Review Article

Journal of Iranian Medical Council, Volume 7, Issue no. 2
http://dx.doi.org/10.18502/jimc.v7i2.15032

COVID-19: A Review on Precautions and Self-Protection

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Received: 7 Jun 2023
Accepted: 22 Jul 2023

Citation to this article
Hasani H, Mardi P, Mardi Sh, Kohandel O, Taherzadeh N, Molaverdi Gh, et al. COVID-19: A Review on Precautions and Self-Protection. *J Iran Med Counc.* 2024;7(2):192-9.

Abstract

In the absence of an effective treatment for COVID-19, we need other methods to control the pandemic of this virus. To achieve this goal, we need non-pharmacological interventions and self-protection. Experience in controlling other viral diseases demonstrated that vaccines are the best way to make social immunity. In this study, we have aimed to review precautions and self-protection methods for fighting the COVID-19 pandemic. This study identified that non-pharmacological and pharmacological interventions, mask-wearing, hand washing, home quarantine, appropriate ventilation, social distancing, chemical disinfectants, and vaccination would be the efficient preventive modalities to mitigate and control the COVID-19 pandemic.

Keywords: Coronavirus, COVID-19, Pandemic, Review

Introduction

Crowds avoiding, physical distancing, mask-wearing, hand washing, coughing into a tissue, and appropriate room ventilating are the simple ways to prevent COVID-19 infection. As a whole, the five non-pharmacological intervention (NPI) scenarios include the followings:

Case isolation at home: symptomatic cases stay at home for 5-14 days.

Voluntary home quarantine: by identifying a symptomatic case, other members of the household stay at home for 5-14 days.

Social distancing.

Closure of schools and universities.

The two main approaches to controlling this pandemic are:

Mitigation

In this method, person-to-person transmission of the virus is controlled using NPIs, but it is not completely stopped. Controlled circulation of the virus among the population builds up immunity in a large part of the population, as a result, the number of cases decreases. In this approach, the average number of secondary cases infected by an infected case decreases but does not fall below. In mitigation, the goal is to gradually reduce the number of infected cases and flatten the curve (1). To achieve this goal, interventions must continue as much as possible, but it should be noted that if the restrictions are applied too soon, the disease can peak again at the end of the intervention. Thus, timing is very important. The best time for mitigation is three months around the peak of the virus (predictions are for the US and UK). The best combination of NPIs that has the best impact on reducing the number of deaths and critical care demand includes case isolation, voluntary home quarantine, and social distancing of those over 70 years old. Predictions show that a three-month mitigation period can halve the number of deaths and reduce healthcare demand by about 33 percent. But the most important thing about mitigation is that it is estimated that in the US and UK, about 8 times the capacity of critical beds will be required at the peak of hospital visits. The same prescription cannot be prescribed for all the countries (2).

Suppression

This approach aims to minimize the person-to-person transmission of the virus. In suppression, the average number of secondary cases infected by an infected case falls below 1. To achieve this goal, we need stricter rules and we need to do more interventions. The optimal combination of NPIs for suppression includes social distancing of the entire population, case isolation, voluntary home quarantine, and closure of schools and universities. Interventions must start as soon as possible and continue until the virus stops circulating in the population or an effective drug or vaccine is detected for the virus. Among NPIs, social distancing of the entire population has the most impact and gives the best results in combination with other interventions (3).

Self-protection

According to the available evidence, human-to-human transmission of the SARS-COV-2 virus is through close contact and droplets and the virus has no airborne transmission except on rare special occasions. As a result, prevention and mitigation measures are the primary ways to fight the virus, both among the medical staff and in the community (4). Therefore, various sources suggest the following for self-protection against the virus (5).

Hands hygiene and decontamination of the environment

Elimination of potentially dangerous germ forms and pathogenic organisms on inanimate objects and surfaces is called disinfection. Different types of disinfection methods are classified into physical or chemical disinfection categories. Physical disinfection agents include heat (in various forms such as burning, boiling, intermittent heat of water vapor with pressure and dry heat), cold, radiation, and chemical agents such as alcohols, aldehydes, biguanides, hypochlorite, iodine compounds, oxidant compounds, phenols, and Quaternary Ammonium Compounds (QAC) are the most important chemical agents for disinfection purposes (6) (Table 1).

One of the most important and widely used disinfectants is sodium hypochlorite (Javelle water). Javelle water is extensively utilized as a disinfectant for surfaces and environments, equipment, clothing,

Table 1. Chemical agents for disinfection

	Alcohols	Aldehydes	Biguanides	Hypo-chlorite	Iodine com-pounds	Oxidizing agents	Phenols	QAC_1
Sample trade names	- Ethyl alcohol - Isopropyl alcohol	- Form-aldehyde - Glu-taraldehyde	Chlorhexi-dine	- Bleach - Javelle water	- Betadine - Povi-doneiodine	- Hydrogen peroxide - H_2O_2	-	-
Mechanism of action	- Precip-itates proteins - Denatures lipids	- Denatures proteins - Alkylates nucleic acids	Alters membrane permeability	Denatures proteins	Denatures proteins	Denatures proteins and lipids	- Dena-tures proteins - Alters cell wall per-meability	- Denatures proteins - Binds phospho-lipids of cell membrane
Ad-vantages	- Fast acting - Leaves no residue	Broad spectrum	Broad spectrum	- Broad spectrum - Short contact time - Inex-pensive	- Stable in storage - Relatively safe	Broad spectrum	- Good efficacy with organic materials - Stable in storage	- Stable in storage - Non-irritating to skin - Effective at high - Tem-perature and high PH (9-10)
Dis-advantages	- Rapid evaporation - Flammable	- Carcino-genic - Mucous membranes and tissue irritation - Only use in well-ventilated areas	- Only functions in limited PH (5-7) - Toxic to fish (en-vironmental concern)	- Inactivated by sunlight - Requires frequent application - Mucous membrane and tissue irritation - Corrodes metals	- Inactivat-ed by QACs - Requires frequent application - Corrosive - Stains cloth and treated surface	Damaging to some metals	Can cause skin and eye irritation	-
Precautions	Flammable	Carcinogenic	-	Never mix with acids; toxic chlorine gas will be released	-	-	May be toxic to animals, especially cats and pigs	-
Efficacy with organic matter	Reduced	Reduced	-	Rapidly reduced	Rapidly reduced	Variable	Effective	Inactivated
Efficacy with hard water	-	Reduced	-	Effective	-	-	Effective	Inactivated
Efficacy with soap/ detergents	-	Reduced	Inactivated	Inactivated	Effective	-	Effective	Inactivated
Disinfection effect on COVID-19	Effective	Effective	Limited	Effective	Effective	Effective	Effective	Variable

Quaternary Ammonium Compounds. Reference: Block, 2001 (7).

as a bleaching agent, *etc*. Of course, the use of Javelle water on various fabrics and metals has limitations, and it also should be used carefully due to its irritating properties on the eyes, skin, and lungs (8). Antiseptic is a solution used on living tissues, which destroys, inhibits, or halts the growth of pathogens. Alcohol is considered to be the most widely used antiseptic solution in the fight against viruses such as COVID-19. Alcohol-based solutions have been suggested to be used if there is no visible dirt on the hands, and soap and water have been recommended if hands are dirty (9).

Ethyl alcohol 70% (ethanol) and isopropyl alcohol 60 to 70% (isopropanol) are effective antiseptics that have a good speed of action but at the same time evaporate quickly and do not leave any traces. These materials should be used on clean surfaces due to their low penetration power. Alcohols change the shape of proteins in the presence of water, while in an environment without water, alcohols do not simply denature. That is why pure ethyl alcohol has fewer antiseptic properties than water-containing alcohol. For example, 70% ethyl alcohol kills many microscopic pathogens in less than 30 *s* (10).

Avoid touching the nose, mouth, eyes, and other mucous membranes with contaminated hands

Studies have shown that the SARS-COV-2 virus can potentially be transmitted by touching the conjunctiva. Therefore, COVID-19 is easily transmitted from a sick person to a healthy person through handshaking. Likewise, as is the case with most respiratory viruses, touching the nose and mouth is another way to spread COVID-19 (11,12).

Observe respiratory hygiene by wearing a mask or cloth around the mouth and nose during sneezing or coughing

Observance of social distance: Studies have shown that SARS-COV-2 transmission is likely through droplets and close contact. As a result, maintaining good respiratory health and social distancing will help to reduce virus transmission.

Use surgical masks if there are symptoms or for the care of patients

There are several types of medical masks with different uses, including N (95,99,100), P (95,99,100), R (95,99,100), FFP (1,2), and surgical masks. Here are two examples of the most widely used types of masks:

N95 respirators: The n95 mask is a filtered breathing mask designed to fit your mouth and nose as much as possible. Studies on this mask demonstrate that it filtrates up to 95% of particles larger than 0.3 microns. Of course, the useful lifetime of these masks is different, and in most cases, it is about 8 hours, and after their lifetime, they must be hygienically destroyed (13).

Surgical mask: A surgical mask is a disposable mouth mask in which polyurethane fabric or other types of fabric is used to make it. The design of these masks is such that it creates a physical barrier between the mouth/nose and the outside environment, however, the sides of this mask are not able to completely cover the skin around the mouth and nose. Studies have shown that this mask can filter up to 80% of bacteria (14).

Cloth face coverings: Before the widespread use of surgical masks, surgeons used to use these clothing masks. Prior studies have represented that these masks cannot provide effective protection against COVID-19, although laboratory studies indicate 50% bacterial filtration by these masks (15). This covering as a barrier between individuals may decrease the trans ability of SARS-COV-2 (5). Since the advent of COVID-19, face masks have spread across China and East Asian countries, including Japan and South Korea, to the extent that some provinces and regions of China have imposed the use of face masks in public places. But various organizations and countries have suggested different uses. For example, the World Health Organization (WHO) suggests the use of masks in healthy people only if patients with COVID-19 are around them, or the Center for Disease Control and Prevention (CDC) does not recommend the use of the N95 mask to the general public and considers its use to prevent COVID-19 only by treatment staff (16). According to the CDC, the use of cloth masks by ordinary people in public places is enough to slow down the spread of the virus (17). A summary of the suggestions of various disease control centers has been brought in table 2.

Immunization

The term vaccine is derived from the Variolae vaccine, the cow smallpox (25). Based on an overwhelming consensus, vaccination is the most effective way to prevent infectious diseases like smallpox, polio, measles, tetanus, and COVID-19 (25). Vaccines against COVID-19 are considered potent agents to control pandemics that have received emergency use authorization in some countries, regardless of their rare side effects (25-27). Different mechanisms have

Table 2. Recommendations on face mask use in community settings during COVID-19 pandemic[6]

Country	Organization	Recommendations	Ref
WHO[1]	-	If you are healthy, you only need to wear a mask if you are taking care of a person with a suspected SARS-CoV-2 infection	(18)
China	State Council	- People at moderate risk[2] of infection: surgical or disposable mask for medical use - People at low risk[3] of infection: disposable masks for medical use - People at very low risk[4] of infection: do not have to wear a mask or can wear a non-medical mask (such as a cloth mask)	(19)
Hong Kong	The Department of Health	- Surgical masks can prevent the transmission of respiratory viruses from people who are ill. It is essential for people who are symptomatic (even if they have mild symptoms) to wear a surgical mask - Wear a surgical mask when taking public transport or staying in crowded places. It is important to wear a mask properly and practice good hand hygiene before wearing and after removing a mask	(20)
Singapore	Ministry of Health	Wear a mask if you have respiratory symptoms, such as a cough or runny nose	(21)
Japan	Ministry of Health, Labor, and Welfare	The effectiveness of wearing a face mask to protect yourself from contracting viruses is thought to be limited. If you wear a face mask in confined, badly ventilated spaces, it might help avoid catching droplets emitted from others but if you are in an open-air environment, using face masks is not very efficient	(21)
USA	CDC[5]	- Centers for Disease Control and Prevention do not recommend that people who are well wear a face mask (including respirators) to protect themselves from respiratory diseases, including COVID-19 - US Surgeon General urged people on Twitter to stop buying face masks	(17)
UK	National Health Service	Face masks play a very important role in places such as hospitals, but there is very little evidence of widespread benefit for members of the public	(22)
Germany	Federal Ministry of Health	There is not enough evidence to prove that wearing a surgical mask significantly reduces a healthy person's risk of becoming infected while wearing it. According to WHO, wearing a mask in situations where it is not recommended to do so can create a false sense of security since it might lead to neglecting fundamental hygiene measures, such as proper hand hygiene	(23)

World Health Organization. People at moderate risk of infection include those working in areas of high population density (*e.g.*, hospitals, train stations), those who have been or live with somebody who is quarantined, and administrative staff, police, security, and couriers whose work is related to COVID-19.
People at low risk of infection comprise those staying in areas of high population density (*e.g.*, supermarkets, shopping malls), who work indoors, who seek health care in medical institutions (other than fever clinics), and gatherings of children aged 3–6 years and school students.
People at very low risk of infection include those who mostly stay at home, who do outdoor activities, and those working or studying in well-ventilated areas.
Centers for Disease Control and Prevention.
Reference: Feng 2020 (24).

been provided by the various vaccine companies, shown below (Table 3).

Conclusion

In conclusion, this study shows that the best prevention method is to avoid contacting with the virus, or in other words, not communicating with suspected or confirmed COVID-19 cases, hand hygiene (with alcohol-based hand rub, or soap and water), avoiding the contact of contaminated hands with face, observing social distance, quarantine while infection occurring and observing personal hygiene. Vaccination is an efficient method to control the pandemic.

Declarations

Ethics approval and consent to participate: Not applicable.

Table 3. Available COVID-19 vaccines' characteristics[1]

Name	Country	Type	Mechanism	Doses	Interval	Storage
Covaxin	India	Inactivated virus vaccine	SARS-CoV2 is chemically inactivated with beta-propiolactone; It cannot be replicated, but all the proteins remain intact	2 shots	21 days	+2-8°*C*
SinoVac	China	Inactivated virus vaccine	SARS-CoV2 is chemically inactivated with beta-propiolactone; It cannot be replicated but all the proteins remain intact	2 shots	21 days	+2-8°*C*
Sputnik V	Russia	Viral vector vaccine	Immune response to Spike protein dsDNA encoding for the Spike protein is protected in Adenovirus	2 shots	28 days	+2-8°*C* for 3 months and -20°*C* for 2 years
Novavax	USA	Synthetic spike protein mounted on nanoparticle	Immune response to Spike protein	-	21 days	+2-8°*C* for 3 months and -20°*C* for 2 years
Sinopharm	China	Inactivated virus vaccine	SARS-CoV2 is chemically inactivated with beta-propiolactone; It cannot be replicated but all the proteins remain intact	-	21 days	+2-8°*C*
Johnson & Johnson	USA	Viral vector vaccine	Immune response to Spike protein dsDNA encoding for the Spike protein is protected in Adenovirus	1 shot	-	+2-8°*C*
Oxford/ AstraZeneca	UK/ Sweden	Viral vector vaccine	Immune response to Spike protein dsDNA encoding for the Spike protein is protected in Adenovirus	2 shots	21 days	+2-8°*C*
Pfizer-BioNTech	USA/ Germany	Encapsulated mRNA vaccine	Protected encoding mRNA for the Spike protein in a lipid nanoparticle	2 shots	21 days	+2-8°*C* for 5 days and -70°*C* for 6 months
Moderna	USA	Encapsulated mRNA vaccine	Protected encoding mRNA for the Spike protein in a lipid nanoparticle	2 shots	28 days	+2-8°*C* for 30 days and -20°*C* for 6 months

Al-Amer, 2022 (28).

Ethical Consideration

Ethical issues (including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, *etc*.) have been completely observed by the authors.

Availability of data and materials

No data have been submitted to any open-access databases. All data supporting the study are presented in the manuscript or available upon request.

Funding

None.

Acknowledgements

No financial support was received for this study.

Conflict of Interest

The authors declare that there is no conflict of interest.

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