichovirus* or trigintaduovirus* or tritimovirus* or tsarbombavirus* or tungrovirus* or tunisvirus* or tupavirus* or turncurtovirus* or turrinivirus* or twortvirus* or tymovirus* or umbravirus* or una4virus* or una961virus* or upsilonpapillomavirus* or v5virus* or varicellovirus* or varicosavirus* or vegasvirus* or velarivirus* or vendettavirus* or vesiculovirus*

or vesivirus* or vespertiliovirus* or vhmlvirus* or vi1virus* or victorivirus* or virtovirus* or virus* or vitivirus* or vp5virus* or waikavirus* or wbetavirus* or wenilivirus* or whispovirus* or wildcatvirus* or wizardvirus* or woesvirus* or wphvirus* or wubeivirus* or wuhivirus* or wumivirus* or xipapillomavirus* or xp10virus* or yatapoxvirus* or ydn12virus* or yingvirus* or yuavirus* or yuyuevirus* or zeavirus* or zetaarterivirus* or zetapapillomavirus* or zetatorquevirus*).mp.

11. ("2019 ncov" or "2019nCoV" or "covid 19" or "severe acute respiratory syndrome coronavirus 2" or "sars cov 2").mp.
12. or/7-11
13. exp Fomites/
14. Equipment Contamination/
15. (surface? or fomite?).tw,kf,mp.
16. (dentist? or dental? or maxillofacial or endodont* or orthodonti* or periodont* or prosthodont*).tw,kf.
17. 1 or 2 or 3 or 4 or 16
18. (countertop? or counter top? or cabinet* or cupboard? or floor? or wall? or sink? or handles or switch or switches or knob? or doorknob? or faucet? or tap or taps or resusable container? or radiograph* or door? or drawer? or carpet* or fabric* or upholster*).tw,kf,mp.
19. 13 or 14 or 18
20. 12 and 17 and 19
21. 13 or 14 or 15 or 18
22. 12 and 17 and 21
23. 12 and 15 and 17
24. 22 not 23