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# AN OVERVIEW; IMPACTION OF RESPIRATORY INFECTION ON PUBLIC HEALTH AND PREVENTION MEASURES

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**Abstract:**

*Healthcare-associated respiratory infections are linked to increased morbidity, mortality, and healthcare costs. Respiratory infections are common in hospitalised children and other immunocompromised or immunologically naive patients, and awareness of the seriousness of these infections in adults is growing. The most common causes of these infections are influenza, respiratory syncytial virus (RSV), and rhinovirus. Narrative review conducted and searched PubMed, Science Direct and more databases for relevant articles published in English up to 2022. We included quasi experimental studies, clinical trials, cohort studies, longitudinal studies, case-control studies, and interrupted time series. We included studies that investigated the effect of the implemented public health measures to prevent and control respiratory infections. Because of the highly contagious nature of viral illnesses and their contributions to morbidity and mortality, prevention of respiratory viral transmission is critical in the healthcare setting. Infection control measures to prevent healthcare-associated illnesses can be supplemented with PCR testing to determine viral causes, but the cornerstone of prevention is human behaviour adhering to known practises to prevent the transmission of respiratory infections from one person to another.*

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## INTRODUCTION:

Acute respiratory infections (ARIs) are the leading infectious disease cause of morbidity and mortality worldwide. Every year, nearly four million people die from ARIs, with lower respiratory tract infections accounting for 98% of these deaths. Infant, child, and elderly mortality rates are particularly high, particularly in low- and middle-income countries [1, 2] ARIs are one of the most common reasons for consultation or admission to a health-care facility, particularly in paediatrics [3].

In many countries, Streptococcus pneumoniae is the most common cause of bacterial community-acquired pneumonia. However, viruses or mixed viral-bacterial infections are the most common pathogens that cause ARIs. ARIs with epidemic or pandemic potential that may pose a public-health risk require extra precautions and planning [4].

Many people have recently been affected by a terrible global pandemic caused by coronavirus disease 2019 (COVID-19). COVID-19 has a similar presentation to respiratory infection in that it causes respiratory disease that can range from asymptomatic or mild to severe disease and death [5]. However, respiratory infections such as the common cold, influenza, influenza-like illness, and especially seasonal influenza cause annual epidemics around the world, resulting in a significant public health burden [6]. It is also still a major cause of death in low-income countries. In other words, because it is very common among the public and its rate of transmission and mortality is not as rapid as COVID-19 [7], the respiratory infection's substantive morbidity, mortality, and economic costs may be overlooked.

For the prevention of infectious diseases, the World Health Organization (WHO) has recommended both pharmacological interventions and non-drug treatments [5]. So far, several therapeutics have been developed, with influenza vaccination clearly being the most important prevention strategy [6]. Non-pharmaceutical interventions, however, may be important in the absence of adequate vaccine supply and to reduce transmission of various respiratory viruses because the large number of immunotypes precludes vaccine development [7]. One major pharmacological intervention, for example, is often less effective in the elderly due to weakened immune systems, chronic disease complications, nutritional deficiencies, and a lack of exercise, among other factors [8].

## METHODOLOGY:

To search and identify articles for inclusion, 8 electronic journal databases, e.g., Embase, Medline, PubMed, Web of Science, Scopus, Cumulative Index to Nursing and Allied Health (CINAHL), SciELo, and Cochrane library were involved. The search period for published studies was set up to the 2022. More relevant articles were included after reviewing the references of found studies.

## DISCUSSION:

The respiratory infection is spread through direct contact with infected people, exposure to virus-infected fomites, and inhalation of infection aerosols [9]. As a result, some public health behaviours, such as hand hygiene and proper respiratory etiquette, have been identified as important non-pharmaceutical interventions for infection prevention [10]. Hand sanitizers and face masks were stockpiled during pandemic preparation and are currently recommended in several countries. A systematic review and a meta-analysis [11,12] found that changing one's hygiene behaviour by handwashing with soap was effective in reducing respiratory illness.

Kawewchana et al. [13] investigated the effect of intensive hand washing education on children's hand-washing behaviours using interactive participations such as individual training, a self-monitoring diary, and the provision of soap. The authors found that both the frequency and quality of hand washing had improved. Furthermore, Nicholson et al. [14] demonstrated that direct-contact hand-washing interventions for younger school-aged children can affect the health of the entire family. Surprisingly, even in military units, hand-washing during field training was an effective preventative measure that significantly reduced the incidence of respiratory infection [15].

Measurement tools used in previous studies for non-pharmaceutical interventions can be classified into medical, psychosocial, and health behaviour domains. For example, incidence of respiratory infections, respiratory infection episodes, and inflammatory biomarker levels were used in the medical domain, whereas quality of life, social network, social capital, stress, and self-efficacy were used in the psychosocial domain [9,10]. Knowledge, Attitude, and Practise (KAP) in the health behaviour domain adopted the frequency and quality of hand washing [13].

Canini et al. [16], on the other hand, failed to confirm any significant effect of surgical facemasks in reducing influenza transmission by large droplets produced during coughing. Larson et al. [17] found no

significant difference between three methods of education, education with alcohol-based hand sanitizer, and education with hand sanitizer and face masks, when applied to as many as 509 participants. Despite having large sample sizes, they concluded that hand sanitizer and/or face masks had no significant advantage over targeted education, except for reduced secondary transmission in the mask-wearing condition.

Furthermore, the findings of Najnin et al. [18] supported the claim that the prevalence of respiratory illness was comparable between a control group and two experimental groups, namely, cholera-vaccine-only and vaccine-plus-behavior-change such as handwashing promotion and drinking water chlorination.

The SARS coronavirus (SARS-CoV) infects both animals and humans and causes SARS. The disease was first reported in Asia in February 2003, and it spread to more than 24 countries in Asia, Europe, North America, and South America before being contained [19]. SARS is not currently known to be circulating among humans, but it may be circulating in animal hosts and thus re-emerge in humans. SARS is primarily transmitted from person to person via droplets or direct contact, though transmission via infectious respiratory aerosols of various sizes may occur at close range [20].

**Influenza virus causing human infection:**

Humans, birds, pigs, horses, and seals are all susceptible to influenza viruses. The primary reservoir for influenza A viruses is birds. Influenza viruses typically infect people in sporadic or seasonal outbreaks; however, when a new human influenza virus emerges, it can cause a worldwide pandemic. Seasonal epidemics are caused by influenza viruses that have evolved to thrive in human hosts. When an influenza virus capable of infecting humans first appears in another species, it is not yet adapted to humans and may circulate in animal hosts, resulting in sporadic human infections. Any new influenza virus that generates sporadic cases of human infection may pose a pandemic risk because it may later evolve the ability for sustained human-to-human transmission. To reduce the risk of serious public health consequences from new influenza viruses, early detection, isolation, and warning of sporadic infections is critical [21].

Direct transmission of avian influenza viruses, such as H5N1, H7N9, H7N2, and H9N2, to humans has been documented on numerous occasions, with a high fatality rate [22]. In recent years, the most common avian virus infecting humans has been avian influenza A(H5N1), which can be highly pathogenic. Human cases of H5N1 were first reported in the Hong Kong Special Administrative Region (SAR) of China in 1997 and have since spread to other countries. Because A(H5N1) is thought to be widely circulating among wild birds, more cases in humans are expected. Contact with infected poultry (e.g., domesticated chickens, ducks, or turkeys) or surfaces contaminated with secretions or excretions from infected birds has resulted in most human cases of avian influenza infection. No efficient or sustained human-to-human transmission of avian influenza A(H5N1) has been demonstrated thus far. In the potential cases of human-to-human transmission, infection was linked to close, unprotected contact, implying that the virus spread via respiratory droplets or contact [23].

The pandemic influenza A (H1N1) 2009 virus was created by the genetic recombination of swine, avian, and human viruses, and it spreads quickly through human-to-human transmission. A(H1N1) pdm09 was first identified in North America in April 2009, and it quickly spread around the world, causing a pandemic between June 2009 and August 2010 [24].

Throughout history, infectious diseases have spread across populations and regions, and it is likely that newly emerging infectious diseases will continue to be identified. Many infectious diseases that have animal reservoirs can occasionally infect humans. Human cases of influenza A(H7N9), which first appeared in 2013, and Middle East Respiratory Syndrome (MERS) coronavirus, which first appeared in 20121, are two examples that occurred after the 2009 influenza pandemic [24].

**PREVENTION MEASURES:**

PERSONAL PROTECTIVE EQUIPMENT AND INFECTION CONTROL PRACTISES:

Recent experiences with pandemic H1N1 influenza and severe acute respiratory syndrome (SARS) highlight challenges that HCWs face in selecting the appropriate type of facial and respiratory protection in clinical situations [25]. The type of facial protection required is determined by the type of infectious particle involved in transmission.

Respiratory viral infections that may not require airborne isolation can increase the risk of transmission to HCWs during aerosol-generating procedures (AGPs), such as positive pressure ventilation, endotracheal intubation, airway suctioning, high-frequency oscillatory ventilation, tracheostomy, chest

physiotherapy, nebulizer treatment, sputum induction, and bronchoscopy. Tracheal intubation was most consistently associated with an increased risk of SARS transmission [26]. Transmissibility of the influenza virus during most of the AGPs in a small study from the United Kingdom did not find an increased probability of influenza virus-containing aerosol, but the study did find a trend in detection above baseline values in bronchoscopy and airway suctioning [27]. Masks confined to the mouth and nose do not prevent transocular transmission of respiratory viruses. Transocular transmission was reported in individuals exposed to live-attenuated influenza virus-containing aerosols, with rapid spread to the nasopharynx most likely via the nasolacrimal duct. The same study demonstrated that the N95 respirator with eye protection provided the best barrier protection against influenza virus contained in aerosols [28].

Consistent and correct use of face masks is a critical public health strategy for reducing SARS-CoV-2 respiratory transmission, especially given estimates that approximately half of new infections are transmitted by people who have no symptoms [26,28]. There is now compelling evidence that cloth face masks are beneficial for both source control (to protect others) and, to a lesser extent, wearer protection. The CDC recommends nonvalved, multilayer cloth masks or nonmedical disposable masks for community use to preserve the supply of N95 respirators for health care workers and other medical first responders. Face mask use is especially important in enclosed spaces and when a physical distance of 6 feet cannot be maintained. When a member of the household is infected or has recently had potential COVID-19 exposure (e.g., known close contact or potential exposure related to occupation, crowded public settings, travel, or non-household members in your house), face masks should be worn [29].

Maintaining a physical distance of 6 feet reduces the risk of SARS-CoV-2 infection from infectious respiratory droplets and aerosols and is important even if no symptoms are present, because transmission can occur from asymptomatic infected people [27]. Close physical contact, shared meals, and being in enclosed spaces have all been linked to an increased infection risk outside of the home [28]. Although the impact of physical distancing is difficult to separate from the impact of other interventions, one study estimated that physical distancing reduced the average number of daily contacts by up to 74% and the reproductive number (R0, a measure of transmission that describes the average number of people infected by one infectious person) to 1. Because the highest risk of transmission has been documented among household contacts of COVID-19 patients [29], keeping the household safe necessitates physical separation, the use of the other public health strategies summarized here, and, in particular, consistent and correct use of face masks (outside the household and in some circumstances within the household) to prevent SARS-CoV-2 introduction and transmission. Physical barriers and visual reminders at the community level may promote adherence to maintaining physical distance [29].

**Avoiding nonessential indoor spaces and crowded outdoor settings:**

Exposures in unnecessary indoor and crowded outdoor settings pose a preventable risk to all participants. Indoor venues (e.g., restaurant dining) where distancing is not maintained, and consistent use of face masks is not possible have been identified as particularly high-risk scenarios. Crowded outdoor events have also been linked to the spread of SARS-CoV-2, though separating the impact of crowded outdoor events from related indoor social interactions can be difficult [30]. To mitigate risk, some restaurants offer take-out and well-ventilated open-air dining, and in many cases, exercise or physical activity (individual or group) can be moved to outdoor settings where physical distance is maintained, and face masks are worn. Community-level policies can reduce transmission even further by encouraging flexible worksites (e.g., telework) and hours, as well as limiting the occupancy of indoor spaces and the size of social gatherings [31].

**Increased testing, diagnosis, and isolation:**

Isolation is used to separate people infected with SARS-CoV-2 from those who are not; people who are found to be infected through testing should be isolated as soon as possible.Estimates vary, but >40% of SARS-CoV-2 infected people may be asymptomatic, and transmission from presymptomatic people (those who are not symptomatic when they transmit infection but later develop symptoms) and asymptomatic people (infected people who never develop symptoms) is estimated to account for >50% of all transmission [29,30]. As a result, relying on symptom screening to identify infected individuals is insufficient. Increased testing is an important strategy for preventing SARS-CoV-2 silent transmission from asymptomatic and presymptomatic individuals. However, because the sensitivity of available tests and the time since exposure vary, a negative test may provide false reassurance; thus, all prevention strategies, including the use of face masks and maintaining physical

distance, should be continued. A comparison of data from six large countries revealed that high levels of testing, combined with robust contact tracing, can significantly reduce SARS-CoV-2 transmission [32]. SARS-CoV-2 transmission on a college campus was effectively limited by frequent testing and contact tracing, in conjunction with other mitigation measures. A strategy of routinely testing certain population groups with high numbers of interactions with other persons, based on their occupational or residential setting, can more quickly identify asymptomatic and presymptomatic infectious persons and their close contacts for isolation and quarantine, in addition to testing symptomatic persons and those with known exposure. Communities with high or increasing SARS-CoV-2 transmission should increase screening testing, focusing on people who are at higher risk of exposure (e.g., workers in high-density workplaces) or who have the potential to infect large groups of people (e.g., people working in congregate settings) or to infect people who are at high risk of severe COVID-19 illness or death (e.g., nursing home staff). Expanded screening testing should be implemented in a way that promotes health equity for people with limited financial resources or other barriers to health care access. Furthermore, prompt reporting of test results to the person tested as well as public health authorities can aid in rapid isolation, case investigation, and contact tracing, as well as accurate monitoring of COVID-19 in the community [33,34].

**Quarantine, and test close contacts:**

Case investigation is the process of gathering detailed information about people who have been diagnosed with COVID-19. It is followed by contact tracing, which involves identifying and communicating with people who have been exposed to SARS-CoV-2 (i.e., close contacts) to inform them of their exposure, educate them about the risks and symptoms of COVID-19, and encourage them to quarantine, seek testing, and monitor themselves for signs or symptoms of illness. A person who has been exposed to SARS-CoV-2 is quarantined to keep them away from other people. When the incidence of COVID-19 in the community or workplace is low or declining, testing and reporting of results can occur quickly, and most contacts can be reached and quarantined, contact tracing is most feasible [35].

## CONCLUSION:

With no effective treatment and vaccine against respiratory viruses, public health measures and non-pharmaceutical interventions are vital to reduce the infection and mortality rate. Some interventions are not efficient enough when implemented alone and could not contain the outbreak, thus, depending on the country and the phase of the epidemic multiple interventions are needed to be applied together to bring the outbreak under control.

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