



Impact of Applied Protective Measures of COVID-19 on Public Health

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Abstract

Background: COVID-19 is one of the emerged pandemic that threaten the globe.

Aim: The aim of the study is to Perform a literature search to investigate possible protective measures which impact on public health and its positive and negative effects during covid-19 pandemic.

Methods: Internet search in scientific publications and collecting data regarding different protective measures like facemask use, wearing gloves, social distancing, forehead temperature measurement by IR thermometer. Besides, we will highlight the negative effects of smart phone, and social media, and their impact on covid-19 spreading.

Discussion and Conclusion: Several reviews indicated that face mask contributes to some extent in reduction of viral infection spreading. Maintaining a distance of 1.5 meter between individuals could limit the infection outspread and breaking the chain of covid-19. Medical gloves provide a barrier between healthcare professionals and potential risks like patients' biological specimens. Unlike pediatric use, non-contact IR temperature measurement devices evidences indicated that they are not accurate in adults and may give a false negative results, due to vasoconstriction of blood flow to the foreheads and excessive sweating and so can be misleading. Smartphone use, and social media can lead to a negative health impacts like brain activity alterations, besides their significant influence on the rise of panic and fear associated with the outbreak of COVID-19. Face shields can be used in conjunction with other protective measures like face masks to provide more protection. Throat gargling could be beneficial in reducing viral load but needs more investigation. Herbs, and healthy diet including fruits and vegetables, and homemade food can contribute in prevention of covid-19 infection. Yoga practice can be a complementary measure for those at risk of covid-19 infection. Breathing exercise did not prove any evidence to help people with a dry cough or mild covid-19 infection. Several covid-19 vaccines are now gained exceptional approval for use and showed good and wide range of efficacy.

Keywords: COVID-19; Face Mask; Social Distancing; Medical Gloves; Public Health

Introduction

Various viral infections have shown a major impact and are responsible for millions of deaths in various countries worldwide.

WHO has declared a global emergency over a recent unprecedented outbreak of Coronaviruses (COVID-19) in Wuhan, China. According to a statistical report, coronaviruses have spread to 178 countries

out of 195, with a total case of 162,184,263 coronavirus infections and 3,364,446 deaths reported till May 16th 2021 [1].

Coronavirus infections can spread through contact, or droplets suspended in the air. By taking the appropriate preventive measures, infection transmission can be reduced. The routine use of soap, hand sanitizer, as well as personal protective equipment like (PPE) masks, face protector, and gowns are the basis of viral infection prevention. Antiseptic hand soaps, for example, provide a larger decrease in microbes counts in a short period of time than regular soaps [2].

Furthermore, alcohol-based sanitizer inhibits viral growth by precipitating surface proteins that break the coronavirus transmission chain. Besides that, the biocidal potentiality of the sanitizers is largely determined by the strength of the alcohol. Since the 1960s, historical evidence has confined the case of coronavirus existence to patients with common cold-like symptoms [3].

Hand sanitization is the main aspect of supportive care to limit viral infection spreading, where, the recommended concentrations of ethyl alcohol are 60% to 70% and isopropanol 70% to 72% for effective virucidal activity. Surface disinfectants such as a mixture of 45 percent isopropanol and 30 percent n-propanol (70 - 100 percent), glutardialdehyde (0.5 - 2.5 percent), formaldehyde (0.7 - 1 percent), and povidone-iodine (0.23 - 7.5 percent) were proven to be effective and inactivate coronavirus [4].

The presence of bio-fluids and faeces in our environment makes COVID-19 appropriate for infection transmission through the surface. Thus, the protective measures will be critical in containing the COVID-19 disease outbreak [5].

Results and Discussion

Protective measures

Face mask

Wearing of masks is among the main protective precautions in COVID-19 management which can achieve, at least, two roles in mitigating the chances of viral transmission in the normal community. Initially, masks can have an impact on the formation of turbulent gas clouds and breathing microbe emissions [6]. Evidence found indicated that masks can obstruct rapid air flow due to coughing or redirecting it in far less harmful ways to reduce airborne infections [7]. Secondly, aerosols as well as droplets containing viral particles,

may be cleared by mask fabric [8]. In addition, by using mask for self-protection in cases of asymptomatic infections may probably lower the risk of infecting other individuals [9].

Masks are classified into three types: medical certified masks that meet government certification standards as N-95 masks, non-certified medical masks but following the laws of the FDA as a regulated medical product as disposable medical masks, and homemade face masks, the quality of which cannot be assured [9]. Generally, certified and medical masks can reduce the load of viruses in effective manner [10].

According to the guidelines and the data available on certified and non-certified medical masks, it has been noted that the potential for the mask material to reduce virus is not necessarily equivalent to the rate of mask viral reduction [11].

It was supposed that wearing masks in community could have a limited lowering factor without performing any fit tests, and providing training or directions. Previous research compared commercial medical masks versus homemade cloth ones, suggesting lower particle penetration protection by homemade cloth masks and bare cloth protection. Although cough pressure can be considerably lowered through wearing masks of any kind. Thus, it was supposed that less than 1 to 2 log₁₀ lowering factors for routine mask wearing in the society [11].

Researchers supposed that the base aerosol reduction percent of commercial medical masks products was approximately 60 percent, suggesting that the best decrease rate is 99 percent for the certified mask N-95 type [11].

Facemask utilization reviews indicate relative risk decrease varying from 6% to 80% for infection, including coronavirus disease as COVID-19, SARS, MERS. This inconsistent results may be due to different criteria for inclusion and exclusion of research types; for example, health-care professionals or general population; the type of used facemask; the considered outcomes, like laboratory-confirmed viral infection versus symptoms alone, as well as undesirable consequences; and the setting like, epidemic versus non-epidemic scenarios [12].

Investigations has outlined about 172 observational experiments in 16 countries across six continents without randomized

controlled trials and 44 relating comparative trials in health and non-health care environments (n = 25,697 patients). Viral transmission was lesser with 1 meter or more physical distancing compared to a distance below 1 meter (n = 10,736, risk difference [RD] 10.2%); Protection has been increased as distance has been increased (change in relative risk [RR] 2.02 per meter). Use of a face mask resulted in a significant reduction in the infection risk (n = 2647; RD 14.3%), with a greater correlation with the N95 or similar masks compared to disposable surgical masks or analogous like reusable 12 to 16-layer cotton masks. Safety goggles has also been correlated with low infection (n = 3713; RD 10.6%) [13].

On the contrary, it had been found that there was a weak support of face mask use as an important hygienic mean to reduce viral infection spreading. Besides that, nose and mouth coverage appears to be associated to the relating protection throughout close contact situations by reducing pathogen-containing particulates and the spread of liquid droplets [14]. In addition, it is well known that the advantages of mask includes protection of the whole face in case of using face shields, easily to use in the right way, no probability for incorrect use, and are available for public. On the other hand, the disadvantages include being an uncomfortable, some models are of low-quality and couldn't prevent COVID-19 alone [15].

For those using face mask N95 for 12 hours, a subjective symptoms were reported like perceived shortness of breath that increased over time, complaints of headache, lightheadedness, perceived exertion, and impeded communication, accompanied by a negative physiologic change (elevation in CO₂ levels). But this elevation in CO₂ level didn't reach the clinical level of hypercapnia [16].

A study indicated that wearing a mask for especially for those severe asthmatic patients may be risky. The results of a study on mild pulmonary diseases patients showed that mask use like N95 resulted in prolonged inspiration and a compressed expiratory phase, and indicated that asthmatic patients may have a particularly difficult time adapting to this type of mask [17].

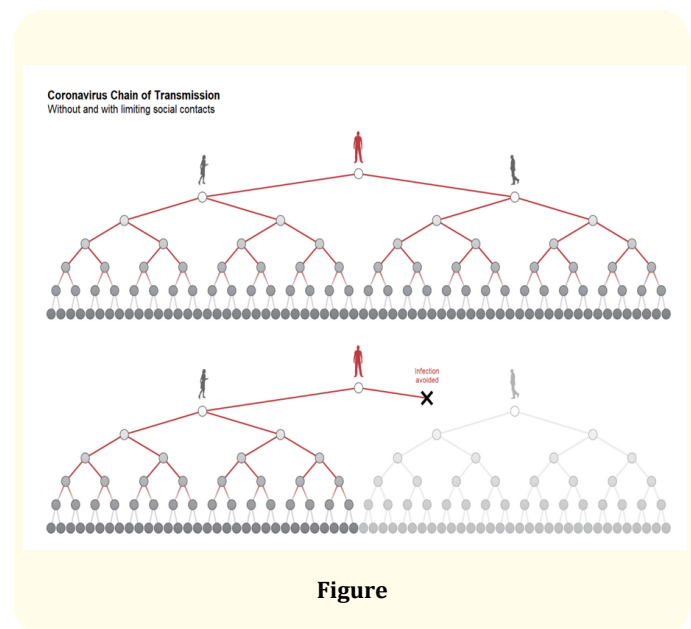
Social distancing

The aim of social distancing is to maintain a distance of 1.5 meter between individuals, which could limit the outspread of the droplets produced by coughing, sneezing or forced speaking and

so reduce incidence of most chest diseases. Social distancing can be considered among the most successful protective measures. By keeping this distance, the outspread of the virus can be reduced. Besides, wearing masks, washing hands frequently and disinfecting with alcohol also help to prevent the virus from spreading from one individual to another [18].

On the other hand, social distancing has been reported to lead to depression and anxiety in some people [19], and thus, is not appropriate in this situation because they will provoke more anxiety and fear between individuals and will also have an influence on social stability. No doubt that, the pandemic has a psychological effect on patients, healthcare professionals and the population [20].

The scientific basis for social-distancing measures may be robust, ethical considerations may have many sides. Importantly, politicians must adopt quarantine and social policies that do not affect any population of people. Interventions could lead to increased risk of reduced income and even jobs loss, and would have a disproportionate impact on the poorest communities. Policies to reduce such risks are deemed necessary. Special emphasis should be placed to the protection of susceptible groups, like homeless, imprisoned, elderly or disabled persons and illegal immigrants. Likewise, exceptions may be essential for certain individuals, including those who rely on continual medical care [21].



Figure

Medical gloves

This is applied for health care workers for preventing microbial contamination by hand contact with body fluids such as blood, restrain the transmission risk from the health care worker to the patient and vice - versa, and lowering the risk of microorganism spread to the community and from one patient to another [22].

Additionally, wearing medical gloves are important for the community in taking care for someone who is sick, especially when contacting organic fluids cleaning and sanitizing the individual and surfaces that are often affected in the surroundings. Disposal of gloves following patient contact, before having to touch other surfaces by washing hands pre and post removal of gloves. Wearing gloves never replace handwashing and sanitization, finally, it is not recommended to wear gloves while running an errand [22].

The pros and cons of medical gloves use may include the following advantages it provides a barrier between employees and potential risks, easily available and can be a cost-effective way to protect workers, reducing significantly the contact between the worker and the virus on any handled object. On the other hand, the disadvantages include the potential for cross-contamination of employees and items due to repetitive touching of various objects, personnel and equipment, the possibility to easily tear, expose employees to potential risks, expensive over time, increase the amount of waste being incinerated, contaminate the worker and others if they are not properly removed, and employee Skin allergies from some products such as latex or powdered gloves which could develop a medical problem [23].

Impact of increasing utilization of mobile phones on health status

We can't deny that remote home working is in an increase during covid-19 pandemic. Remote work has several advantages like 1) Work-life balance, which means that rather than going to work and wasting time in transportation, you may relax from home, adjust your habits, and have more time for your social life. 2) Workplace efficiency, instead of wasting time at work on meetings and useless tasks, you may focus on your responsibilities without interruptions. 3) Work management, instead of being restricted, which means that you may take break when you want, giving you greater control over your day. 4) Maintaining social distancing, preventing overcrowding, and controlling covid-19 spread [24].

On the other hand, disadvantages of remote home working include 1) Home office limitations, which means instead of a life filled with social interaction and activity, you have reduced contact with others, leave the house less, spend more time in front of the screen, and are bothered by others at home. 2) work insecurity, meaning that rather than finding purpose in work, the work situation is uncertain since there isn't enough to accomplish, the remaining duties aren't engaging, financial issues may arise, and you won't be able to focus on your work. 3) Inadequate equipment, instead of having simple access to what you need to accomplish your job, you lose crucial work tools, data, and papers that you need to accomplish your job properly [24].

The utilization of smart phones with their emitted waves directed towards the user and surrounding environment his expected to increase significantly after the pandemic COVID-19 due to lock down periods at different intervals at first, second, during which most of the jobs were performed online and working from home increased which consequently might result in negative impact on population health status and thus safety measures should be applied to prevent and decrease the incidence of many diseases which might result from overuse of smart phones, computers and other devices used for distant communications mainly for obligatory attendance of educational sessions, webinars, conferences and meetings.

Investigators have reported negative health impacts from smartphone use, such as alterations in brain activity, response times, and sleeping habits. Children are at a higher risk than adults for progressing brain cancer as a result of mobile phones use. This result from the ongoing development of their nervous systems and therefore more prone to cancer-causing factors [25].

In India, a community-based study showed that the prevalence of smart phone use was 70%.Health issues such as headache, tinnitus, distressing fingers and nervousness were found to be remarkably correlated with cell phone use and there was a negative correlation between elevated blood pressure and smartphone use [26].

A study was aimed to examine whether symptoms of poor health reported by young adults may be associated with the use of mobile devices and to analyze their effect on the health and development of medical students. Many students (83.57%) had some

understanding of the side effects of mobile device use, 16.08% complained of headache, tiredness (24.48%), decreased concentrations (34.27%), memory disruptions (40.56%), Insomnia (38.8%), hearing impairment (23.07%) of students warm feeling within the auricula and behind or around the ear (28.32%). Of the 286 individuals who took part in this research 44.4% attributed their disorders to mobile use [27].

Forehead temperature measurements

In order to perform temperature measurement of an individual, the infrared thermometer uses infrared rays that detect body temperature without affecting the retina. The FDA noted that infrared thermometers can be used to lower the risk of cross-contamination and reduce the risk of disease transmission without noting that they pose a vision risk [28].

From the advantages of infra- red thermometers includes the reduction of risk of COVID-19 spreading, show temperature reading instantly, light and compact, convenient to use, clean, and disinfect, and an essential resource for locations with an increased flow of people, such as health care facilities, airports, educational institutions, supermarket chains, and restaurants. Concerning their disadvantage which includes reduced precision of this thermometer by excess dust and steam, requires a training for unfamiliar individuals who will operate it, the internal cavity of the device sensor must be kept clean before and after use, otherwise the accuracy of the measurement will be impacted [28].

Evidence has been provided for non-contact IR temperature measurement devices indicating that they are not accurate in adults, mainly due to vasoconstriction of blood flow to the foreheads and excessive sweating leading to a false negative results. A similar finding has also been achieved by the Scottish Health Technology Group [29].

Another study findings showed that IR temperature control of the forehead is not an appropriate instrument for screening for infectious disease immediately at the entrance of a building, at least during cold outdoor air temperature during the early spring season [30].

Effect of Social media platforms and news on the population health status

It was found that social media had a significant influence on the rise of panic and fear associated with the outbreak of COVID-19 in

Kurdistan area (Iraq), with a possible negative impact on the mental and emotional health of individuals. Facebook was the most used to spread fear and confusion over the outbreak of COVID-19. A positive and significant statistical correlation was found between self-reported use of social networks and the deploy of COVID-19-related panic ($R=.8701$). The results have shown that youngest people between the ages of 18 and 35 face anxiety. Social networking has played a major role in spreading fear and panic about the outbreak of COVID-19 in Kurdistan area (Iraq) [31].

The findings of studies showed that use of new media was significantly associated with more negative effects, depression, anxiety, and stress, rather than traditional media. Besides this, more positive effects and less depression were associated with seeing acts of bravery, speeches from professionals, and understanding of the disease control and prevention. The study suggested that new media use and more media engagement were associated with poor psychological outcomes, while positive psychological effect was associated with certain media content. This research highlights the need for timely communication from official sources to public health and suggests that decreased exposure to new media may be beneficial [32].

Use of face shield

Face shields are a plastic gatekeeper that protect the eyes and face. It can be categorized as personal protective equipment (PPE). It is a first line of defence used by physicians and front-line health professionals to guard against contagious body fluids and aerosols. It is made from inexpensive polycarbonate material, and has excellent optical transparency in UV, visible, and IR spectrum. Face shield is used in varieties of applications, for example it can be used in medical field, military defense, construction sites, fire protection, heat and radiation protection, and welding [33].

Face shields are generally used in conjunction with other protective measures (face masks) and are thereby known as adjunctive personal protective equipment [34,35]. Face shields can be reused indefinitely and are easily cleaned with soap and water or domestic washing disinfectants on a regular basis. They are simple to put on, and reduce the chance of auto-inoculation by preventing the person from touching his face [33].

In a simulation trial, face shields were shown to minimize immediate viral exposure by 96% when worn by a healthy person

within 18 inches of coughing. Also after half an hour of contact, the face shield provides a protective shield or effect of approximately 80%, and it also eliminates the entry of small particle aerosols to 68%, which are not thought to be a significant source of SARS-CoV-2 infection [36].

There are several advantages of wearing face shields like 1) A plastic covering that can't be broken, 2) Protect larger portion of the face, 3) Make the person less likely to touch his face and eye. 4) Easily disinfected. 5) Can be worn at the same time with face masks. On the other hand, there are some disadvantages for face shield like 1) Glare fogging, 2) Weightier than helmets and safety goggles. 3) May be Optically defective. 4) Some types do not match correctly with some respirators [37].

Mouth and throat gargles

Recently, Hong Kong researchers discovered that patients infected with severe SARS-CoV-2 had the highest salivary viral load in oropharyngeal saliva during the first week, especially on the 4th day. Besides, another Chinese study showed that the presence of SARS-CoV-2 RNA in the nasopharynx was linked to the severity of the disease [38].

A randomized clinical trial conducted in Japan found that gargling the throat with tap water three times per day decreased the rate of upper respiratory tract infection by 36%. In Japan, the concentration of chlorine in tap water exceeds 0.1 mg/L and can reach 0.5-0.8 mg/L in certain areas, ensuring virus inactivation. Chloride ions in hypertonic saline have been found to prevent virus replication and are used by cells to generate hypochlorous acid, which has antiviral properties. More large-scale research is required to ascertain the chloride concentration and duration of gargling [38,39].

The physical washing agent used in throat gargling can induce shedding of the virus and infected cells or chemical inactivation of the virus, that explain why mouth wash and gargle could be effective [38].

Another randomized trial study in England found that using hypertonic saline for throat gargling and nasal cavity irrigation 48 hours after symptom onset of upper respiratory tract infection substantially shortened the duration of illness by 1.9 days, drug usage by 36%, household touch transmission by 35%, and viral load remarkably [40].

A clinical review examined seven reagents commonly used as mouthwashes for their antiviral activity. Those agents are povidone-iodine, chlorhexidine, hydrogen peroxide, cyclodextrin, citrox, cetylpyridinium chloride, and essential oils. The review concluded that there is no clinical evidence to suggest anti-SARS-CoV-2 mouth rinses to control the viral load in the oral cavity. But, some components in antiseptic mouthwashes have antiviral effects which can reduce the viral load of SARS-CoV-2 [41].

Throat gargling could be beneficial to the general public during the latest COVID-19 pandemic but needs more investigation.

Protective effect of several herbs

Recent research studies confirmed that cinnamon, black pepper, tulsi, and turmeric are contributing effectively against COVID-19 and other viral infections [42]. Other researchers suggested the use of Giloy, Ginger, and Curcumin because of their antiviral properties [43].

Tulsi leaves have been shown to increase the number of helper T cells as well as natural killer cells, which aids fighting against viral infection. Besides, in ancient times, it was used to treat fever, pain, cough, pneumonia, and diarrhea [42].

Black pepper showed to alleviate sinusitis and nasal inflammation. It also contains quercetin flavonoid that possess antiviral properties which improves the body's immunity. Researchers recommended the use of black pepper and ginger in regular diets on daily bases, since they may help prevent coronavirus. Besides, coriander, and garlic that are recommended in cooking [42,44].

Drinking of herbal tea and/or decoction (kadha) made from black pepper, basil, ginger, cinnamon, and raisin once or twice per day with addition of natural sugar or fresh lemon juice as a test enhance is recommended [42].

Food and diet control

Almost 70% of the reports found promoted the intake of fruits, vegetables, and whole grain foods. Fruit and vegetable diets are abundant in vitamins including vitamins A, C, D, E, and B complex, as well as minerals like zinc and selenium, which are essential immune system modulators. Furthermore, fruits and vegetables can provide good amounts of water, antioxidants, and fiber, all of which can contribute in regulating three of the most significant risk fac-

tors for COVID-19 complications which are diabetes, hypertension, and weight gain [45].

Guidelines recommendations are supporting homemade and fresh food rather than processed food [46,47]. Drinking a reasonable amount of water is essential for maintenance of adequate body hydration in order to keep cellular homeostasis, kidney function, and other vital body functions working well [45]. High salt intake can affect renal function [48], high sugar drinks can raise blood glucose and promote obesity [45].

Yoga and meditation

Yoga practice can be a complementary intervention for populations at risk of covid-19 infection. It could downregulate pro-inflammatory markers, and influences the decreases in IL-1, IL-6, and TNF- α . In groups at high risk of increased inflammation, such as those with heart disease, a shorter duration of yoga practice of just 8 weeks has been proposed as necessary to suppress inflammatory processes. Also, yoga practice can help to reduce covid-19 infection exacerbations and enhance its clearance in diabetic patients by reducing the impact of the systemic elevated blood glucose and inflammatory environment [49].

Yoga and meditation, especially slow deep breathing, have been shown to reduce sympathetic nervous system activation and improve baroreflex sensitivity in hypertensive patients, lowering blood pressure. So, it could provide a safe complementary strategy to manage elevated blood pressure in COVID-19 patients with hypertension [49,50].

Breathing exercise

Deep breathing and forced coughing can help remove airway mucus, but they are improbable to help people with a dry cough or mild covid-19 infection. The aim is to keep airways open, and coordinate breathing with medication to deliver the required optimal dose. Furthermore, it can increase oxygen amount getting into, and carbon dioxide leaving the body [51].

COVID-19 vaccination

Currently, more than 230 vaccine candidates are under development. The majority of vaccine candidates are designed to induce neutralizing antibodies against the virus's S protein, thus inhibiting viral particle identification and uptake mediated by human ACE2 receptor binding. The majority of preliminary findings are positive,

with various candidates inducing higher neutralizing antibody titers than normal infection [52].

By the end of 2020, most countries have granted conditional marketing approval for using different developed COVID-19 vaccines. Among the approved vaccines, mRNA vaccines (Pfizer-BioNTech), and mRNA-1273 (Moderna), Vector based vaccine AZD1222 (AstraZeneca), Sputnik V (Gamaleya), and Ad26.COV2.S (Johnson Pharm), inactivated vaccine BBIBP-CorV (Sinopharm), and CoronaVac (Sinovac). The effectiveness of these vaccines ranges from 50.38 to 95 percent [53].

Conclusion

Several reviews indicated that wearing face mask and gloves contributes to some extent in reduction of viral infection spreading, and with conjunction use of a face shield we can get more protection. Regarding non-contact IR temperature measurement devices evidences indicated that they are not accurate in adults and may give a false negative results.

The findings indicated that use of news social media was significantly associated with more negative effects, depression, anxiety, and stress, rather than traditional media. Smartphone use can lead to a negative health impacts like brain activity alterations, response times, and sleeping habits. Children are at a higher risk than adults for progressing brain cancer. Social media had a significant influence on the rise of panic and fear associated with the outbreak of COVID-19, with a possible negative impact on the mental and emotional health of individuals. Mouth washes and throat gargling could be beneficial in reducing viral load but needs more investigation. Herbs, and healthy diet including fruits and vegetables, can supply the body with beneficial nutrients and antioxidants that aids in boosting the immunity and contribute in protection from covid-19 infection. Yoga practice can be a complementary measure for those at risk of covid-19 infection. Breathing exercise did not prove any evidence to help people with a dry cough or mild covid-19 infection. Several covid-19 vaccines are now gained exceptional approval for use and showed wide range of efficacy ranged from 50 to 95%.

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