Protocol for a Systematic Review and Meta-analysis of Racial, Ethnic, and Socioeconomic Disparities in COVID-19

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Protocol

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Abstract

Background: Coronavirus disease 2019 (COVID-19) is an infectious disease caused by SARS-CoV-2. It has become a pandemic and an international public emergency. Preliminary evidence shows that as the pandemic spreads throughout the countries, disparities are observed in health outcomes of patients with COVID-19, especially in terms of morbidity and mortality.

Methods: A systematic review and meta-analyses will be conducted to measure the racial, ethnic, and socioeconomic disparities in COVID-19. The target population includes the population of the countries during the pandemic of COVID-19. The exposure is minority ethnicity and low-socioeconomic status. Minority or low-socioeconomic status groups will be compared to the majority or high-socioeconomic status groups. The main outcomes of interests include 1) mortality rate, 2) morbidity rate, 3) deaths among the infected individuals, 4) availability of healthcare resources, 5) accessibility of healthcare resources, 6) time to recovery, 7) complications; and 8) access to testing.

Discussion: By quantifying and documenting the existence and extent of the racial, ethnic, and socioeconomic disparities in COVID-19, we will identify the areas that deserve immediate action to prevent devastating consequences. The results of this systematic review will help policymakers to adopt effective strategies in managing the COVID-19 crisis in a just way not only in the absence of certain treatment and vaccination but also after reaching them as well.

Systematic review registration: PROSPERO registry number: CRD42020190105

Background

Since its beginning in late December 2019 in Wuhan- China [1] and rapid spread in more than 180 countries, Coronavirus Disease 2019 (COVID-19) has caused 379,941 deaths and many more morbidity by June 3, 2020 [2]. The spread of the disease was so rapid that the World Health Organization (WHO) declared it as a global public health emergency on March 11, 2020 [3]. Due to the lack of certain treatment as well as vaccination [3, 4], most of the researches have focused on clinical, pharmaceutical, and epidemiological aspects of the pandemic and the main role of the public health in ensuring the equity in access to needed services and, consequently, health outcomes have been overlooked [5].

Racial, ethnic, and socioeconomic status (SES) disparities in health are ubiquitous [6, 7] and have been linked directly or indirectly to individual life expectancy and mortality [8]. Evidence shows a connection between low-SES and high risk of infectious disease in terms of both incidence and severity [9, 10]. Therefore, narrowing the disparity gap or eradicating racial, ethnic, and SES disparities is a public health priority [11]. This calls for research studies to identify and understand the status of disparities across different population groups [7, 12]. Because their specific SES could influence the incidence and severity of the disease in a variety of ways [6], low-SES and racial/ethnic minority groups need to be considered as high-risk populations during epidemics of infectious diseases [13].
As the COVID-19 pandemic spreads throughout the countries, racial, ethnic, and SES disparities are observed in the health outcomes of the population, especially in terms of morbidity and mortality [5, 14-16]. Gross disparities in rates of hospitalization and mortality in the context of COVID-19 remark the shortcomings of public health strategies in achieving the "optimal health for all" by targeting the vulnerable population [5, 17]. Several studies have shown a disproportionately negative effect of COVID-19 on African Americans [14, 18-20]. For instance, a study by Garg et al. on 580 hospitalized patients with COVID-19 in 19 states of USA showed that blacks represented 33% of hospitalized patients, while they comprised only 18% of the total population of the region [21]. Another study uncovered a higher mortality rate in black populations [22]. A study in the UK showed that 35% of the patients with COVID-19 hospitalized intensive care units were from minority ethnic groups [23]. Disparities in COVID-19 is not merely a concern of developed countries. Rather, it may affect Low- and Middle-Income Countries (LIMICs) even more severely. Nevertheless, many LIMICs do not have an appropriate surveillance system and responsive healthcare infrastructure [24] to address such issues reliably.

Rational

It is well-documented that individuals from low-SES or minority groups are more vulnerable to COVID-19 [25]. It is particularly important to explore the racial, ethnic, and SES disparities along with other pharmaceutical researches to reach a precise understanding of the status and extent of potential disparities in the context of COVID-19. Additionally, several commentaries and editorials [5, 23, 26, 27] have highlighted the essential need for exploring the disparities in COVID-19 to conduct early interventions. Although a shred of evidence suggests stark race, ethnic, and SES disparities in COVID-19, the evidence are not consistent. For example, while some reports suggest the higher rates of mortality in minority groups [6, 25, 28], a study by Azar didn't find such differences by race and ethnicity [29] which necessitates conducting a review study to systematically collect data, compare and document findings from the different studies.

Though minority groups are the main subject of every epidemic, they are exceptionally vulnerable to the COVID-19 pandemic because the transmission of the infection is extremely associated with the behavioral, lifestyle, and background characteristics of the individuals. There are some potential reasons for the higher incidence and severity of COVID-19 in minority groups and individuals from low SES. When speaking about SES, we generally focus on occupation, income, and education level of people [30]. The risk of the transmission of COVID-19 in professions that involve constant interpersonal interactions is higher. As a result, the incidence of the disease among workers is higher [31]. People with low-SES are more likely to experience work stress, which increases the risk of cardiovascular disease [32] and disrupts the function of the immune system [33], and consequently results in lower resistance to COVID-19. Low-income could influence the housing conditions of the individuals in a way that increases the risk of the spread of the infectious disease, for example, small and overcrowded houses [6]. Lower education levels could increase the COVID-19 severity indirectly by behavioral pathways, poor diet, smoking, and other risk factors [34]. Racial and ethnic minority groups are usually from economically disadvantaged
backgrounds and are more likely to work in jobs that are not suitable for remote working [35]. Furthermore, the vaccination policies of the minority group in their birth countries may put them in an increased risk of COVID-19 severity [36].

It is necessary to cope with the disparities in COVID-19, and we should become aware of the extent of the problem before any action. This is especially crucial when further peaks of the outbreak is a possible scenario [37-39]. The results of this review study will provide policymakers with valuable information on areas with problems in equal outcomes and access to healthcare to be used in managing the COVID-19 pandemic as well as any other epidemics in the future. Two main questions that will be explored include: 1) are certain racial, ethnic, or SES groups disproportionately impacted by COVID-19?; and, 2) are there any differences in COVID-19 health outcomes among racial, ethnic, or SES groups? The conceptual framework to guide our study is presented in Figure 1.

Figure 1

**Methods/design**

A systematic review will be conducted to measure the racial, ethnic, and SES disparities in COVID-19. The protocol is reported in accordance with the reporting guidance provided in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols (PRISMA-P) statement (see the checklist in Additional file 1).

**Inclusion criteria**

**Population:** Population of the countries during the pandemic of COVID-19

**Intervention/Exposure:** The exposure is belonging to racial/ethnic minorities or low-SES population groups.

**Comparators:** Racial/ethnic minorities and low-SES groups will be compared to the majority and high-SES groups.

**Outcomes:** The outcomes of interests include:

1) mortality rate (confirmed COVID-19 deaths in 100,000 population);

2) morbidity rate (confirmed COVID-19 cases in 100,000 population);

3) deaths among the infected individuals (case fatality rate);

4) availability of healthcare resources (including hospital beds, ICU, ventilator, physician, healthcare workforce);
5) accessibility of healthcare resources (utilization of healthcare resources such as hospitalization, ICU use, and ventilator use among those with COVID-19);

6) time to recovery;

7) complications (outcomes among survivors);

and 8) access to testing (testing per 1,000 population).

If data are available, length of stay in hospital and unmet needed services will be assessed as the additional outcomes.

**Types of studies:** Empirical peer-reviewed articles including epidemiological or observational studies written in the English language will be included in the review. Editorials, reviews, commentaries, mathematical modeling reports, methodological articles, meta-analyses, studies with the subjects related to animals, and studies without a clear description of the healthcare outcomes will be excluded from the review.

**Search strategy and information sources**

Keywords were identified in three main domains including coronavirus infectious disease, disparity, and minority group, through conducting a rapid literature review and using Medical Subject heading (MeSh) (see Table 1 for details). A well-experienced medical librarian contributed to the development of the preliminary search strategy. When conducting the pilot searches, each one of the domains was searched independently followed by a comprehensive search using a composition of all domains to make sure that the final search strategy was appropriate. A sample search strategy for PubMed is available in Appendix 2. Full search strategies will be provided in the complete review.

**Table 1:** key terms for database search strategy

| Concept 1:                          | Concept 2:                        | Concept 3:                       |
|-------------------------------------|-----------------------------------|----------------------------------|
| COVID-19                            | Disparity                         | Race, ethnicity, SES             |
| COVID-19                            | disparit* OR discriminat*         | ethnic* OR indigen*              |
| SARS-CoV-2                          | inequit* OR inequal*              | deprived OR poverty OR poor OR income OR wealth |
| coronavirus                         | enable* OR facilitate* OR access*| minorit* OR race OR racial       |
| 2019-nCoV                           | barrier*                          | socioeconomic OR economic        |

**Search strategy:** 1 AND (2 OR 3)
Major electronic databases will be searched (from late 2019 onwards) including, PubMed, Cochrane Library, Scopus, CINAHL, ProQuest, Embase, EconLit. Also, reference and citation lists of relevant studies, Google Scholar search engine, relevant reviews, clinical trial registers (Clinical trials.gov), gray literature (Gray.net), preprint sources such as medRxiv, bioRxiv, and arxiv.org., the website of WHO, and other relevant evidence will be searched carefully. A sample search strategy for PubMed is presented in Additional file 2.

**Critical appraisal of individual sources of evidence**

Using the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist [40], two authors will independently conduct the quality assessment of the studies. STROBE encompasses 22 items in domains of title, abstract, introduction, methods, results, and discussion sections of the articles. Each item in the checklist will be scored as 0, 1, and 2, which shows how the contents of the studies follow the checklist's criteria. The possible minimum and maximum scores for the checklist are 0 and 44, respectively. Studies will be categorized in quality of good [with the scores of 34-44], moderate [17-33], and poor [0-16].

Two reviewers will independently assess the potential risk of bias of the target studies using the Cochrane Handbook [41]. This applied tool encompasses six main dimensions to assess the risk of potential biases including sequence generation, allocation concealment, blinding, incomplete outcome data, selective outcome reporting, and other sources of bias. In the case of any discrepancies in the judgments of two reviewers, the results will be discussed with one or two other team members to make an appropriate decision.

**Data management and extraction**

After pooling all search results in the Endnote reference management software program, duplicated results will be identified and removed. Two reviewers will screen titles or abstracts to find all relevant studies. Then, the full-text of the relevant studies, based on the eligibility criteria, will be read carefully. One of the authors will independently extract essential information and insert them into a data extraction form designed in Microsoft Word. The extraction form contains items such as bibliographic information, type of study, number of participants, the setting of the study, participant characteristics (exposure group and the comparators), geographic location, complications, and reported outcomes (see Additional file 3). A pilot test of three articles will be conducted by the investigators to ensure the validity of the data extraction form. The PRISMA flow diagram will be used to provide a report the flow of the screening and study selection processes.

**Data synthesis, analysis, and reporting**
By aggregating the information extracted from each manuscript, we will provide a complete description of the included studies. Using the Comprehensive Meta-Analysis (CMA) software program, we will perform a random-effects model on the data extracted from primary epidemiological or observational studies (if the data is appropriate). The heterogeneity will be explored as a priori to the meta-analyses, determining the summary estimates using the Hartung-Knapp-Sidik-Jonkman random-effects model [42]. To visualize the extent of the heterogeneity among the studies, we will use forest plots. I2 statistics, which determines the proportion of the variation in prevalence estimates as well as the variance between studies, will be calculated to measure the quantity of the statistical heterogeneity. The results of the Tau2 and Cochran Q test will be presented to illustrate the heterogeneity and a P-value of < 0.05 will be considered as the cut-off for statistical significance. Other data will be summarized and reported using descriptive statistics methods. Additionally, contingent on the availability of data, we will perform subpopulation analyses by country, gender, comorbidities, and other characteristics.

Meta-biases

Appropriate strategies will be adopted to minimize the likelihood of potential biases in the review. Unpublished manuscripts such as the preprints as well as gray literature will be included in the review. Using a Funnel plot, the potential publication biases will be explored by detecting and assessing the magnitude of reporting biases. Additionally, the methodological quality of this review study will be measured using the Assess the Methodology Quality of Systematic Reviews (AMSTAR) tool [43].

Discussion

By quantifying the existence and magnitude of the racial, ethnic, and SES disparities in COVID-19, we will identify the areas that deserve immediate action to prevent devastating consequences of COVID-19 pandemic, especially among the disproportionately impacted population groups. The results of this systematic review will help policymakers to adopt effective strategies in managing the COVID-19 as a public health emergency. It is assumed that minority groups are more vulnerable to COVID-19. However, without reaching precise knowledge on the status and extent of the potential disparities and finding the areas in need of urgent and specific interventions we could not guarantee the equal access of the population to needed services and effective adaptation of the public health preventive measures.

We expect several limitations for this study. First, information on race, ethnicity, and SES information might be incomplete in medical records [6]. This can make it difficult for researchers to measure health disparities in COVID-19. However, we believe that dissemination of this protocol can potentially encourage the researchers to adopt suitable strategies to collect, analyze, and report data on racial, ethnic, and SES characteristics of the infected individuals. Second, evidence shows that in some different published studies the same sample of patients has been included without clear explanations for the duplicate reporting [44]. To mitigate this issue, we will pay extra attention to identify patient groups repeatedly included in different studies. Third, in the diagnosis of the patients with COVID-19, diagnosis
codes for every level of severity are the same, while the severity of the symptoms is in a range from mild to threatening, and even, in some infected cases, it is asymptomatic [29]. Finally, the diagnostic tests and degree of accuracy (sensitivity and specificity) of the diagnostic tests might vary from study to study, resulting in the misclassification of the infected and healthy individuals.

**Dissemination plan**

Final reports of this systematic review will be published in peer-reviewed academic journals. Additionally, early findings will be presented in scientific conferences, symposia, and other professional assemblies.

**Abbreviations**

COVID-19: Coronavirus Disease 2019

WHO: World Health Organization

SES: Socioeconomic Status

LIMICs: Low- and Middle-Income Countries

MeSh: Medical Subject heading

STROBE: Strengthening the Reporting of Observational Studies in Epidemiology

PRISMAP: Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocol

CMA: Comprehensive Meta-Analysis

AMSTAR: Assess the Methodology Quality of Systematic Reviews

**Declarations**

**Ethics approval and consent to participate**

Not applicable

**Consent for publication**

Not applicable

**Availability of data and materials**
Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

**Competing interests**

The authors declare that they have no competing interests.

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**Authors' contributions**

All authors contributed to outlining the study design, selecting the keywords, preparing preliminary protocol. AK and SI drafted the manuscript. AK edited the manuscript. All authors commented on the manuscript and approved the final manuscript.

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Figures
Figure 1

Conceptual framework for disparities in COVID-19.

Supplementary Files

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- CoverletterDisparityCOVID19.doc
- AddiotionalFile3dataextractionform.pdf
- AdditionalFile1PRISMAPstatement.pdf
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