



Making a Statement: Facemask and Its Role in Curbing the Spread of COVID-19 Especially in a Developing Country

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Abstract

The use of cloth masks is probably a phenomenon that could only have been thought of in the sense of fashion in most parts of the world. The current Coronavirus Disease 2019 (COVID-19) pandemic has made these masks a very important part of living in light of global shortage of medical masks. According to the United States of America Centre for Disease Control (CDC), more than one-third of COVID-19 patients are asymptomatic while the virus, in about 40% of the time, gets transmitted from infected individuals to others before the infected individuals even show symptoms. The Director General of the Nigeria Center for Disease Control (NCDC) expressed that providing facilities and venues to the many cases recorded in Nigeria consistently is a major challenge particularly in Lagos, Kano and Zamfara states where the quantity of new cases was exceeding the limit. This statement came at a time when the total number of confirmed cases was just 3,526. Various studies have shown the effectiveness of facemasks in curbing the spread of respiratory viruses (including corona viruses) via the droplet and airborne routes. Many countries have advised their citizens to use facemasks (mostly cloth masks) when in public. This is a positive development that may be especially helpful in developing countries where access to basic healthcare is usually a luxury but this should be done with clear and proper guidelines.

Keywords: Facemask; COVID-19; Developing country; Asymptomatic; Coronavirus

Introduction

While it is difficult to identify from history when the use of facemasks began, the evolution of how it is used is noteworthy. From protection essentially by killing the so-called "miasma" in the air through perfume and spices held under a mask, (for example, the plague doctors' bird-like masks) in the 17th century; to being used as a system of infection control (by surgeons in the operating room) that concentrated on fending off all germs (instead of killing them with chemicals) in the 19th century; and afterward during the 1918 to 1919 flu pandemic, the method of reasoning moving past their previous use in the theatre, to likewise giving the wearer protection against the disease even while in the community [1]. In the current COVID-19 pandemic, there has been a noticeable shift regarding who should use a facemask; from the World Health Organization (WHO) initial recommendations of wearing one by an individual who is taking care of a person with COVID-19 or use by people who are coughing or sneezing; to CDC's recommendation of all people to wear fabric face covers in open settings where social distancing measures are hard to maintain because of the way the virus can spread between individuals associating in close proximity-for instance, speaking, coughing, or sneezing - regardless of those individuals not exhibiting symptoms [2,3]. The COVID-19 pandemic and recommended public health protection strategies *vis-a-vis*: Good hand and environmental hygiene practices, social distancing, use of facemasks in public etc. has brought the issues surrounding the usefulness of facemasks in preventing/limiting the spread of respiratory infectious diseases to fore. Developing countries face unique challenges in curbing the spread of the novel Coronavirus. These include: Under-resourced hospitals and fragile health systems, lack of access to soap and water, poor urban planning and overpopulation in some cities, weak waste disposal services, and traffic congestion hindering access to healthcare facilities etc [4]. The NCDC has recently alerted Nigerians to the scarcity of isolation beds for the growing number of COVID-19 cases [5]. Many countries worldwide including developing ones like Nigeria have adopted the CDC's recommendation. Given the global shortage of medical facemasks which is even more pronounced in developing countries, the role of cloth masks (which are readily available) in preventing the spread of COVID-19 is worth exploring.

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Covid-19 and Its Peculiarities

Coronavirus Disease 2019 (COVID-19) is defined as an illness caused by a novel Coronavirus now called Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2; formerly called 2019-nCoV), which was first identified amid an outbreak of respiratory illness cases in Wuhan City, Hubei Province, China. It was initially reported to the WHO on December 31st, 2019. On January 30th, 2020, the WHO declared the COVID-19 outbreak a global health emergency and it declared it a pandemic on March 11th, 2020 [6]. Transmission is believed to be for the most part from person-to-person through methods such as: Close contact between individuals [within six feet], respiratory droplets delivered when an infected individual coughs, sneezes, talks or breathes, as the droplets land in the mouths or noses of individuals who are close by or perhaps be inhaled into the lungs which implies it tends to be spread by asymptomatic people [7,8]. Another method is by contacting a surface or item that has the virus on it and afterward touching one's own mouth, nose, or eyes [7]. SARS-CoV-2 is highly transmissible, with a replication number estimated to be approximately 2.4 [9]. This figure allowed to the number of other people one sick person is likely to infect on average in a group that is vulnerable to the disease (which means they do not already have immunity from a vaccine or from a previous infection) [10]. This implies that each infected individual can spread it to at least 2 other persons. According to CDC, about 35% of COVID-19 patients are asymptomatic and about 40% of Coronavirus transmission occurs before symptoms begin [11]. Majority of patients have a pre-symptomatic incubation period ranging from 2 to 15 days, with an average of 5.1 days. They are most infectious during the initial days of infection when symptoms are mildest or absent [9].

Facemasks

Facemasks considered in this paper are surgical masks, 'Not resistant to oil' 95 (N95) respirators [or its equivalent in Europe – Filtering Face Piece 2 (FFP2)] and cloth mask [9]. Respiratory droplets are commonly grouped based on size into aerosols (droplets less than 5 μm) and droplets greater than 5 μm [12]. A surgical mask (Figure 1) is a loose-fitting, disposable device that creates a physical barrier between the mouth and nose of the wearer and potential contaminants in the immediate environment. A surgical mask whenever worn appropriately will assist to prevent large-particle droplets that may contain germs (viruses and bacteria) from getting to the mouth and nose. Surgical masks may also help diminish exposure of one's saliva and respiratory secretions to others [13]. An N95 respirator (Figure 2) is a respiratory protective device designed to accomplish a very close facial fit and very efficient filtration of airborne particles. The 'N95' designation means that when subjected to careful testing, the respirator blocks at least 95 percent of very small [0.3 micron (μm)] test particles. If properly fitted, the filtration capacities of N95 respirators exceed those of surgical masks. Be that as it may, even a properly fitted N95 respirator does not totally eliminate the risk of disease or death [13]. The above two are recommended for use by health workers or those caring for COVID-19 patients or someone actively coughing and sneezing [2]. The cloth masks are made out of everyday fabric and can act as a barrier to respiratory droplets (Figure 3) [14,15]. Howard et al. [9] in analyzing different studies that show the filtration effects of cloth masks relative to surgical masks found that particle sizes for speech are around 1 μm while droplet sizes are between 5 μm to 10 μm . Common household materials had between a 49% and 86% filtration rate for 0.02 μm exhaled particles



Figure 1: Surgical mask.



Figure 2: N95 respirator.



Figure 3: Cloth Mask.

whereas surgical masks filtered 89% of those particles. Konda et al. [12] in testing the efficiencies of common household materials in filtering aerosols ranging from $\sim 0.01 \mu\text{m}$ to 6 μm in size found that the efficiencies generally improved when either multiple layers of a single material or exact combinations of different materials are used. The combinations which were called 'hybrids' include: Cotton-silk, cotton-chiffon, cotton-flannel. They were found to have filtration efficiencies of more than 80% and 90% for particles less than 0.3 μm and those greater than 0.3 μm respectively. During breathing, speaking, or coughing, only a little amount of what is expelled from the mouth is already in aerosol form. Nearly all of what is being emitted is droplets. Many of these droplets eventually evaporate and turn into aerosolized particles that are 3 to 5-fold smaller. The point of wearing a mask as source control (i.e. preventing spread of germs from an infected person to others) is largely to prevent this process from occurring, since big droplets dehydrate to smaller aerosol particles that can remain in the air for longer times [9].

Facemask Usefulness during Covid-19 Pandemic

There is general evidence supporting facemask usefulness (especially if adhered to) in limiting the spread of respiratory viruses in the community [16]. MacIntyre and Chughtai, in their study of eight clinical trials on the use of masks in preventing respiratory

infections in the community, state that the results show protection for healthcare workers and community members, and likely beneficial use of masks as source control (although the effect of masks were not studied alone but together with hand hygiene) [17]. Anfinrud et al. [18] used a planar beam of laser light to detect droplet emission while speaking. Their analysis showed a significant drop in the amount of droplets when a homemade mask was used as there was no rise detected in droplet level above the background value during talking with cloth mask cover. The authors thus stated that "if speaking and oral fluid viral load proves to be a major mechanism of SARS-CoV-2 transmission, wearing any kind of cloth mouth cover in public by every person, as well as strict adherence to distancing and hand washing, could significantly decrease the transmission rate and thereby contain the pandemic until a vaccine becomes available." Howard et al. [9] in their paper on the review of evidence on facemasks against COVID-19, made the following assertions: i) "literature offers evidence in favor of widespread mask use to reduce community transmission", ii) "non-medical masks have been effective in reducing transmission of influenza", iii) "non-medical masks have been shown to be effective in small trials at blocking transmission of Coronavirus and iv) that "places and time periods where mask usage is required or widespread have shown substantially lower community transmission." Thus, they suggest that "near-universal adoption of non-medical masks when out in public, in combination with complementary public health measures could successfully reduce effective-R to below 1.0, thereby stopping community spread". In a recent study done by the Department of Microbiology at the University of Hong Kong, their conclusion drawn from an experiment using hamsters infected with COVID-19 was that transmission rate can be halved when surgical masks are used, especially when masks are worn by infected individuals [19]. In a more recent WHO funded study by Chu et al. involving a systematic review of 172 studies on COVID-19, Severe Acute Respiratory Syndrome (SARS), and Middle East Respiratory Syndrome (MERS), the data suggest that in public settings, use of either surgical masks or reusable 12 to 16 layer cotton masks provides protection against infection by the earlier mentioned coronaviruses, with the possibility of an extra benefit when the eyes are also protected (although a lot of the evidence was based on the use of masks within households and among contacts of cases). They also provided strong evidence to support a huge drop in infection with physical distancing of at least one meter, and even more when up to two meters. They however noted that none of these interventions assured complete protection from infection [20]. While facemasks are useful as shown in earlier paragraphs, it is important to note some potential risks of its usage as outlined by WHO: Self-contamination by touching and reusing contaminated mask; false sense of security, leading to potentially less adherence to other preventive measures such as physical distancing and hand hygiene [21,22].

Conclusion

Extreme forms of social distancing is not sustainable, and total lockdown of cities or even whole countries is extremely devastating to the economy (8); this devastation is especially pronounced in developing countries. The effect of face masks on viral transmission from available studies is as a source control measure and since a significant number of individuals with COVID-19 may be asymptomatic, this protection will only make sense if everyone or at least majority complies when in public. Though individual persons may not always be optimally protected, Sande states that from a public health point of view, any type of general face mask usage

can still reduce viral transmission. Also, it is important not to focus on a single intervention in case of a pandemic, but to integrate all effective interventions for optimal protection. Thus, while individual motives may differ in the use of the cloth masks, either with the aim of protecting others or just as a fashion statement, if it is properly used as recommended by health authorities and dutifully combined with other proposed public health measures, may buy the needed time for a definite solution (a vaccine or cure) to be made available. And for developing countries whose already fragile health care systems may be at the brink of a collapse, this time is of the essence.

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