Use of gloves for the prevention of COVID-19 in healthy population: A living systematic review

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ABSTRACT

Objective

To determine the efficacy of the use of gloves in the prevention of COVID-19 in healthy population.

Methods

We adapted an already published common protocol for multiple parallel systematic reviews to the specificities of this question.

We searched for studies evaluating the effect of glove use in healthy population to prevent COVID-19.

We conducted searches using the special L·OVE (Living Overview of Evidence) platform for COVID-19, a system that maps PICO questions to a repository, maintained through regular searches in electronic databases, preprint servers, trial registries and websites relevant to COVID-19. All the searches covered the period until November 30, 2020. No date or language restrictions were applied.

Two reviewers independently evaluated potentially eligible studies according to predefined selection criteria, and extracted data on study characteristics, methods, outcomes, and risk of bias, using a predesigned, standardised form.

A living, web-based version of this review will be openly available during the COVID-19 pandemic. We will resubmit it every time the conclusions change or whenever there are substantial updates.

Results

Our search strategy yielded 362 references. Finally, only 1 non-randomised study evaluating the use of gloves among other preventive measures was considered eligible. We were not able to perform a meta-analysis, thus the results were presented as a narrative synthesis.

In healthy population, the evidence is very uncertain about the effect of the use of gloves on COVID-19 cases, hospitalizations for COVID-19, respiratory failure and all cause-mortality.

Conclusions

The evidence is insufficient to support or refute the use of gloves in healthy population to prevent COVID-19. There should appear well designed studies addressing the question of this review to provide valuable evidence to inform researchers and decision makers in the near future.

PROSPERO Registration number CRD42020188674.

Keywords

COVID-19, Coronavirus disease, Severe Acute Respiratory Syndrome Coronavirus 2, Coronavirus Infections, Systematic Review, glove, double-glove.

Key Ideas

- Gloves are part of personal protective equipment (PPE). For healthcare workers, they reduce the risk of infection and contamination.
- The efficacy of using gloves by the general population to prevent COVID-19 is unknown. Despite not having evidence to support its use, a large number of people have decided to use them during daily activities.
- In this living systematic review, we evaluated the effect of glove use in healthy population to prevent COVID-19.
- Given the scarcity and quality of the evidence found, there are insufficient data to support or refute the use of gloves in a healthy population to prevent COVID-19.

INTRODUCTION

COVID-19 is an infection caused by the SARS-CoV-2 coronavirus [1]. It was first identified in Wuhan, China, on December 31, 2019 [2]; six months later, more than fifteen million cases of contagion had been identified across 188 countries [3]. On March 11, 2020, WHO characterised the COVID-19 outbreak as a pandemic [1].

While the majority of cases result in mild symptoms, some might progress to pneumonia, acute respiratory distress syndrome, and death [4],[5],[6]. The case fatality rate reported across countries, settings and age groups is highly variable, but it ranges from about 0.5% to 10% [7]. In hospitalised patients it has been reported to be higher than 10% in some centres [8].

Gloves are part of personal protective equipment (PPE) [9], [10]. For healthcare workers, they reduce the risk of infection and contamination, taking care of both healthcare workers and patients. During the current COVID-19 pandemic, healthcare workers are in the front-line, at greater risk of becoming infected than the general population. Gloves, along with face masks and other elements, allow to reduce that risk [11].

However, people have also used gloves in ordinary activities like going to the supermarket, drugstores or in public transport. This may create a false sense of security, making people more susceptible to contamination due to an inadequate use or when taking them out without the appropriate technique. The incorrect use of gloves by the general population could increase the risk of infection and contamination of surfaces [12]. Additionally, the use of gloves by the general population could threaten the supply of PPE for healthcare workers [13], [14].

The efficacy of using gloves by the general population to prevent COVID-19 is unknown. Despite not having evidence to support its use, a large number of people have decided to use them [15], and governments and media don't have a clear message about using gloves by the general population. If

we also consider the shortage of medical supplies, it's crucial to determine the efficacy of routine glove use by the general population in preventing COVID-19.

Using innovative and agile processes, taking advantage of technological tools, and resorting to the collective effort of several research groups, this living systematic review aims to provide a timely, rigorous and continuously updated summary of the evidence available on the efficacy of use of gloves to prevent COVID-19 in healthy population.

METHODS

This manuscript complies with the 'Preferred Reporting Items for Systematic reviews and Meta-Analyses' (PRISMA) guidelines for reporting systematic reviews and meta-analyses [16] (see **Appendix 1 - PRISMA Checklist**).

A protocol stating the shared objectives and methodology of multiple evidence syntheses (systematic reviews and overviews of systematic reviews) to be conducted in parallel for different questions relevant to COVID-19 was published elsewhere [17]. The review was registered in PROSPERO with the number CRD42020188674 and a full protocol will be available.

Search strategies

Electronic searches

We used the search strategies already developed in the L·OVE (Living Overview of Evidence) platform (<https://www.iloveevidence.com>), a system that maps the evidence to different research questions. The full methods to maintain L·OVE are described in the website, but the process to devise the search strategies can be briefly described as:

- Identification of terms relevant to the population and intervention components of the search strategy, applying Word2vec technology [18] to the corpus of documents available in Epistemonikos Database.
- Discussion of terms with content and methods experts to identify relevant, irrelevant and missing terms.
- Creation of a sensitive boolean strategy encompassing all the relevant terms.
- Iterative analysis of articles missed by the boolean strategy, and refinement of the strategy accordingly.

All the information in the L·OVE platform comes from a repository developed and maintained by Epistemonikos Foundation through the screening of different sources relevant to COVID-19. At the time of submitting this protocol, this repository includes more than 66989 articles relevant to Coronavirus disease, coming from the following databases, trial registries, preprint servers and websites relevant to COVID-19: Epistemonikos database, Pubmed, EMBASE, ICTRP Search Portal, Clinicaltrials.gov, ISRCTN registry, Chinese Clinical Trial Registry, IRCT - Iranian Registry of Clinical Trials, EU Clinical Trials Register: Clinical trials for covid-19, NIPH Clinical Trials Search (Japan) - Japan Primary Registries Network (JPRN) (JapicCTI, JMACCT CTR, JRCT, UMIN CTR), UMIN-CTR - UMIN Clinical Trials Registry, JRCT - Japan Registry of Clinical Trials, JAPIC Clinical Trials Information, Clinical Research Information Service (CRiS), Republic of Korea, ANZCTR - Australian New Zealand Clinical Trials Registry, ReBec - Brazilian Clinical Trials Registry, CTRI - Clinical Trials

Registry - India, DRKS - German Clinical Trials Register, LBCTR - Lebanese Clinical Trials Registry, TCTR - Thai Clinical Trials Registry, NTR - The Netherlands National Trial Register, PACTR - Pan African Clinical Trial Registry, REPEC - Peruvian Clinical Trial Registry, SLCTR - Sri Lanka Clinical Trials Registry, medRxiv Preprints, bioRxiv Preprints, SSRN Preprints, WHO COVID-19 database.

The last version of the methods, the total number of sources screened, and a living flow diagram and report of the project is updated regularly on the website [19].

The repository is continuously updated [19] and the information is transmitted in real time to the L-OVE platform, however, it was last checked for this review on November 30, 2020. The searches covered the period from the inception date of each database, and no study design, publication status or language restriction was applied.

The following strategy was used to retrieve from the repository the articles potentially eligible for this question.

(coronavir* OR coronavirus* OR "corona virus" OR "virus corona" OR "corono virus" OR "virus corono" OR hcov* OR "covid-19" OR covid19* OR "covid 19" OR "2019-nCoV" OR cv19* OR "cv-19" OR "cv 19" OR "n-cov" OR ncov* OR "sars-cov-2" OR "sars-cov2" OR (wuhan* AND (virus OR viruses OR viral) OR coronav*) OR (covid* AND (virus OR viruses OR viral)) OR "sars-cov" OR "sars cov" OR "sars-coronavirus" OR "severe acute respiratory syndrome" OR "mers-cov" OR "mers cov" OR "middle east respiratory syndrome" OR "middle-east respiratory syndrome" OR "covid-19-related" OR "SARS-CoV-2-related" OR "SARS-CoV2-related" OR "2019-nCoV-related" OR "cv-19-related" OR "n-cov-related") AND (coronavir* OR coronavirus* OR "corona virus" OR "virus corona" OR "corono virus" OR "virus corono" OR hcov* OR "covid-19" OR covid19* OR "covid 19" OR 2019-nCoV OR cv19* OR "cv-19" OR "cv 19" OR "n-cov" OR ncov* OR "sars-cov-2" OR (wuhan*:ti,ab AND (virus OR viruses OR viral OR coronav*)) OR (covid* AND (virus OR viruses OR viral)) OR "sars-cov" OR "sars cov" OR "sars-coronavirus" OR "severe acute respiratory syndrome" OR "mers-cov" OR "mers cov" OR "middle east respiratory syndrome" OR "middle-east respiratory syndrome") AND (glov* OR "double-gloving" OR "double-glove" OR "double-gloves")

Eligibility criteria

We included studies evaluating healthy population, and excluded trials evaluating healthcare workers, since they have been considered to be at a higher risk of contagion.

The intervention of interest was the use of gloves. We did not restrict our criteria to a specific type, brand, or use of single or double gloves.

The comparison of interest was no intervention. Trials assessing gloves plus other personal protective equipment (PPE) were considered eligible if the cointerventions were identical in both the intervention and the comparison groups.

Our primary outcome of interest was the number of COVID-19 cases. Secondary outcomes were sick-leave days and hospital admission. We also extracted information on the adverse events of the use of gloves.

We did not consider the outcomes as an inclusion criteria during the selection process. Any article meeting all the criteria except for the outcome criterion was preliminarily included and assessed in full text.

Selection of studies

The results of the searches in the individual sources were de-duplicated by an algorithm that compares unique identifiers (database ID, DOI, trial registry ID), and citation details (i.e. author names, journal, year of publication, volume, number, pages, article title, and article abstract). Then, the information matching the search strategy was sent in real-time to the L-OVE platform where at least two authors independently screened the titles and abstracts yielded against the inclusion criteria. We obtained the full reports for all titles that appeared to meet the inclusion criteria or required further analysis and then decided about their inclusion.

We recorded the reasons for excluding trials in any stage of the search and outlined the study selection process in a PRISMA flow diagram which we adapted for the purpose of this project.

Extraction and management of data

Using standardised forms, two reviewers independently extracted the following data from the included trial: study design, setting, participant characteristics (including disease severity and age) and study eligibility criteria; details about the administered intervention and comparison, including type, preventive scheme and duration; the outcomes assessed and the time they were measured; the source of funding of the study and the conflicts of interest disclosed by the investigators; the risk of bias assessment for each individual study.

We resolved disagreements by discussion, with one arbiter adjudicating unresolved disagreements.

Risk of bias assessment

The risk of bias for the study included was assessed by using the Joanna Briggs Institute Checklist for Analytical Cross Sectional Studies [20], a tool for assessing risk of bias in cross sectional studies of interventions considering the following domains: (1) bias due to inclusion criteria, (2) bias in describing the setting and study subjects, (3) bias in measurement of exposure, (4) bias in measurement of the condition, (5) bias in describing confounding factors and (6) strategies to deal with them, (7) bias in measurement of outcomes and (8) bias in the statistical analysis used.

Strategy for data synthesis

The results of the search and the selection of the studies is presented, by means of the corresponding flow chart, according to recommendations of the PRISMA statement [16].

We formulated a narrative synthesis, describing the study in terms of the direction and the size of effects, since it was not possible to calculate an effect estimate.

Living evidence synthesis

An artificial intelligence algorithm deployed in the Coronavirus/COVID-19 topic of the L·OVE platform provides instant notification of articles with a high likelihood of being eligible. The authors review them, decide upon inclusion, and update the living web version of the review accordingly.

This review is part of a larger project set up to produce multiple parallel systematic reviews relevant to COVID-19 [17].

RESULTS

Results of the search

We conducted searches using L·OVE (Living Overview of Evidence) platform for COVID-19, a system that maps PICO questions to a repository, maintained through regular searches in 27 databases, preprint servers, trial registries and websites relevant to COVID-19. All the searches covered the period until November 30, 2020. No date or language restrictions were applied.

The search in the L·OVE platform retrieved 362 records. We considered 176 as potentially eligible and obtained and evaluated their full texts. Among these articles, one ongoing study was found, and finally only one study was included for analysis.

The complete study selection process is summarised in the PRISMA flow chart (Figure 1) and the full list of included, excluded and ongoing trials is presented in Appendix 1.

Source: Own production

Figure 1: Prisma Flowchart.

Description of the included study

The included study evaluated the effect of glove use on estimated prevalence of COVID-19. The study used a non-randomised, non-comparative online survey. Inclusion criteria are not described. The measured intervention, among many other behaviours, was the use of gloves. The baseline characteristics of the participants is presented in Table 1.

Table 1 - Baseline characteristics of the participants

	Rodríguez-Barranco et al [29]
Number of participants	2086
Geographic location and Setting	Spain; outpatient setting
Mean age (years)	Not reported; “the age of more than 40% of participants range between 40 and 54

	years"
Females in study, %	66.8 (Total= 1393)
Estimated prevalence of COVID-19, %	4.7 (Confirmed cases= 49*, People people with symptoms compatible with COVID-19 who declared they suspected of having suffered the disease= 50)
Current smokers, %	16,4 (Total= 342)
Underlying comorbidities, %	25 (Total= 517)
Overweight, %	23.1 (Total= 479)

Source: Own production

* Confirmation method no reported

Risk of bias in the included study

The included study had issues with bias due to inclusion criteria, and measurement of the condition and outcomes. According to the Joanna Briggs Institute Checklist for Analytical Cross Sectional Studies tool [20], the overall appraisal should be to exclude the study, but since it is the only evidence found, we decided to include it to report its results.

The study design did not consider a comparison group, so no confounding factors are described for the outcomes assessed.

Table 2 summarises the risk of bias assessments.

Table 2 - Risk of bias

	D1	D2	D3	D4	D5	D6	D7	D8	OA
Rodríguez-Barranco et al [29]	NO	YES	NA*	NO	NA*	NA*	NO	YES	Include**

Source: Own production

- D1 Were there clear criteria for inclusion in the sample clearly defined?
- D2 Were the study subjects and the setting described in detail?
- D3 Was the exposure measured in a valid and reliable way?
- D4 Were objective, standard criteria used for measurement of the condition?
- D5 Were confounding factors identified?
- D6 Were strategies to deal with confounding factors stated?
- D7 Were the outcomes measured in a valid and reliable way?
- D8 Was appropriate statistical analysis used?

OA	Overall appraisal
*	Not applicable
**	The decision to include the study is discussed above

Effect of use of gloves on estimated prevalence of COVID-19

The included study is a non-comparative, non-randomised study. Despite having a serious risk of bias, we decided to report its results, since it is the only study found that evaluates the effect of the use of gloves in a healthy population as a means of prevention for COVID-19.

Primary outcome: COVID-19 cases

Of the total number of participants (2086), 65.5% wore gloves when leaving during confinement. The prevalence of COVID-19 was estimated in 4.7% (99 out of 2086 participants). The use of gloves had no statistically significant effect on the estimated prevalence of COVID-19.

Secondary and other outcomes

None of the secondary and other outcomes (sick-leave days, hospital admission and adverse events of the use of gloves) were reported in the included study.

DISCUSSION

The efficacy of using gloves by the general population to prevent COVID-19 is unknown. Despite not having evidence to support its use, a large number of people have decided to use them [15], and governments and media don't have a clear message about using gloves by the general population. It's crucial to determine the efficacy of routine glove use by the general population, since the incorrect use of gloves could increase the risk of infection [12], and use by the general healthy population could threaten the supply to health care workers [13].

We performed a comprehensive search of the literature and we found only 1 non-randomised trial evaluating the effect of the use of gloves in healthy population to prevent COVID-19.

The study [29], published online in September 2020, is a non-comparative, non-randomised online survey. The limitations related to their study design and additional quality issues are critical when assessing the certainty of the evidence. Given the uncertainty regarding the effect of glove use, due to insufficient data, we are currently unable to support or refute the use of gloves in healthy population to prevent COVID-19.

The main limitation of our review results from the insufficiency of the existing evidence to inform decisions. We have identified only 1 ongoing study addressing this question, which hopefully will provide valuable evidence to inform researchers and decision makers in the near future. We hope that in the coming months there will be more studies evaluating the efficacy of glove use in healthy population to prevent COVID-19.

Systematic reviews are the gold standard to collect and summarize the available evidence regarding a scientific question. However, the traditional model for conducting reviews has several limitations, including a high demand for time and resources [23] and a rapid obsolescence [24]. Amidst the COVID-19 crisis, researchers should make their best effort to answer the urgent needs of health

decision makers yet without giving up scientific accuracy. Information is being produced at a vertiginous speed [25], so alternative models are needed.

One potential solution to these shortfalls are rapid reviews, a form of knowledge synthesis that streamlines or omits specific methods of a traditional systematic review in order to move faster. Unfortunately, in many cases, this rapidity comes at the cost of quality [26]. Furthermore, they do not solve the issue of obsolescence. Living systematic reviews do address that issue [27]. They are continually updated by incorporating relevant new evidence as it becomes available, at a substantial effort. So, an approach combining these two models might prove more successful in providing the scientific community and other interested parties with evidence that is actionable, rapidly and efficiently produced, up to date, and of the highest quality [28].

This review is part of a larger project set up to put such an approach into practice. This project aims to produce multiple parallel living systematic reviews relevant to COVID-19 following the higher standards of quality in evidence synthesis production [17]. We believe that our methods are well suited to handle the abundance of evidence that is to come, including evidence on the role of gloves for the prevention of COVID-19.

During the COVID-19 pandemic we will maintain a living, web-based, openly available version of this review, and we will resubmit it every time the conclusions change or whenever there are substantial updates. Our systematic review aims to provide a high-quality, up-to-date synthesis of the evidence that is useful for clinicians and other decision makers.

NOTES

Differences with the protocol

Searches: Searches were carried out exclusively on the L-OVE platform, since this repository includes all the standard databases plus preprint servers.

Outcomes: In the final review, we decided to eliminate the outcomes of respiratory failure and all-cause mortality, due to its distance from the intervention studied, the use of gloves.

Sensitivity and subgroup analysis: As no randomized trials were found, only a descriptive study, we did not perform sensitivity or subgroup analysis as stated in the protocol.

Assessment of certainty of the evidence: It was not possible to evaluate the certainty of the evidence, since the included study did not allow the evaluation of the Grading of Recommendations Assessment, Development and Evaluation (GRADE) necessary domains [22].

Measures of intervention effect: the reported outcome did not allow measurement of the effect of the intervention.

Data synthesis: data were not available to conduct a formal quantitative synthesis (meta-analysis), so we formulated a narrative synthesis.

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Roles and contributions

All the review authors drafted and revised the protocol, conducted article screening and data collection, and drafted and revised the review.

The COVID-19 L·OVE Working Group was created by Epistemonikos and a number of expert teams in order to provide decision makers with the best evidence related to COVID-19. Up-to-date information about the group and its member organisations is available here: epistemonikos.cl/working-group.

Competing interests

All authors declare no financial relationships with any organisation that might have a real or perceived interest in this work. There are no other relationships or activities that might have influenced the submitted work.

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This project was not commissioned by any organisation and did not receive external funding.

Epistemonikos Foundation is providing training, support and tools at no cost for all the members of the COVID-19 L·OVE Working Group.

PROSPERO registration number CRD42020188674.

Ethics

As researchers will not access information that could lead to the identification of an individual participant, obtaining ethical approval was waived.

Data sharing

All data related to the project will be available. Epistemonikos Foundation will grant access to data.

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