

A Scoping Review of Studies on COVID-19

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ABSTRACT

The recent Covid-19 outbreak has spurred research activities in understanding its clinical characteristics, epidemiology, treatment and containment, hence resulting in a surge of publications related to the outbreak. This scoping review aims to provide insight into the overarching types and genres of studies on Covid-19 and highlight the gaps to be filled in by subsequent research. This study adopted the scoping frame of Arksey and O'Malley based on the PRISMA systematic review. It qualitatively analysed 587 scholarly articles published between December 2019 and 5 May 2020, which were drawn from ProQuest, Scopus and Web of Science (WoS). The initial lists of articles passed through the four stages of the PRISMA, namely identification of literature, screening, eligibility assessment and inclusion to qualify for qualitative analysis. The review showed that descriptive studies predominated over analytic studies (84.3% versus 15.7%) and most of the studies (14.3%) were related to clinical signs and characteristics/parthenogenesis. The understudied areas consisted of vaccines development, ecological/environmental implications and forensic. This review highlights tremendous opportunities for research related to Covid-19 addressing the analytic aspects, the understudied areas as well as areas such as information technology (IT) and data processing, economics, social and psychological facets and risk assessment.

Keywords: Covid-19; SARS-CoV-2; public health; clinical; therapy; epidemiology

INTRODUCTION

Covid-19 is the abbreviation for coronavirus disease 2019, an infectious pneumonia-like disease caused by the severe acute respiratory syndrome

coronavirus 2 (SARS-CoV-2). Infected individuals commonly develop fever, cough and breathing difficulty over an incubation period of two to fourteen days.^[1] Similarity of these symptoms to other common illnesses such as influenza makes the detection of the infection at the onset, hence its containment, difficult. To complicate its detection, there are instances where infected individuals may not show the symptoms until later into the incubation period. The symptoms can escalate into breathing difficulty, persistent chest pain and bluish lips which signal the need for medical attention.^[1]

As of 5 May 2020, more than 3.6 million people worldwide had been diagnosed with Covid-19 and individuals succumbing to Covid-19 reached 59,245 deaths, indicating a death rate of 5.3%.^[2] In response to the difficulty in early detection of infected individuals and the rising diagnosed cases of Covid-19, many countries have implemented movement controls starting with the community containment in Wuhan, the initial epicentre of Covid-19 as well as restricted and prohibited entries of foreigners.^[3] Self-quarantine and quarantine were quickly imposed on returning citizens and individuals with suspected contacts with those infected and travel records to regions of known Covid-19 outbreak. Social-distancing is now the rule of thumb in countries inflicted by Covid-19.^[4]

These measures aiming to contain the spread of SARS-CoV-2 have had their impacts on societies and economies.^[5] A common reaction upon announcement of imminent lockdown in many countries such

as China, the United States, Australia and Malaysia was panic buying during which groceries and supermarkets were swarmed with people stocking up food and daily needs. [6] Non-essential businesses were ordered to close during lockdown and employees either had to work from home or were asked to go on unpaid leaves. [5] The socioeconomic implications are far-reaching with small businesses facing the risk of closing down and employees potentially made redundant. With transboundary travels almost coming to a standstill and domestic travels greatly reduced, demands for crude oil slumped. [7] On the positive side, environmental pollution has substantially declined as people are confined to their homes. [8]

The SARS-CoV-2 and the multitude of implications it brings to societies and economies have garnered much research attention. After five months since the first case of Covid-19 was reported on the 8 December 2019 and three months into the global alert raised by the World Health Organization (WHO) on Covid-19 on the 30 January 2020, many studies related to this theme have been published. [3] Recognizing that SARS-CoV-2 and Covid-19 present an entirely new regime of research, the global scientific communities are racing against time to understand the virus and the resultant outbreak from multiple perspectives and much emphasis now has been placed on searching for effective treatment of Covid-19. [9] Likewise, review papers published thus far revolve around treatment and epidemiology of Covid-19. [10-13] It is of interest to identify the current direction of research related to SARS-CoV-2 and Covid-19 to highlight the gaps of research and suggest the paths future research can take. As such, this paper aims to perform a scoping review to provide an overview of current research trend in these genres and draw research gaps which can guide future research.

METHODS

Study design: This scoping review employed the framework proposed by Arksey and O'Malley comprising the framing of research questions, the definition of search criteria, implementation of literature search and checking of the search results against search criteria and research questions, which are based on the PRISMA systematic review process. [14] The main research question defining this study centres on the genres of studies that have been conducted for SARS-CoV-2 and Covid-19 thus far. The primary databases used were ProQuest, Scopus and Web-of-Science, all of which contain extensive collections of peer-reviewed literature from multiple disciplines to provide a balanced search result covering the science, social, engineering and economic aspects of SARS-CoV-2 and Covid-19.

The search criteria include all peer-reviewed scholarly articles, conference papers and conference proceedings published between December 2019 and 5 May 2020. The articles must contain the key word Covid-19 or the equivalent such as coronavirus disease 2019. As ProQuest gathered articles of different document types such as news and commentary which did not meet the criterion of scholarly article, the document types had been narrowed down to article, literature review and case report. Similarly, the document types on Scopus and Web of Science Core Collection databases were specified to only include articles and reviews.

The flow of information through the four stages of this study namely identification of literature, screening, eligibility assessment and inclusion was presented with a PRISMA flowchart in [Figure 1](#) below. During screening, articles bearing titles related to Covid-19 whose contents had little or no relation to Covid-19, SARS-CoV-2 or the equivalent were removed. In determining the eligibility of the literature, news articles as well as non-scholarly editorials and letters to editor which eluded the initial filter of the

databases were excluded despite the relevant themes. The abstracts of the articles were carefully examined and if they could not provide sufficient clues about the nature

and relevance of the articles, the respective full texts were referred.

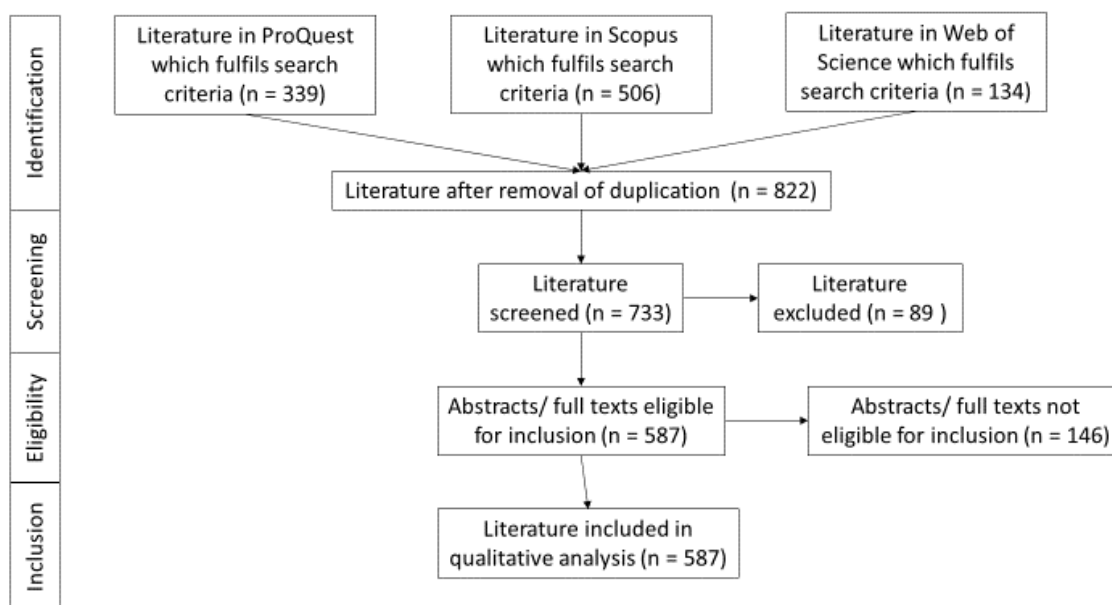


Figure 1. PRISMA flowchart of this systematic review

Articles that qualified for qualitative analysis were examined and classified in terms of their overarching study approaches, i.e. whether they were descriptive or analytic. [15] Descriptive articles are those adopting qualitative approach comprising case reports, reviews, scholarly letters to editors, experts' opinions, updates, epidemiological reports, recommendations, guidelines and clinical reports among others. Analytic articles report results of experiments, modelling, clinical trials, cohort studies, case-control studies, development and validation of models, etc. [15] The studies were also classified based on genres derived from screening of the articles' titles which consisted of 1) Treatment/ therapy; 2) Epidemiology/ prevalence; 3) Vaccines; 4) Transmission; 5) Pathobiology; 6) Health practices; 7) Diagnosis/ screening; 8) IT/ data processing; 9) Framework/ model; 10) Resources/ economics; 11) Background/ guidelines/ challenges; 12) Clinical signs and characteristics/ parthenogenesis; 13) Comorbidities; 14) Prevention; 15) Ecology/

environment; 16) Occupational health and safety; 17) Public health responses/ containment; 18) Social aspects/ Psychology; 19) Risk assessment; 20) Forensic; 21) Scoping review.

Treatment/ therapy concerns the use, development, administration of drugs and care for Covid-19 patients. [16,17] Epidemiology/ prevalence covers articles on prevalence, fatality, predictions of infection, basic reproduction number, cluster identification, etc. [18] Vaccines tract is dedicated to articles on development and trials of vaccines. [19] Transmission centres on interspecies and intraspecies transmissions of SARS-CoV-2 while pathobiology focuses mainly on the biological and biochemical characteristics of SARS-CoV-2, for instance its genome and receptor recognition. [20,21] Health practices revolve around the management strategies and practices adopted by different health care professionals such as dentists, radiologists, surgeons, etc. [22] Diagnosis/ screening, however, concerns methods to diagnose patients and screen suspects of

Covid-19. [23] IT/ data processing explores the use of information technology, algorithms and artificial intelligence on aspects related to the Covid-19 and framework/ model deals with development of models for outbreak-related predictions and framework for conducting studies among others. [24] Resources/ economics probe the implications of Covid-19 on supply chain, adequacy of resources as well as regional and global economy. [25]

Background/ guidelines/ challenges contain articles aiming to provide background information and updates of Covid-19, general guidelines such as institutional guidelines and illustrate challenges related to the pandemic. [26] Clinical signs and characteristics/ parthenogenesis includes articles illustrating or analysing the clinical signs, imaging and pathological characteristics, and physiological damages resulted from SARS-CoV-2 infection. [27] Comorbidities encompass Covid-19 patients with other health complications such as diabetes and cancer. [28] Prevention focuses on preventing infection by and transmission of SAR-CoV-2. [29] Ecology/ environment is related to the ecological and environmental implications of Covid-19 whereas occupational health and safety enlists studies on personal protective equipment and measures to keep health professionals safe. [30,31] Public health responses/ containment covers articles on containing outbreak, transportation and travel arrangements and public health measures to stall the community spread of Covid-19. [4] Social aspects/ psychology encompasses studies on social and psychological implications of Covid-19 and circulation of misinformation. [32] Risk assessment presents studies evaluating risk and identifying risk factors on, for instance, the spread of and vulnerability to Covid-19. Forensic caters for the niche studies on investigation of Covid-19 scenes and post-mortems, [33] and scoping review is intended for studies similar to this. There is only one scoping study published so far. [34]

RESULTS AND DISCUSSIONS

Publications related to Covid-19 and SARS-CoV-2 have been on the rise especially in the past two months. Most of the studies were published by Chinese researchers. [34] In all the databases searched in this study, descriptive studies outnumbered analytic studies. Descriptive studies constituted 84.3% of all the studies analysed (Figure 2). A reason for the prevalence of descriptive studies over analytic studies could be their lower complexity in comparison to analytic studies, involving the reporting of cases, sharing of clinical experiences and practices as well as recommendation-making which can usually be accomplished in a shorter timeframe than analytic studies. [15] Analytic studies usually take longer time to complete, hence published due to the need for experiments, surveys or observational designs and the results are often subject to more extensive analysis. [15] Scopus search yielded the highest number of published scholarly article (n = 309), followed by ProQuest (n = 176) and WoS (n = 102).

The most popular genre of study was clinical signs & characteristics/ pathogenesis (n = 84), accounting for 14.3% of the total articles analysed (Figure 3). Number of articles on epidemiology/ prevalence came in second (n = 67) with a percentage of 11.4%, while articles on background/ guidelines / challenges had the third highest number (n = 64), equivalent to 10.9% of the total articles analysed. Other popular tracts were health practices (n = 54), treatment/ therapy (n = 52) and public health responses/ containment (n = 44) (Figure 3). There were not many studies related to vaccines development (n = 6) in contrast to the publicized news on the races for vaccine trials. [35] Similarly, studies on the ecological/ environmental implications of Covid-19 (n = 2), forensic (n = 2) and scoping review (n = 1) were scanty. Articles in the tracts of forensic and scoping review were contributed entirely by ProQuest (Appendix 1) whereas articles on vaccines, prevention, ecology/ environment and risk

assessment came from both ProQuest and Scopus ([Appendix 1](#)).

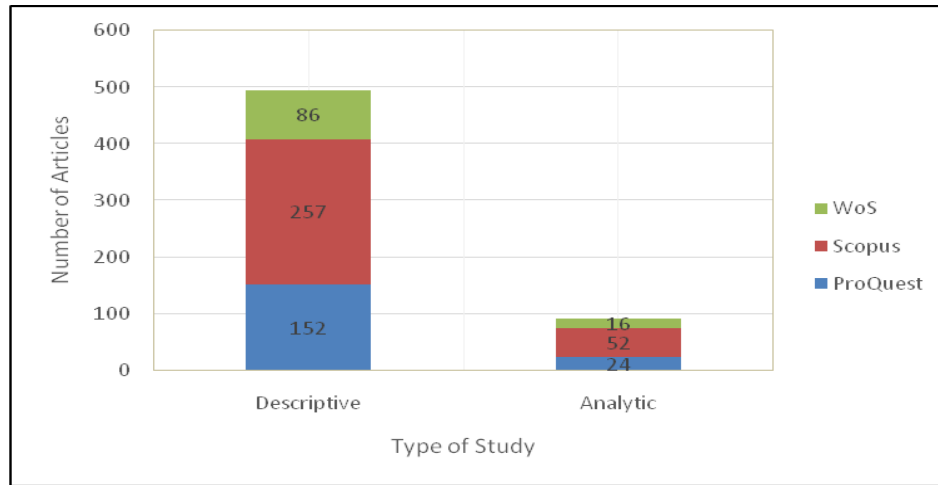


Figure 2. Number of Articles based on the Type of Study

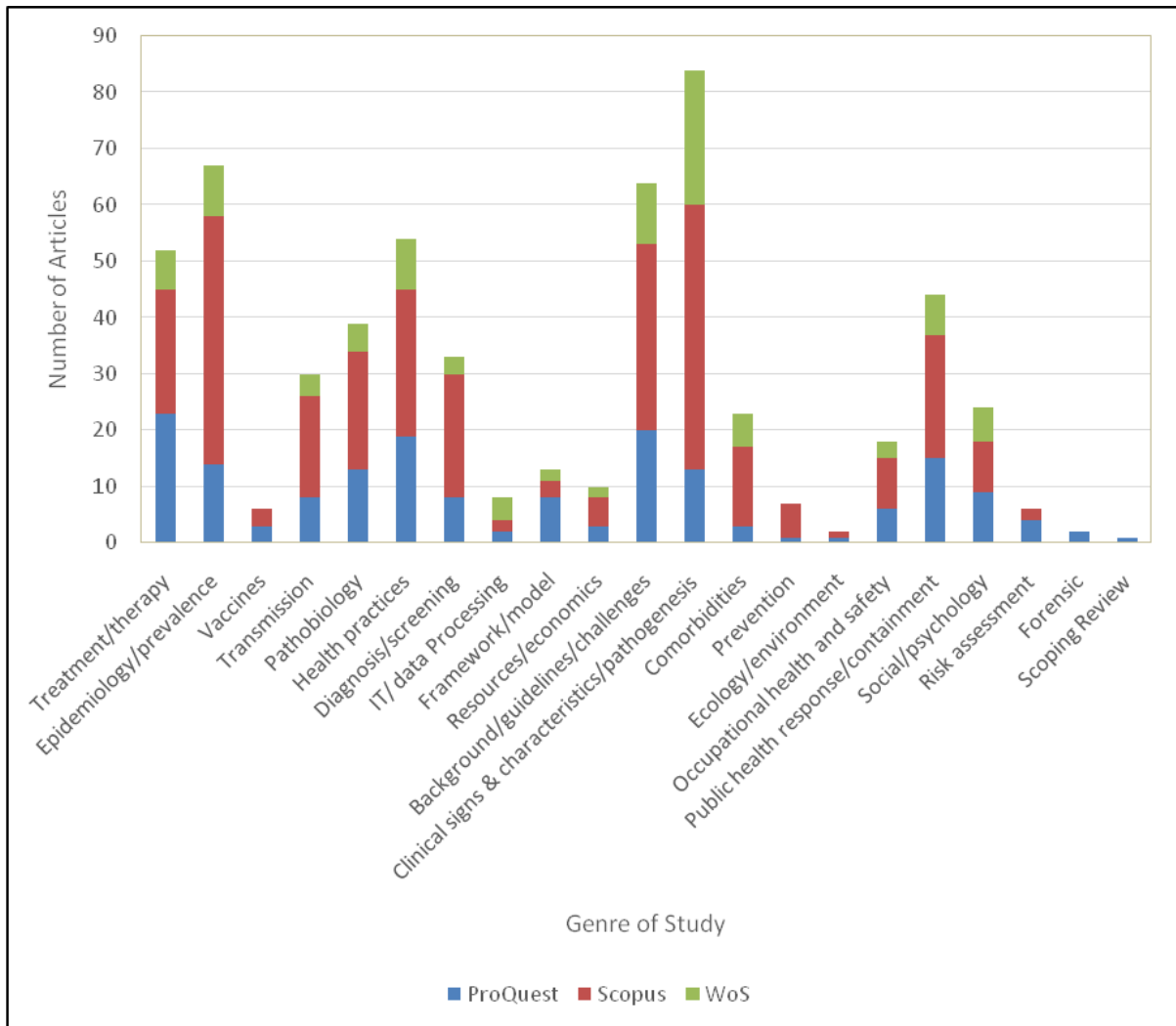


Figure 3. Number of Article based on Genres of Study

Adhikari et al. classified the genre of studies into four overarching categories i.e. causes, epidemiology, clinical manifestation and diagnosis as well as prevention and

control, and demonstrated published scholarly articles related to causes had the highest abundance (38.5%) in contrary to the finding of this study showing studies on clinical signs & characteristics/pathogenesis were most abundant. [34] Nevertheless, the definition of causes by Adhikari et al. covers virology and pathogenesis, hence overlapping partially with both the categories of clinical signs & characteristics/pathogenesis, and pathobiology adopted in this study. [34] Similar to this study, articles related to epidemiology were reported to have the second highest abundance (29.2%). The number of articles included in the scoping review of Adhikari et al. was 65 in comparison to 587 in this study, indicating phenomenal growth in the published articles related to Covid-19 over a span of approximately two months, i.e. February and March 2020. [34] This also sheds light into the intense race for publications in academia. [36] While Adhikari et al. [34] reported that 44.6% of the studies analysed were mathematical modelling, the scenario has changed during the writing of this article with descriptive studies far more prevalent than analytic studies.

Some studies are region-specific with names of the respective countries or regions included in the titles. Screening of the titles showed that studies related specifically to China were significantly higher than other countries (n = 91) ([Appendix 2](#)). Studies specific to Italy and Korea shared the second rank in terms of number (n = 11) ([Appendix 2](#)). Australia-specific studies recorded the third highest number (n = 8).

This study has drawn out obvious gaps in Covid-19-related research which is dominated by descriptive studies. The room for analytic studies is enormous and there are apparent domains which are currently understudied particularly forensic, implications of Covid-19 on ecology/environment, risk assessment of regional outbreaks and vaccines development. Covid-19 has changed multiple aspects of

life and the economy and these impacts have not been sufficiently captured in the current published articles. [3] The causes and consequences of misinformation as part of the social implications, [37] together with other socioeconomic implications such as work arrangements, buying behaviours, lifestyle, education, transportation, travel, communications, etc. remain inadequately understood. The psychological impacts of containment, lockdown and movement control on different members of the public and of providing treatment and medical care during Covid-19 outbreak by frontline health workers also present substantial research opportunities.

The adoption of IT and data processing for various aspects of Covid-19 from treatment, diagnosis, predictions of spread, controlling flow of people, screening information, etc. also provides spaces for research. Forensic covering tracts of outbreak and Covid-19 fatalities scene investigations as well as post-mortems also offers a niche research area. As the publication settings will quickly change due to copious ongoing studies conducted on Covid-19 and SARS-CoV-2 and rapid rates of publication, scoping and systematic reviews still have their places in future research.

Region-specific studies particularly on the epidemiology, socioeconomic implications, economic impacts, ecological/environmental domains, public health responses/containment, occupational safety and health, and risk assessment may also guide future directions of research on Covid-19 since most of the region-specific studies currently are China-related ([Appendix 2](#)). Region-specific studies could be spurred by regional efforts in planning, policy-making and strategizing for Covid-19 outbreak which are often government-linked. There is also rising interest in sector-specific guidelines and recommendations pioneered currently by the health sector and are expanding to other sectors such as academia.

While highlighting the many possibilities of research related to Covid-19, this study has its limitations. Other than the two overarching study types, this study did not categorize the articles based on the types of descriptive and analytic studies. It did not specify the nationality of the authors and the countries the articles were published. Due to the qualitative nature of this scoping review, the classification of the articles based on type and genre might not be entirely error free though checking of the main texts was done when doubts arose during classification. [14] Only three most common databases were used to extract the articles for this study despite the presence of many other databases.

CONCLUSION

This study provides a detailed classification of genre for the current published scholarly articles related to Covid-19 and SARS-CoV-2. It provides insight into the types of study approach of those articles and shows the past-faced publications occurring due to many studies undertaken in this area. It points to the dynamic publication settings while bringing the research gaps to the limelight encompassing the domains of socioeconomics, psychology, IT/ data processing, ecology/ environment, vaccines, forensic and risk assessment among others. It also suggests region-specific studies to provide regional insights of the outbreak. This scoping review, therefore, contributes significantly to scholarly development in Covid-19 and is beneficial to researchers interested to conduct research in this area.

Conflicts of Interests

No conflicts of interests have been identified.

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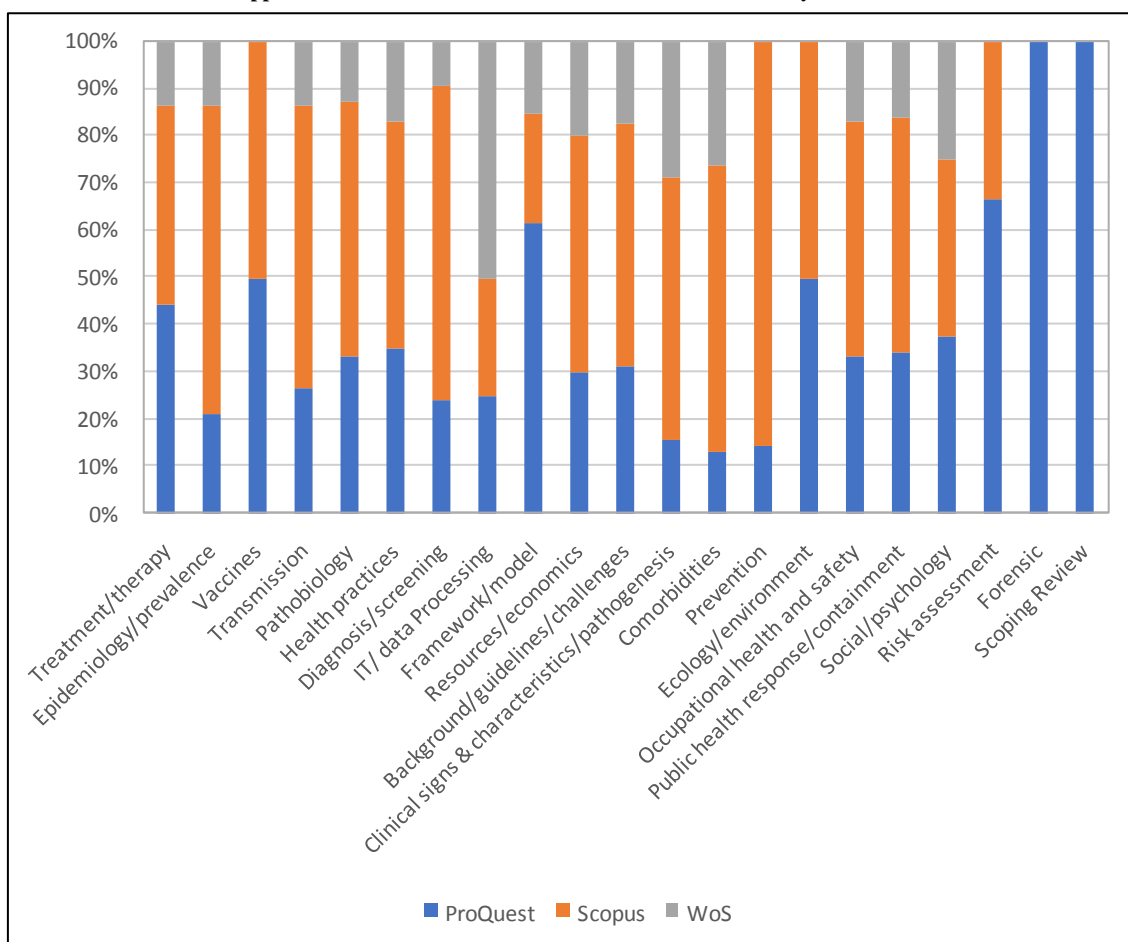
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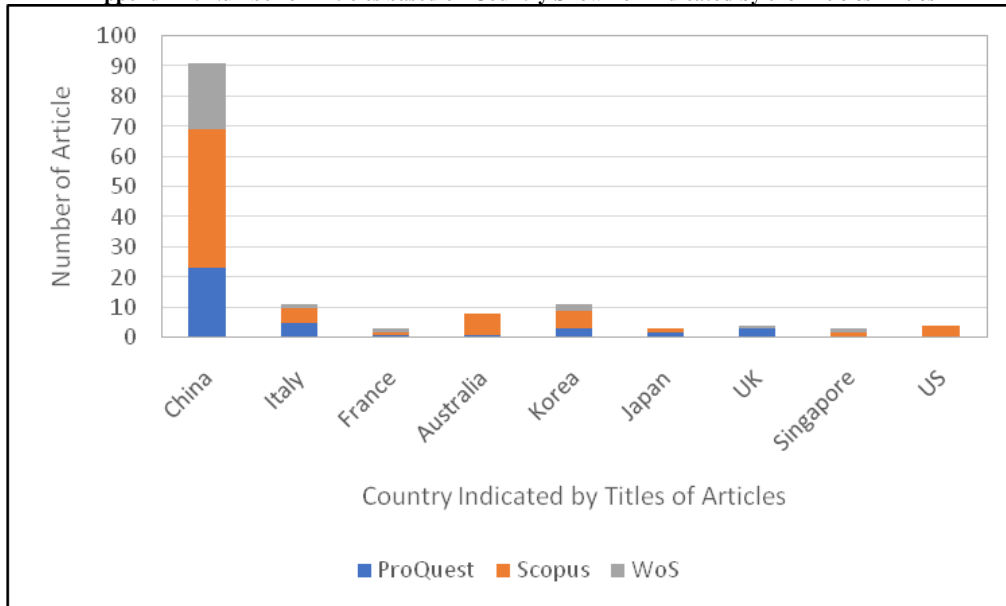
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Supplementary Materials

Appendix 1: Percent Contribution of Articles of Each Genre by Databases



Appendix 2: Number of Articles based on Country Shown or Indicated by the Articles' Titles



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