

## REVIEW ARTICLE

# Effectiveness of Face Masks in Preventing the Transmission of Respiratory Tract Infections: A Rapid Review.

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### Abstract

**Introduction:** People wear various types of face masks to protect themselves from breathing in dust, pollutants, allergies, and harmful organisms. In light of the recent Covid-19 pandemic, mask-wearing has been made mandatory globally. As part of personal protective equipment and a public health strategy to stop the spread of illnesses, wearing face masks has been widely recommended. This rapid review was conducted to explore and analyze the effectiveness of face mask usage in preventing the transmission of respiratory tract infection. **Method:** The review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Twenty three out of 134 articles met the inclusion criteria. The types of masks studied were N95 masks, surgical masks, cloth masks, non-medical masks, and unspecified face masks.

**Result and conclusion:** The analysis of the review indicates that the usage of masks does indeed offer a certain degree of protection to the individual and to those around them. Therefore, policy makers should encourage the general population to use face masks for health protection. However, more evidence is required in terms of clarifying the usage of the mask in various settings and against diverse types of infection. It is emphasised that the use of face masks, in combination with other preventive measures such as handwashing and social distancing, should be implemented concurrently to prevent any outbreak of respiratory tract infections.

**Keywords:** *Effectiveness, face masks, N95 mask, surgical mask, transmission, respiratory tract infection.*

## Introduction

In recent years, many infections have endangered people, causing acute respiratory illnesses that have a negative impact on human lives and civilizations. Respiratory tract infections have always resulted in significant morbidity and mortality globally. It is one of the most common problems faced by individuals regardless of age and gender. Respiratory tract infections can be caused by a wide variety of pathogens such as viruses or bacteria. Although most of the infections are usually mild and not incapacitating, some respiratory tract infections have the capability to pose a serious problem in cases of pandemics or even epidemics. This is mainly due to the high transmissibility rate among humans. An example of serious respiratory tract infections could be seen through the frequent influenza epidemics and the deadly COVID-19 pandemic. All these epidemics and pandemics became a major public health burden worldwide. It was clear from various published literatures that there were three transmission routes of concern for respiratory viruses which were through droplet, airborne, and contact, including fomites [1,2,3]. Since all these viruses were transmitted through the respiratory route, their spread can likely be prevented using similar methods [4]. Over time, humans have developed various defence strategies against such viruses, including wearing face masks, implementing household quarantines, developing medicines, and creating vaccines that boost immunity against these pathogens. The use of non-drug interventions, such as wearing respiratory personal protective equipment (RPPE), was vital for protecting and decreasing the associated hazard of health care workers (HCWs) against respiratory infections when specialised vaccines or disinfection treatments are not available.

In view of the recent pandemic, the World Health Organization (WHO) and Centres for Disease Control and Prevention (CDC) recommended the public to wear face masks as part of the personal protective measures against the latest respiratory viral infection, COVID-19. Generally, there are 3 types of face masks being used which were

respirators, surgical and cloth face masks. Respirators, also known as the N95 face masks as well as the surgical face masks were widely used among the healthcare workers (HCW) while the cloth face masks were popular among the general population. Face masks were being used as a source control to prevent the respiratory virus from spreading through airborne droplets. Moreover, face masks were being used to protect the wearers by filtering the inhaled air from respiratory virus and bacteria. A systematic and meta-analysis on the effectiveness of cloth masks against respiratory viral infection has shown that cloth masks offer minimum efficacy and are inferior to N95 and surgical masks [5].

This review offered an essential and timely assessment of face mask usage and protection against respiratory tract infections. This review aimed to offer a comprehensive overview of the evidence showcasing the effectiveness of different types of face masks in preventing respiratory tract infections, both in community and healthcare settings. This review explored the following research question: Are face masks effective in preventing the transmission of respiratory tract infection in the general population?

As long as respiratory tract infections have not been eradicated, this review remains relevant for future use in upcoming endemic or pandemic outbreaks. Consequently, it was in our interest to develop a rapid review on the efficacy of face masks in deterring the transmission of respiratory tract infections.

## Materials and methods

A rapid review was conducted in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses [6]. A comprehensive searching strategy was meticulously used to select eligible studies from multiple electronic databases such as Cochrane Library, PubMed, ScienceDirect, HealthEvidence

and Google Scholar. Searches conducted on Google Scholar were mainly done to search for Gray literature related to the title of this rapid review. The following search terms were used for this rapid review: (“mask” OR “face mask” OR “effectiveness of face mask” OR “N95” OR “surgical mask”) AND (“respiratory tract infection transmission” OR “respiratory tract infection” OR “infection transmission”). No filters related to date or publication status were applied. Moreover, references from all the eligible articles were further searched to retrieve even more additional eligible studies. Articles that were not complete, only had abstracts and which were not related were all excluded. After eliminating duplicate entries, each abstract and title was critically reviewed by all three reviewers to filter out unrelated entries. In order to include relevant reviews, we obtained and studied the full text of any prospective research that met the selection criteria. The outcomes were analysed and discussed by all reviewers. If a discussion between any two reviewers failed to produce an agreement, the third reviewer was asked to reach a consensus. The extracted data were population types, the type of face mask used in the study, the type of setting, the effectiveness of face masks and the rate of infection transmission with and without face masks. Finally, the extracted data were reviewed for authenticity, accuracy, and completeness.

## Results

### Study selection

Six thousand four hundred forty-two (6442) articles were identified in the initial database search, of which 2479 articles had been removed as they were duplicates. The articles were screened based on their titles and abstract and 134 articles were retrieved. After excluding 111 articles for not meeting the inclusion criteria (reasons explained in Figure 1), 23 articles were eligible to be included in the study. Of the 23 studies, 11 were systematic reviews and meta-analysis, 3 were cluster randomised controlled

trials, 2 were literature review, 1 was cross sectional study, 1 was systematised review, 1 was pre-systematic review and 4 of the remaining studies were rapid reviews including 1 technical review.

Figure 1 below showed the study selection process of reports to review the effectiveness of face masks to prevent the transmission of respiratory tract infections (n=6442 studies).

### Study characteristics

Figure 2 represents the settings of the study conducted in the various papers. All of the studies (n=23) included in this review described the use of different types of face masks to prevent the transmission of respiratory tract infections. Table 1 summarises the types of masks used in the studies analysed. Figure 3 depicts the different types of face masks and corresponding number of studies that used them.

For the study population, 8 studies focused the efficacy of usage of face masks among healthcare workers. In one of the studies, it focused on the healthcare workers that were from the emergency departments and respiratory wards. 12 studies focused the effectiveness of face masks in general population, whereas one study focused on non-healthcare workers. There were a few studies that used specific area of population, one study used Asian population meanwhile another study focused on the Western population. One study used focused population of Hajj pilgrims. One study used volunteers with influenza-like illness, whereas one study focused on asymptomatic individuals without COVID-19 infection and confirmed COVID-19 patients. Majority of the studies (n =23) included in the review reported the use of various types of face masks to control the transmission of respiratory infections. Table 3 summarised the background of the studies together with the types of masks used to control the various respiratory infections and their effectiveness in preventing the transmission of respiratory tract infection.

## Discussion

The results regarding the effectiveness of face masks in preventing the transmission of respiratory infections were conflicting. A few studies ( $n = 3$ ) suggested that N95 respirators were more protective as compared to other types of face masks, including surgical or medical masks and cloth masks. According to a cluster randomized clinical trial (RCT) of 1441 hospital HCWs, N95 respirators were shown to be much less susceptible to bacterial colonisation, co-colonization, and viral-bacterial co-infection. Medical masks, on the other hand, were proven to be ineffective and may even increase the risk of viral co-infections. This result might be linked to the physical characteristics of medical masks that enhance moisture or other factors that raise the likelihood of co-infection [7]. The results correspond to those of a randomized clinical study that compared the efficacy of medical masks and N95 respirators (fit checked and non-fit checked) among HCWs. In the medical mask group, the incidence of infections such as clinical respiratory disease, influenza-like illness, laboratory-confirmed respiratory virus, and influenza was twice as high as in the N95 group [9]. Additionally, a literature review demonstrated that N95 respirators decreased substantially the probability of bacterial colonisation by 62% when compared to no mask and by 46% when compared to medical masks [11].

However, according to only one study ( $n = 1$ ) it was still uncertain if N95 respirators provide considerably greater protection than surgical masks for all patient care procedures in a healthcare setting [19].

While some of the studies concluded N95 was superior to surgical face masks, a few studies ( $n = 2$ ) involving N95 respirators and surgical masks suggest both masks were effective in reducing the risk of respiratory tract infections, SARS, and H1N1 among HCWs [16] as well as COVID-19 among the general population [18].

Additionally, few studies ( $n=5$ ) found that face masks in general were effective in mitigating respiratory infections. Systematic reviews and meta-analysis demonstrated that the use of face masks does provide protection against respiratory viral infections in general [20], decrease the risk of contracting SARS-CoV-2 infection [27], block or filter airborne virus-carrying particles [17] and could prevent spread of virus [14]. Furthermore, the length and severity of respiratory tract infection symptoms might be minimised when wearing masks [29]. A study conducted in both Asian countries and Western countries also discovered that wearing masks provided protective effects among both HCWs and non-HCWs [28].

Moreover, several studies ( $n = 5$ ) conducted to find the efficacy of surgical or medical masks revealed both significant ( $n = 4$ ) and non-significant ( $n=1$ ) protective effects against respiratory tract infections. A rapid review and meta-analysis demonstrated that medical face masks had a considerable protective impact in preventing the transmission of all respiratory tract infections, but this was contingent on compliance and use in conjunction with other preventative measures such as thorough hand hygiene [23]. Additionally, a systematic review of the effectiveness of surgical face masks against respiratory infections in mass gatherings, including among Hajj pilgrims and the HCWs who worked there, found significant protection against respiratory illnesses [26]. Furthermore, a study of a cluster RCT to explore the effectiveness, acceptability, and tolerability of non-pharmaceutical intervention in households with an influenza index patient reported statistically significant findings of decreasing influenza transmission across households in both the Mask group and the Mask with Hygiene group. This demonstrated that when implemented early and carefully, non-pharmaceutical interventions (NPI) such as face masks and increased hand hygiene could minimise household influenza transmission [25]. Next, a cross sectional study with voluntary sampling method investigated the

effectiveness of surgical face masks as a source control against Influenza A and Influenza B showed surgical face masks produced a 3.4-fold reduction in viral aerosol shedding. It was crucial to highlight that the number of viral copies in fine particle aerosols, as well as evidence for their infectiousness, implies that they play a key role in seasonal influenza transmission [24]. Besides, according to the findings of a systematic review and meta-analysis, using face masks might significantly decrease the clinical symptoms of respiratory infection in community settings [22]. Furthermore, findings from a systematic review conducted in non-healthcare settings, surgical masks had a moderate but non-significant protective impact on the frequency of acute respiratory infections (ARIs) [21].

In contrast, a few studies (n = 6) found no significant effectiveness of face masks in preventing respiratory infections. A systematic review assessing the efficacy of face masks against COVID-19 in healthcare settings discovered minimal data to support the effectiveness. However, the use of N95 respirators or air supplying respirators, as well as attention to personal hygiene guidelines, regular hand washing, and the use of disinfectants, could help to lower the prevalence of COVID-19 among healthcare personnel [8]. Next, a systematic review and meta-analysis to assess the effectiveness of face mask usage alone or in conjunction with hand hygiene in community settings in minimising the transmission of viral respiratory infection, found no significant decrease of ILI with the use of face masks, with or without hand hygiene, in these settings [10]. Furthermore, findings from a systematic review conducted in non-healthcare settings, indicated that surgical masks had a moderate but non-significant protective impact on the frequency of acute respiratory infections (ARIs) [21]. Similarly, a systematic review and meta-analysis found a non-significant protective effect of mask use in preventing influenza H1N1 infection. The findings indicated that campaigns promoting frequent hand hygiene, along with the use of face

masks in high-risk exposure situations, were likely to contribute to the prevention of pandemic influenza infection [15]. Additionally, there was low to moderate evidence from observational studies suggested that HCWs using face masks and PPE may be effective against COVID-19 [12]. However, another study found that both surgical and cotton masks might not efficiently filter SARS-CoV-2 from the environment or the exterior mask surface [13].

This rapid review has some limitations. First, there is still a lack of high-quality prospective studies with good design and research on mask use in the general population. Secondly, the mode of transmission for each respiratory infectious diseases influences the use, type and efficacy of masks; however, pertinent studies are very few. Thirdly, most of the studies did not address how long the masks were worn or whether they were worn correctly, which plays a huge role in determining how exactly the infection was transmitted. Finally, knowledge of additional influencing variables, including age, gender, culture, hand hygiene, and vaccination, might influence the protective effect of masks and thus needs to be explored in greater detail.

The results of this research, encompassing diverse study designs and exploring the effectiveness of different types of face masks across various groups and scenarios in preventing respiratory infections, revealed that well-fitted face masks were effective when worn consistently. To enhance infection prevention further, it is recommended that individuals also adopt other Non-Pharmaceutical Interventions (NPIs) like practicing good hand hygiene and maintaining social distancing.

## **Conclusion**

This rapid review highlighted the effectiveness of the usage of face mask in preventing the transmission of respiratory tract infections regardless of the type of setting, population, or respiratory pathogen. The findings clearly showed that the usage of masks does indeed offer

a certain degree of protection to both the individual and those around them.

Therefore, the policymakers should encourage face mask use among the general population for health protection. However, more evidence is required in terms of clarifying the usage of the mask in various settings and against diverse types of infection. Several reviews have highlighted the need for further research on personal protective equipment. This is crucial for drawing clearer conclusions and aiding higher authorities in making informed decisions on managing and controlling future pandemics or endemics effectively. It is challenging to prevent the spread of infectious diseases that are transmitted through droplet or airborne routes. In this era of newly emerging infectious diseases, infection prevention and control practices require continuous critical assessment. The public should be encouraged to wear face masks for health protection given the effectiveness of face mask use as a strategy for preventing respiratory infections. This review also demonstrate that there are geographical variations in how people perceive, intend to use face masks, and actually do so. These variations likely result from the diverse effects of various infectious diseases, regional cultures, and local legislation.. Authorities and allied organizations should work to reduce obstacles to wearing face masks and improve adherence by addressing stigma and bias

associated with mask use and educating the public through media and other communication channels.

#### **Conflict of interest**

The authors verified that there were no financial or commercial ties that might be viewed as having a potential conflict of interest.

#### **Declaration of competing interest**

None.

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#### **Authors contribution**

The first four authors designed, managed and wrote the paper as main contributors of this study. The rest of the authors provided intellectual and technical input to the manuscript for publication purpose.

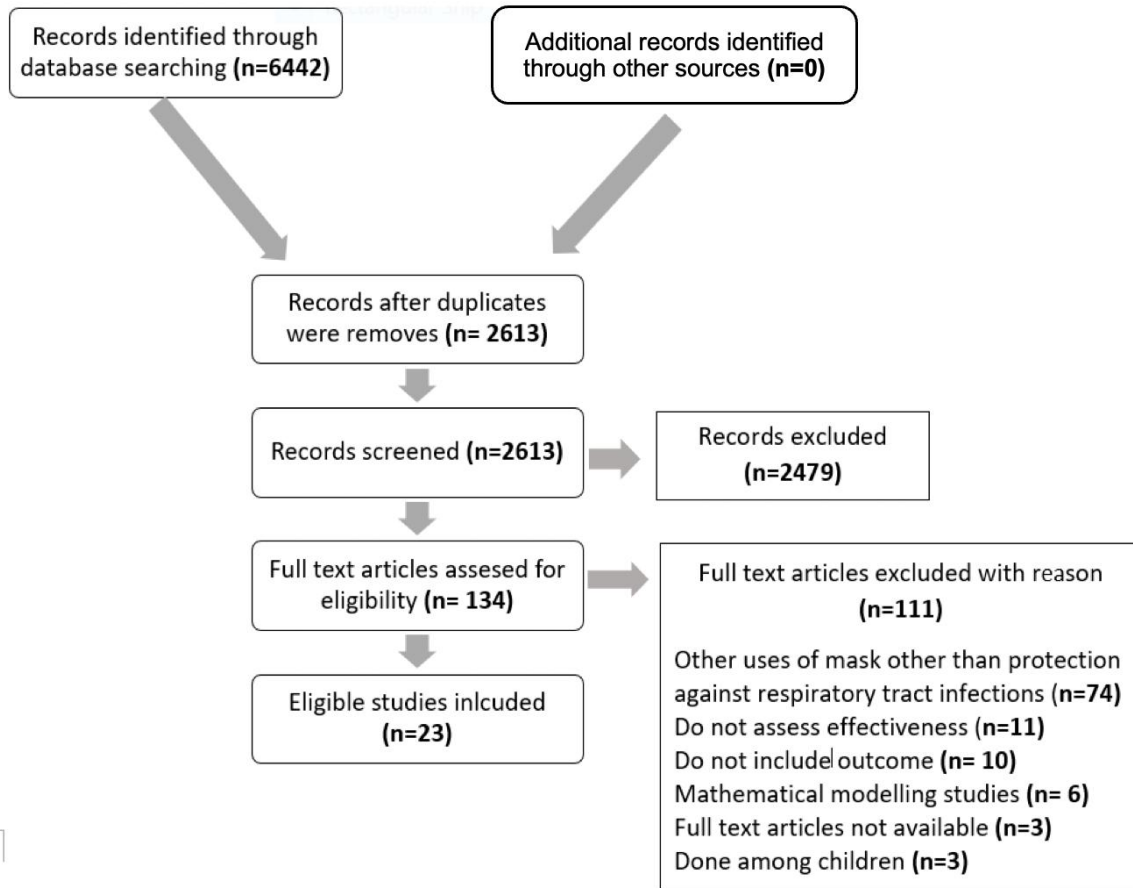


Figure 1. PRISMA flow diagram

Table 1. Types of face mask used and corresponding authors and number of studies

Type of face mask used	Authors	Number of studies (n=)
N95	MacIntyre, et al., 2014 (7), Dehaghi, Ghodrati-Torbati, Teimori, Ghavamabadi, & Jamshidnezhad, 2020 (8), MacIntyre, et al., 2011 (9), Aggarwal, Dwarakanathan, Gautam, & Ray, 2020 (10), MacIntyre & Chughtai, 2015 (11), Mohammad Ibrahim Khalil, 2021 (12), Pires, 2021 (13), Shaterian, Abdi, Kashani, Shaterian, & Darvishmotevalli, 2021 (14), Saunders-Hastings, Crispo, Sikora, & Krewski, 2017 (15), Offeddu, Yung, Low, & Tam, 2017 (16), Mingrui Liao, et al., 2021 (17), Abboah-Offei, et al., 2021 (18), Gamage, et al., 2005 (19) and Kim, et al., 2022) (20)	14
Surgical	Gamage, et al., 2005 (19), Wang, Gwee, Chua, & Pang, 2020 (21), Abboah-Offei, et al., 2021 (18), Mingrui Liao, et al., 2021 (17), Offeddu, Yung, Low, & Tam, 2017 (16), Saunders-Hastings, Crispo, Sikora, & Krewski, 2017 (15), Hui Li, et al., 2022 (22), Mohammad Ibrahim Khalil, 2021 (12), Pires, 2021 (13), Shaterian, Abdi, Kashani, Shaterian, & Darvishmotevalli, 2021 (14), Aggarwal, Dwarakanathan, Gautam, & Ray, 2020 (10), Kim, et al., 2022 (20), Chaabna, Doraiswamy, Mamtani, & Cheema, 2021 (23), MacIntyre & Chughtai, 2015 (11), MacIntyre, et al., 2011 (9), Milton, Fabian, Cowling, Grantham, & McDevitt, 2013 (24), Suess, et al., 2012 (25), Barasheed, et al., 2016 (26), MacIntyre, et al., 2014 (7) and Dehaghi, Ghodrati-Torbati, Teimori, Ghavamabadi, & Jamshidnezhad, 2020 (8)	19
Cloth	Mingrui Liao, et al., 2021 (17), Chaabna, Doraiswamy, Mamtani, & Cheema, 2021 (23) and Dehaghi, Ghodrati-Torbati, Teimori, Ghavamabadi, & Jamshidnezhad, 2020 (8)	3
Non-medical	Shaterian, Abdi, Kashani, Shaterian, & Darvishmotevalli, 2021 (14), Mohammad Ibrahim Khalil, 2021 (12), Pires, 2021 (13) and Kim, et al., 2022 (20)	4
Unspecified	Tabatabaeizadeh, 2021 (27), Liang, et al., 2020 (28), Brainard, Jones, Lake, Hooper, & Hunter, 2020 (29)	3



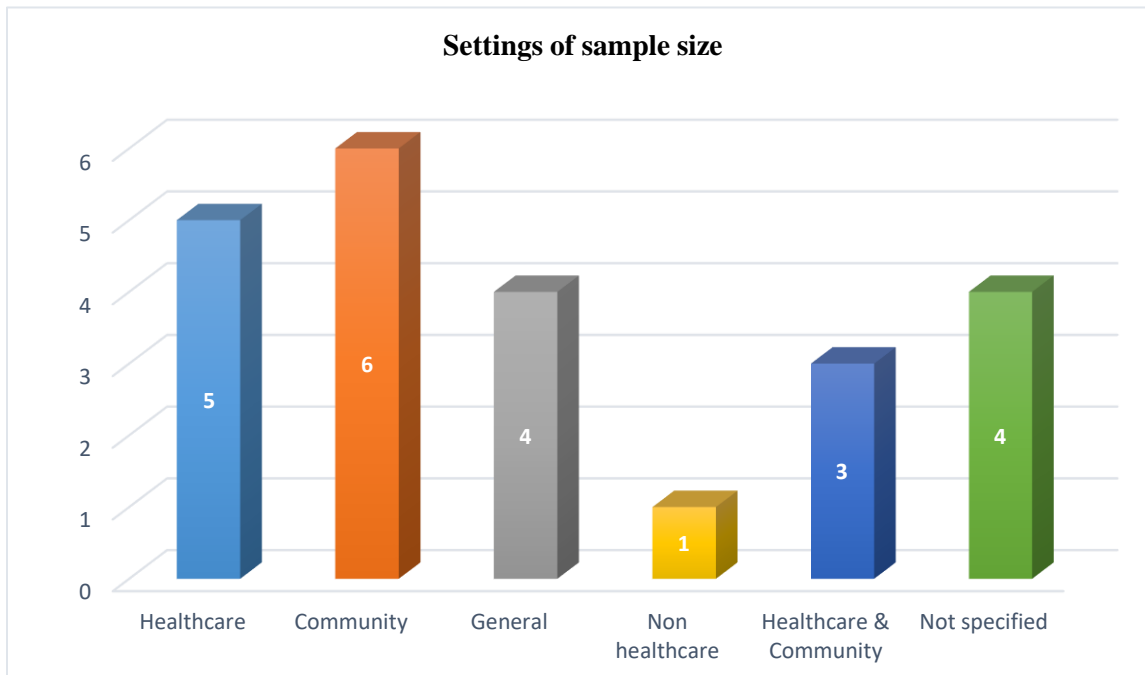


Figure 2. Settings of sample size

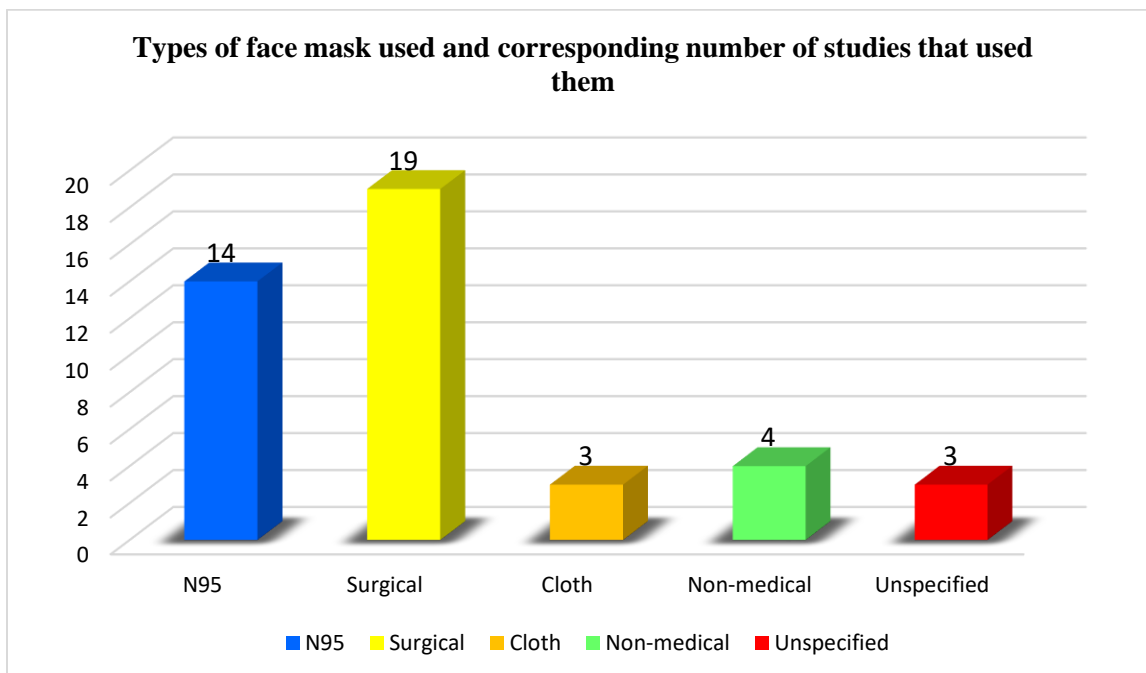


Figure 3. Types of face mask used and corresponding number of studies that used them

Table 1. Study population and corresponding authors

<b>Authors</b>	<b>Study population</b>
Mohammad Ibrahim Khalil, 2021 (12), Dehaghi, Ghodrati-Torbati, Teimori, Ghavamabadi, & Jamshidnezhad, 2020 (8), Liang, et al., 2020 (28), Offeddu, Yung, Low, & Tam, 2017 (16), Barasheed, et al., 2016 (26), MacIntyre, et al., 2014 (7), MacIntyre, et al., 2011 (9) and Gamage, et al., 2005 (19)	Healthcare workers
Suess, et al., 2012 (25), MacIntyre & Chughtai, 2015 (11), Aggarwal, Dwarakanathan, Gautam, & Ray, 2020 (10), Chaabna, Doraiswamy, Mamtani, & Cheema, 2021 (23), Kim, et al., 2022 (20), Pires, 2021 (13), Shaterian, Abdi, Kashani, Shaterian, & Darvishmotevalli, 2021 (14), Hui Li, et al., 2022 (22), Mingrui Liao, et al., 2021 (17), Abboah-Offei, et al., 2021 (18), Wang, Gwee, Chua, & Pang, 2020 (21) and Brainard, Jones, Lake, Hooper, & Hunter, 2020 (29)	General population
Liang, et al., 2020 (28)	Non healthcare workers, Asian population, Western population
Barasheed, et al., 2016 (26)	Pilgrims
Milton, Fabian, Cowling, Grantham, & McDevitt, 2013 (24)	Volunteers with influenza-like illness from the Lowell, MA community, primarily among students and staff of the University of Massachusetts
Saunders-Hastings, Crispo, Sikora, & Krewski, 2017 (15)	Humans exposed to a pandemic influenza

Table 3. Studies included on face mask use in preventing respiratory tract infections

No	Author / Year / Country	Study aim	Population	Sample size	Settings	Types of masks	Type of respiratory infection	Study design	Effectiveness of face mask	Conclusion/Remarks
1.	MacIntyre, et al., 2014 (7) Beijing, China	To compare the efficacy of medical masks and N95 respirators in preventing bacterial colonization/infection in healthcare workers (HCWs).	HCW: nurses and doctors	1922 participants (1441 randomized and 481 control)	Health care	N95 and surgical face masks	Respiratory bacterial infections: Streptococcus pneumoniae, Bordetella pertussis, Chlamydia pneumoniae, Mycoplasma pneumoniae or Haemophilus influenzae type B	Cluster randomized controlled trial	59% efficacy against control of N95 respirators against any co-infection, and 67% against bacterial/viral co-infection. Medical masks were not protective and may in fact increase the risk of viral co-infections.	It is possible that the physical conditions of a medical mask may increase moisture or other parameters to increase risk of co-infection.
2.	Dehaghi, Ghodrati-Torbati, Teimori, Ghavamabadi, & Jamshidnezhad, 2020 (8) Seoul, Wuhan,	To assess the effectiveness of face masks against the novel coronavirus.	HCW	5 studies	Health care	N95, surgical face masks and cloth face masks	COVID-19	Systematic review	There is little evidence to support the effectiveness of face masks to reduce the risk of COVID-19 infection. However, the use of N95	More studies in controlled contexts and studies of infections in healthcare and community places are needed for better definition of the

	Hong Kong								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 healthcare providers.	effectiveness of face masks in preventing coronavirus.
3.	Barasheed, et al., 2016 (26) 55 countries	To synthesise evidence about the uptake and effectiveness of face mask against respiratory infections in mass gatherings.	HCW and Hajj pilgrims	25 studies	Health care and community	Surgical face masks	Respiratory infections	Systematic review	Only 13 studies examined the effectiveness of face mask, and their pooled estimate revealed significant protectiveness against respiratory infections (relative risk [RR]=0.89, 95% CI: 0.84-0.94, p<0.01), but the study end points varied widely.	The main limitation is that most of the studies were of 'average' or 'below average' quality.
4.	Suess, et al., 2012 (25)	To investigate efficacy, acceptability	General population	302 participants	Community	Surgical face masks	Influenza H1N1, Influenza	Cluster randomised	Statistically significant results of lowered	Household transmission of influenza can be

	Berlin, Germany	y, and tolerability of non-pharmaceutical intervention in households with influenza index patient.	which involving households above 14 years old				a B and Influenza-like illness	controlled trial	influenza transmission among households in both Mask group and Mask with Hygiene group.	reduced using non-pharmaceutical interventions (NPI), such as face masks and intensified hand hygiene, when implemented early and used diligently.
5.	Milton, Fabian, Cowling, Grantham, & McDevitt, 2013 (24) USA	To investigate the effectiveness surgical face masks as a source control.	Volunteers with influenza-like illness from the Lowell, MA community, primarily among students and staff of the University of Massachusetts	89 participants	Community	Surgical face masks	Influenza A and Influenza B	Cross sectional study design with voluntary sampling method	Overall, surgical face masks produced a 3.4-fold reduction in viral aerosol shedding.	The abundance of viral copies in fine particle aerosols and evidence for their infectiousness suggests an important role in seasonal influenza transmission.
6.	MacIntyre, et al., 2011 (9) Beijing, China	To compare the efficacy of medical masks, N95 respirators	Hospital HCWs aged above 18 years old	1441 participants	Health care	N95 respirators fit-tested, N95 respirators	Clinical respiratory illness, Influenza-like illness, laboratory	Cluster randomized clinical trial	The rates of CRI (3.9% versus 6.7%), ILI (0.3% versus 0.6%), laboratory-confirmed respiratory	Rates of infection in the medical mask group were double that in the N95 group. A benefit of

		(fit tested and non-fit tested), in HCW.	and from the emergency departments and respiratory wards of 15 hospitals.			non-fit-tested and medical masks	ry-confirmed viral respiratory infection and laboratory-confirmed influenza A or B.		virus (1.4% versus 2.6%) and influenza (0.3% versus 1%) infection were consistently lower for the N95 group compared to medical masks.	respirators is suggested but would need to be confirmed by a larger trial, as this study may have been underpowered.
7.	MacIntyre & Chughtai, 2015 (11)	To inform policy makers and stakeholders by examining and summarising the available evidence related to the efficacy of face masks and respirators, current practice, and guidelines, as well as highlighting the gaps in evidence.	General population	14 studies	Community and healthcare	Medical masks and N95 respirators	Respiratory infection (Viral infection, bacterial infection, influenza)	Literature review	None of the four RCTs showed that medical masks were efficacious, although efficacy might have been at a lower level than the trials were able to detect. N95 respirators significantly reduced the risk of bacterial colonisation by 62% compared with no mask and by 46% compared with medical masks, which were not efficacious.	Health economic analyses of face masks are scarce and the few published cost effectiveness models do not use clinical efficacy data. The lack of research on face masks and respirators is reflected in varied and sometimes conflicting policies and guidelines.

8.	Aggarwal, Dwarakanathan, Gautam, & Ray, 2020 (10)	To estimate the effectiveness of face mask, use alone or along with hand hygiene in community settings in reducing the transmission of viral respiratory illness	General population	17 studies	Community	Medical masks and N95 respirators	Influenza-like illness	Systemic review and Meta-analysis	The pooled estimate of the randomized control trials did not show any significant reduction of ILI using face masks with or without hand hygiene in community settings.	Available evidence does not confirm a protective effect of face mask usage alone in a community setting against influenza-like illnesses (and potentially, the COVID-19). For maximum benefit, mask use should be combined with other essential non-pharmaceutical interventions like hand hygiene.
9.	Chaabna, Doraiswamy, Mamtani, & Cheema, 2021 (23)	To inform policymakers and stakeholders by examining and synthesizing available evidence on the effectiveness of cloth and medical face masks for preventing transmission of respiratory	General population	12 primary studies	Community	Medical and cloth face masks	Influenza, influenza-like illness, SARS-CoV, and SARS-cov-2	Rapid review and Meta-analysis	The current meta-analysis demonstrated a significant protective effect of medical face mask use (combined or not with other interventions) in preventing the transmission of all respiratory infections, including	Medical face mask effectiveness is dependent on compliance and utilization in combination with preventive measures such as intensive hand hygiene.

		infections in community settings and pointing out the gaps in evidence.							SARS- CoV -2 and SARS- CoV	
10	Kim, et al., 2022 (20)	To evaluate the comparative prevention effectiveness of the most common types of face maskss (N95 respirators, surgical or medical masks, and non-medical masks) that have been used as personal protective equipment (PPE) by network meta-analysis	General population	35 articles	Health care and community	N95 respirators, surgical or medical masks, and non-medical masks	Respiratory viruses (influenza virus, SARS-CoV, MERS-CoV, and SARS-cov-2)	Systematic review and Meta-analysis	Our study demonstrated that the use of face masks provides protection against respiratory viral infections in general. Among various types of face masks, it is slightly safer to use N95 or equivalent in healthcare settings as PPE for the moment until more evidence on other types of masks are realised.	Our study confirmed that the use Of face masks provides protection against respiratory viral infections in general. However, the effectiveness may vary according to the type of face mask used. Our Findings encourage the use of N95 respirators or their equivalents for best Personal protection in healthcare settings until more evidence on surgical and



										Medical masks are accrued. This study highlights a substantial lack of evidence on the Comparative effectiveness of mask types in community settings.
11	Mohammad Ibrahim Khalil, 2021 (12)	To quantify the risk of COVID-19 among surgeons and explore whether face masks and other PPE could minimise the risk of COVID-19 among surgeons.	Health care workers	14 primary studies and 11 systematic reviews	Health care	N95 respirators, surgical or medical masks, and non-medical masks	SARS-cov-2	Systemised review (Not a systematic review)	There is low to moderate evidence from observational studies that face mask and PPE use by HCWs may be beneficial against COVID-19, although these are grossly underutilized.	We note that surgeons are at risk of COVID-19, although the precise risk could not be estimated.
12	Pires, 2021 (13)	To review, analyse and discuss all works about the wearing and development of face masks as potential protection	General population	21 studies	Not specified	N95 respirators, surgical or medical masks, and non-medical	SARS-CoV-2	Pre-systematic review	Worryingly, during coughing, both surgical and cotton masks may not effectively filter SARS-cov-2 from the environment	-

		against SARS-COV-2 during the COVID-19 pandemic.				1 masks			and external mask surface, which is also reinforced by the facts that particles 0.04 to 0.2 μm can penetrate surgical masks and that surgical masks and unvented KN95 respirators only reduce the outward particle emission rates by 90% and 74% (average values), respectively, when speaking and coughing in comparison to wearing no mask.	
13	Shaterian, Abdi, Kashani, Shaterian, & Darvish motevalli, 2021 (14)	Aimed to assess the impact of face masks and respirators on reducing the spread of respiratory viruses.	General population	10 articles	Not specified	N95 respirators, surgical or medical masks, and non-medical masks	SARS-CoV -2, MERS, MERS-CoV, Rhinovirus, Influenza A viruses (H1N1), Influenza B	Systematic review	This systematic review showed that using face masks or respirators aided in preventing the spread of respiratory viruses. The result of the present	We recommend conducting more studies on the effect of each type of face mask and respirator, individually, and on the prevention of the spread of different viruses.

							viruses, Parainfluenza 1,2 and 3 viruses, Enteroviruses, Adenoviruses, Human metapneumoviruses, Respiratory syncytial virus A or B, Coronaviruses, Picornaviruses, and Enteroviruses		systematic review showed that using face masks could prevent the spread of virus.	Moreover, we suggest assessing the effect of simultaneous use of masks, duration of using a face mask, and distance between healthy people and the person infected with respiratory viruses.
14	Hui Li, et al., 2022 (22)	This systematic review and meta-analysis aimed to firstly evaluate the efficacy of medical masks use on reducing the respiratory infection in community settings,	General population	8 RCT studies on efficacy of face masks use, 78 studies for perception, intention, and practice towards wearing face mask.	Community	Medical mask	Respiratory infection	Systematic Review and Meta-analysis	Our results suggest face mask use may significantly reduce the clinical symptoms of respiratory infection.	The governments and related organizations should make effort to increase the compliance of face mask use and reduce barriers associated with the use of face masks, such as reducing stigma and prejudice on face mask use,

		and secondly estimate the perception, intention, and practice regarding wearing face masks among the general population during infectious disease pandemics.								public education through media and other communication channels.
15	Saunders - Hastings, Crispo, Sikora, & Krewski, 2017 (15)	To examine the effectiveness of personal protective measures in preventing pandemic influenza transmission in human populations.	Humans exposed to a pandemic influenza	16 studies (Eight studies evaluated the effectiveness of face mask use in preventing pandemic influenza infection)	Not specified	Hand hygiene, surgical masks, and N95 respirators	H1N1 Influenza	Systematic Review and Meta-analysis	Meta-analysis found a non-significant protective effect of mask use in preventing influenza infection	Despite persisting knowledge gaps in relative effectiveness between interventions and across population groups, results suggest that campaigns to increase the frequency of hand hygiene, alongside use of face masks in situations with a high risk of exposure, are likely to contribute to preventing pandemic

										influenza infection.
16	Offeddu, Yung, Low, & Tam, 2017 (16)	To develop evidence-based recommendations to reduce the occupational risk of respiratory infection among medical personnel.	Health care workers	29 studies (23 observational studies and 6 randomized controlled trials)	Not specified	N95 respirators and medical mask	SARS H1N1	Systematic Review and Meta-analysis	We found evidence to support universal medical mask use in hospital settings as part of infection control measures to reduce the risk of respiratory tract infection among HCWs	Our analysis confirms the effectiveness of medical masks and respirators against SARS.
17	Brainard, Jones, Lake, Hooper, & Hunter, 2020 (29)	To assess effectiveness of wearing face masks in the community to prevent respiratory disease and recommend improvements to this evidence base.	General settings	33 studies (12 randomized control trials (RCTs) were included.	Community	Not specified	Respiratory illness, such as from coronaviruses, rhinoviruses, influenza viruses or tuberculosis	Rapid scoping review	It is possible that face mask wearing reduced duration or severity of symptoms experienced due to reducing infectious dose received, although not actual disease.	Wearing face masks may reduce primary respiratory infection risk, probably by 6-15%.
18	Liang, et al., 2020 (28)	To evaluate the effectiveness of the use of masks to	Health care workers, non-healthcare worker	21 studies	General	Not specified	Influenza, SARS, Covid-19	Systematic review and meta-analysis	Wearing masks does provide protective effects in both Asian countries and	This study adds additional evidence of the enhanced protective value of

		prevent laboratory-confirmed respiratory virus transmission.	s, Asian population, Western population						western countries by 69% and 55%, respectively. Among HCWs, it reduced the risk in both Asian and western countries. Especially, for non-healthcare populations, reduced risk of 54% was found in western countries, and a reduced risk of 49% was found in Asia.	masks, we stress that the use masks serve as an adjunctive method regarding the COVID-19 outbreak.
19	Mingrui Liao, et al., 2021 (17)	To review the design, manufacturing, functional performance, and effectiveness of various types of face masks.	General population	4 studies	General	N95 mask, surgical mask, and cloth mask	Covid-19	Technical review	Face masks wearing can block or filter airborne virus-carrying particles through the working of colloid and interface science.	Although the current demand has driven many commercial masks from various manufacturers and suppliers, there is a lack of agreed standards or requirements concerning their manufacturing and testing that would provide

										evidence-based guidelines on their safe use for the general public, and hence, fit for purpose.
20	Abboah-Offei, et al., 2021 (18)	To investigate the impact face mask use has had in controlling transmission of respiratory viral infections.	General population	58 studies (13 systematic reviews and 45 quantitative studies)	General	N95 and surgical mask	Covid-19	Rapid review	Face masks use have shown a great potential for preventing respiratory virus transmission including COVID-19.	Regardless of the type, setting, or who wears the face mask, it serves primarily a dual preventive purpose, protecting oneself from getting viral infection and protecting others. Therefore, if everyone wears a face mask in public, it offers a double barrier against COVID-19 transmission.
21	Wang, Gwee, Chua, & Pang, 2020 (21)	This review aims to summarize and assess the association between surgical mask wearing	General population	23,892 (15 studies)	Non healthcare	Surgical mask	Acute respiratory illness	Systematic review	A modest but non-significant protective effect of surgical masks on acute respiratory illnesses (ARIs)	Surgical mask wearing among individuals in non-healthcare settings is not significantly associated with reduction in ARIs

		and acute respiratory infection incidence, from existing interventional and observational studies conducted in non-healthcare settings.							incidence was observed.	incidence in this meta-review
22	Gamage, et al., 2005 (19)	The purpose of this paper is to review the findings of a literature search on the effectiveness of infection control practices aimed at preventing occupational-associated transmission of infectious respiratory agents in the health care setting	Health care workers	168 studies	Health care	Surgical mask and N95 respirators	SARS	Literature review	It is still unclear whether N95 respirators offered significantly better protection than surgical masks for all patient care activities	Failure to implement appropriate barrier precautions is responsible for most nosocomial transmissions
23	Tabatabaizadeh, 2021 (27)	This study is aimed to investigate the airborne	Asymptomatic individuals	7688 participants (4 Studies)	General	Not specified	Covid-19	Meta-analysis.	Meta-analysis of studies has suggested that the use	In conclusion, there is association between face mask use and



	transmission of COVID-19 and the role of face mask to prevent it.	without COVID-19 infection and confirmed COVID-19 patients.						of the face mask was associated with a decreased risk of SARS-CoV-2 infection ( $P < 0.001$ )	reduction of COVID-19
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