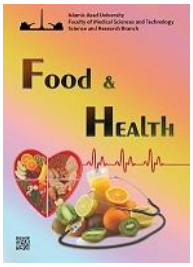

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Emerging 2019-ncov disease: A narrative review on the personal and social preventive behaviors

Vahid Ranaei [1], Soudabeh Yarmohammadi [2], Leyla Alizadeh [3], Sakineh Dadipoor [4], Zahra Pilevar [5], Teamur Aghamolaei [*6]

[1] Student Research Committee, Faculty of Health, Hormozgan University of Medical Sciences, Bandar Abbas, Iran
[2] School of Public Health and Safety, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[3] Department of Food Quality Control and Hygiene, Science and Research Branch, Islamic Azad University, Tehran, Iran
[4] Social Determinants in Health Promotion Research Center, Hormozgan Health Institute, Hormozgan University of Medical Sciences, Bandar Abbas, Iran
[5] School of Health, Arak University of Medical Sciences, Arak, Iran
[6] Cardiovascular Research Center, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

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ABSTRACT

The zoonotic 2019-nCoV is driving an apparent rapid spread among human populations. Apart from deaths and disabilities, the social and economic downturn of viral spread is inevitable. Currently, there isn't any specific vaccine or treatment and there is an urgent need for early interventions based on available information about the subject. In this review article, after an introduction to 2019-nCoV outbreak and behavioral changes, the role of health care workers, universities, and the government is reviewed. In addition, the personal and social controlling behaviors associated with 2019-nCoV disease are comprehensively discussed. Given that medical teams are expected to treat the patients by working for long hours and scarifying their lives, concurrently, sectors such as government, university, and health care workers have a critical role in prevention and control measures. Pandemics require changing of social and personal behaviors regarding socialization, hygiene, etc. Implementation of vigilant controlling measures associated with personal and social behaviors such as timely dissemination of accurate information, early identification, and isolation of people who have 2019-nCoV disease, quarantine, stopping mass gatherings, providing advanced remote medical treatments, and education of personal hygiene seems to be the most efficient interventions to contain the pandemic of 2019-nCoV. Personal and social preventive behaviors suppress the peak and slowdowns the rapid spread of outbreaks until effective drugs and vaccines become available.

1. Introduction

The first reports of 2019-nCoV were announced by the Chinese Health commission on Dec 31, 2019 (1). The novel coronavirus was named by World Health Organization (WHO) as 2019-nCoV. All the three zoonotic viruses of 2019-nCoV, SARS (severe acute respiratory syndrome), and MERS (Middle East respiratory syndrome) were initially spread in China in 2019, 2002, and 2012, respectively (2-4). The SARS and MERS outbreaks ended in less than one year and seven years, respectively (5). As reported from Chinese studies, 2019-nCoV, MERS, and SARS mortality rates are 2.2%, 35%, and 10%, respectively (6). The average reproduction number (R_0) for 2019-nCoV is 3.28 (median R_0: 2.79), which is higher than SARS and MERS and it shows the higher transmissibility of 2019-nCoV than previous outbreaks (7). Infected asymptomatic patients of 2019-nCoV can shed virus unknowingly. Although many control measures have been suggested, the most efficient solution to control the super spread of this event is to isolate infected persons and quarantine individuals and educate personal and social hygiene. China has almost stopped the rapid spread of virus through social distancing, self-isolation, and mandated quarantine of infected cases (8). This achievement has encouraged other countries to implement the same preventive measures. However, there is an urgent need for knowledge

*Corresponding author: Cardiovascular Research Center, Hormozgan University of Medical Sciences, Bandar Abbas, Iran.
E-mail address: teaghamolaei@gmail.com (Teamur Aghamolaei).

about the controlling and preventive measures of 2019-nCoV. More studies should be conducted for deeper evaluation of disease. Although the long-term objective of hygienic measures is to prevent pandemics by the implementation of preventive measures, however, we have already encountered a pandemic. The understanding and implementation of personal and social preventive behaviors lead to progress in the containment of the outbreak. This study aims to review the findings of recently published literature to explain the personal and social preventive behaviors regarding the prevention of 2019-nCoV spread based on the previous coronavirus. In this article, after an introduction to the subject and a brief perspective from the frontline and exploiting the full potential of engaged sectors to implement prevention and control measures, the personal and social preventive behaviours as the best possible methods to combat the deadly outbreak are thoroughly reviewed.

2. Materials and methods

To collect relevant information for the current article, the Persian and English databases including Google Scholar, Scopus, ScienceDirect, Web of Science, PubMed, SID, IranMedex were explored using appropriate keywords. There was also a hands-on search of journals, a collection of abstracts at conferences, and conferences and dissertations. To search the databases, the letters "AND" and "OR" were used to obtain consistent and different studies. The time limit of the studies was considered from the beginning of January 2020 onwards, and there were no restrictions for searching the electronic database in terms of the duration of the articles, the type of participants, and the setting of the study. Studies were selected that 1) provided sufficient and clear information about the preventive behaviours of 2019-nCoV disease 2) Persian and English language studies and 3) full text of the article were available.

3. Results and discussion

3.1. Personal and social preventive behaviours

As shown in Table 1, the controlling measures range from encouraging personal responsibility for disease identification to social distancing and community quarantine. Defining the clinical characteristics, programming the diagnosis procedure, determination of patterns for transmission, and strategies for quarantine are measures needed to be conducted at the early stages of spread (9). It should be stated that some controlling measures are not compatible for all members in different countries and cultures. For example, unlike many European countries, shaking hands is not a part of the culture in China. Therefore, the preventive measure of “avoid handshaking” is not a necessary one to disseminate. As another example, consumption of game meat is not common and the controlling measure of avoiding foods containing wild animals does not take place in many cultures. Maintaining the mobility of the population to cooperate in prevention and control the spread requires dissemination of clear, updated, and accurate information. The people are confused by contradicted information and they do not implement the healthy behaviours correctly. The emotion of society can be appeased with adequate updated information on the latest epidemiological characteristics and transmission. Critical decisions are made based on information perceived. Therefore, validated information should be provided (9).

3.2. Personal preventive behaviours

3.2.1.Wearing mask

The 2019-nCoV can persist in aerosols and wearing masks is an important personal health intervention to control the transmission. Wearing masks by infected cases reduces the aerosols shedding of virus (24). As issued in WHO guidelines, health care workers should protect themselves by wearing medical masks when caring for suspected or infected cases. The particulate respirators (certified N 95 by US National Institute for Occupational Safety and or FFP2 by European Union standard) are appropriate for aerosol-generating procedures. In SARS outbreak, wearing gloves, gowns, N95 respirators, and eye protection were mandatory for health care workers in Toronto and Singapore (25). Due to the shortage of respirator masks, the CDC recommends wearing surgical masks as an acceptable alternative for health care workers. According to WHO guidelines, in public, for individuals without any respiratory symptoms wearing medical masks is not necessary. They should perform hand hygiene, avoid crowded places, keep at least 1 meter of distance from people, and refrain from touching their face. Those who have fever or respiratory symptoms including cough, sneeze, and breathing difficulty are recommended to use medical masks to prevent transmission. The tissue paper and disposable materials contaminated with secretions should be immediately disposed and hand hygiene must be performed after disposal. All who are in close contact (<1 meter) with suspected or infected cases with respiratory symptoms are exposed to infection via infective respiratory droplets and should protect their selves from human-to-human transmission (11, 26). It should be mentioned that asymptomatic cases may transmit the disease to others. The 2019-nCoV infection might be without any symptoms or with mild symptoms, especially in younger individuals. Therefore, mask-wearing for all and healthy persons can help in decreasing transmission rate if being along with social distancing and hand hygiene (27). Early measures regarding social distancing and wearing masks have an important role in controlling the pandemics. The immediate production of masks should be considered at the early stages of pandemics. However, wearing mask is not an alternative for frequent hand washing and social dancing. Given that the surgical masks do not filter out the 2019-nCoV particles which N95 or; FFP2 respirator masks do, wearing surgical masks is better than being without any protection. If there is a masks shortage, the health care workers need these masks more than public, and it might work better in hospitals than in public.

Table 1. Personal and social preventive behaviors.

Control domain	Suggested interventions	Control issues	References
Individual Behavior	Population movement	Limitation the meetings and visits to workplaces	(10)
	Person to person distance	Tele-working and remote medical treatments	(10)
		Avoid visiting crowded places	(11)
	Personal hygiene	Frequent hand washing	(11)
		Taking shower	(12)
		Decontamination of infected clothes and gowns	(12)
		Providing personal protective equipment	(13)
		Wearing masks and gloves	(14)
		Not touching eyes, nose, and mouth	(15)
		Spraying the contact surfaces with alcohol	(16)
		Carrying hand sanitizers	(11)
		Covering cough and sneeze with tissues or by using flexed elbow	(16)
	Transmission from animals	Avoid unprotected and direct contact with animals	(17)
		Avoid consumption of animal raw or uncooked products	(17)
Social Behavior	Knowledge	Raising public awareness by online medical advice	(18)
	Isolation and Quarantine	Monitoring, tracing contacts, and quarantine of infected cases	(11)
		Isolation of patients	(17, 19)
	Education and dissemination of information	Training health care workers and consulting experts on interventions	(17)
		Rapid dissemination of the latest accurate information about the transmission	(16)
	Social distancing	Ban mass gatherings	(20)
		Centralizing the infected cases in hospitals and designating 2019-nCoV hospitals	(14)
		Separation of patients and health care workers facilities	(14)
		Providing facilities and equipment for workers to work from home	(14)
		Developing delivery systems (e.g., Amazon)	(21)
		Closure of schools	(22, 23)
		Reduce social contacts by online distance education	(22)
		Travel at quiet times and try to avoid crowds	
	Animal-human transmission	Prosecute wild animal sales and markets	
	Medications	Vaccine and therapeutic drug development	
	Protective equipment	Providing protective wear, gloves, face shield, boots for in contact personnel	(23)
		Frequent laundering of bed sheets and clothing of patients	
	Disinfection and disposal	Disinfection and air ventilation of public toilets and crowded places	
		Safe disposal of health care wastes	
		Disinfection of ablutions, work surfaces, canteens, and door handle of workplaces	

Despite the limited supply, a number of authorities have encouraged all people to wear masks to prevent transmission (27, 28). In some countries, the shortage has led to "do-it-yourself movements" and they have produced cloth masks. In this regard, the efficacy of cloth and homemade masks and the ideal material for masks require further studies. The cloth masks are not recommended for high-risk situations especially health care workers (27). There are some important instructions regarding the use of masks. The masks need proper fitting to cover the mouth and nose properly. The health workers receive training on how to wear masks. The poor filtration, moisture retention, and re-using masks might lead to infection which should be prevented (27). According to WHO guidelines, any gaps between the mask and face, touching the worn mask, and using a damp mask should be avoided. The mask should be carefully placed and removed. The single-use mask should be discarded immediately after removal (26).

3.2.2.Face touching

Several respiratory tract infections are transmitted by touching the face (29). As quantified with a videotape recording, people touch their face 10-20 times an hour (30). Self-consciousness and awareness make it worse and people touch their mouth, eyes, and nose more frequently (31). To ease avoiding the face touching, tissues can be set in required places to use them instead of scratching by hands (15). Another intervention is to advise people to use their bent elbow for

sneeze for sneeze or cough instead of using their hands (15).

3.2.3.Hand hygiene practices

Application of GHP (good hygiene practices) will prevent the transmission of infections not only for 2019-nCoV but also for other infections. Hand hygiene is one of the most effective prevention measures and it is recommended to be performed by 5 moment's instructions. There are 5 necessary moments for hand hygiene areas before and after putting on the personal protective equipment, after contact with suspected/infected cases and any respiratory secretions, after using the toilet, and before eating foods or water (23, 32, 33). Therefore, hand hygiene facilities should be available and trained cleaners should clean the toilet twice a day. WHO recommends frequent hand washing for 20 seconds (and for 40-60 seconds for visibly dirty hands) with soap and water. As a temporary alternative for alcohol rubbers and soap, 0.05% chlorinated water can also be used for handwashing (23). However, the frequent use of chlorinated water might lead to dermatitis and asthma. Cleaning the seemingly clean hands can be performed with an alcohol-based rub for 20-30 seconds (23, 33, 34). Unlike non-enveloped viruses (e.g., adenoviruses and norovirus), the outer lipid cell membrane of 2019-nCoV is less stable to water and oxidants and is easily inactivated by hand washing. For effective disinfection by chlorine as an oxidant, the concentration of free chlorine should be more than 0.5 mg/L after at least half an hour at pH values less than 8 (23, 35). In addition to chlorine, quaternary ammonium compounds and peroxyacetic acid are of effective disinfectants (36). The effective measures for hand hygiene can be achieved by wash practitioners who improve the facilities and use of behavioural change techniques (23).

3.2.4.Disinfection of surfaces

It has been reported that the survival time of 2019-nCoV on surfaces is between 2 hours to 9 days (23, 37). The survival on surfaces is associated with the type, humidity and temperature of surface. The surface can be cleansed from 2019-nCoV by application of typical disinfectants including ethyl alcohol (>70 % v/v) or sodium hypochlorite (0.5 % or 5000 ppm). The ethanol is recommended for disinfection of reusable equipment and small areas (23).

3.2.5. Consumption of dietary supplement

Although there is no evidence, vitamin C (ascorbic acid) is recommended to prevent 2019-nCoV infection. This might be due to the role of this vitamin in maintaining immunity (16). The Zn^{2+} intake has been shown to inhibit the replication of other RNA viruses including influenza and may have the same role for 2019-nCoV as an RNA virus. Zn^{2+} affects the RNA polymerase activity and its ionophores block the replication in cell cultures (16, 38).

3.3. Social Preventive behaviours

3.3.1.Isolation, quarantine, and social distancing at the social level

Preventive measures should be taken to halt ongoing transmission from infected cases. Monitoring the contacts requires cooperation and understanding of both public health care workers and cases. Mathematical models have been proposed to assess the efficacy of controlling 2019-nCoV outbreak by isolating and identifying the contacts. Unlike SARS, 2019-nCoV infectiousness starts before the onset of the symptom and can be transmitted from asymptomatic infected patients. Therefore, delays in symptoms onset result in less effectiveness of isolation of cases and tracing contacts (39). Prolonging the time from onset of symptoms to isolation leads to increase of transmission and fastens the spread of 2019-nCoV. Identification of suspected and infected cases should be done in the shortest time. However, the only possible ways to mitigate the spread are social distancing, early self-isolating of households, quarantine of towns and cities, and banning of mass gatherings (10). The social distancing should be first implemented in small scales of epicentre city and province and then in the whole country (40). The lock-down of infected cities increases the mortality rates in these cities but prevents the spread of 2019-nCoV to other cities (41). The United States of America has suspended the entry of travellers from high infected areas (6, 18, 42, 43). About one month after the onset of the first infected cases, the Wuhan city of China with 11 million residents was quarantined on 23 January 2020, and all public transportation was uncompromisingly sealed off (6). Another 15 cities of China were shut down on Jan 24, 2020 (8). The delay in quarantine allowed the transmission of virus nationally and internationally (6). Many Chinese provinces have been already infected before the shutdown of Wuhan and 5 million people had already left this city (44). The delayed travel limitations have modestly slowed down the spread to other cities (21). The quarantine can take place at both home and designated places. In the SARS outbreak in Ningbo of China, only one person was permitted to go shopping every other day (9). For SARS, the likelihood of transmission by patients was reduced when patients were isolated within 4 days after onset of symptoms (45). For 2019-nCoV, after 30 days of strict isolation in Wuhan and Hubei (Jan 2020), the R_0 was reduced to 1.58 from 2.2 (40). However, the rapid spread of 2019-nCoV is known to be attributed to mass population movement from Hubei (18, 44). By proper implementation of isolation, virus starves and the host is eliminated (9). However, isolation for the prevention of new pandemics has caused negative psychological effects regarding unemployment and economic aspects.

3.3.2.Cancelling flights and restricting non-essential travels

As aforementioned, as possible, the flights to infected areas must be cancelled to prevent the spread of the outbreak. WHO advises enforcing restrictions for traveling (46)? Some countries have suspended visa issuance and air traffic from infected areas. All travellers from infected geographical

regions must be evaluated for infection and quarantined as they return to their homes. Thermal scanners can be installed in airports to prevent transmission for all departing passengers. To prevent the health-related risks of airborne contamination, personal protective equipment, and standard hygiene materials, etc. should be provided. Staff should be trained and they should consult with health care systems for any inquiry when assessing travellers who are from infected geographical regions (47).

3.3.3.Raising public awareness by online hygienic advice

Raising the public awareness on early recognition of 2019-nCoV symptoms and training protective measures including frequent hand washing and avoiding suspected or infected cases assist in the prevention of transmission (48). The symptoms of suspected or infected cases should be all medically explained in detail. The anytime-anywhere access to the internet can be of most helpful ways for healthcare sectors to inform prevention measures to people who are in isolation or quarantine. Following the hygienic advice and instructions remotely unless the occurrence of severe symptoms helps in social distancing and isolation of cases (8). Other than the benefits of isolation, communicating through online services can help in appeasing society's emotions, rejecting rumours, coping with the fear of death, and giving hope to overcome the outbreak (18). To reduce the costs of medical services and compensate for the low ratio of medical personnel, home monitoring can be employed for monitoring the patients who do not need general hospitalization. However, this requires the connection between hospital employees and patients (49).

3.3.4.School closure and online distance education to reduce social contacts

Epidemiologically, 2019-nCov involves all age groups, however, elder cases are more probably to have severe symptoms (6, 50). As reported in Hubei, 78.7, 0.9, and 1.2 % of infected cases were between 30-69, 0-9 and 10-19 years old, respectively. The mortality rates of over 80 years are 14.8 % (9). 2019-nCoV disease can be transmitted from children to others. school closure and limiting children's exposure to 2019-nCoV can prevent the super spreading of disease (8). Online distance education using available technologies and software has been welcomed by faculties, teachers, and students. These online courses provide a safe education without leaving their homes. Teachers and faculties can respond to rumours and questions of society by their knowledge. However, campus life is severely affected by long periods of isolation (18). Other than its economical drawbacks, some teachers and students are unfamiliar with novel technologies and may not have internet access to classes.

3.3.5.Safely managing wastewater and drinking water by public health centres

There is no evidence of the probable presence of 2019-nCoV in drinking water or water supplies (35). Although there is uncertainty about the survival of 2019-nCoV in drinking water or sewage, the measures should be conducted to prevent the possible transmission of virus via groundwater sources or drinking water (23). Some protective measures are to ensure the safety of at levels of distribution, storage, and consumption. The treatment can be conducted by using ultra/Nano-membrane filtration, disinfectants, solar or UV irradiation water by treating water and boiling (23, 35, 51). To treat wastewater, an oxidation pond is generally maintained which pathogens are destroyed after a long period of retention. The intrinsic and extrinsic factors such as pH value and sunlight can accelerate the destruction of pathogens. The same simple technique is proposed for the treatment of 2019-nCoV in sewage and wastewater. In sanitizing process, the facilities and personal protective equipment should be provided for health workers to prevent the transmission of 2019-nCoV disease (23).

4. Conclusion

The current article is a review of the literature which has been done related to the prevention and control measures. Understanding of protective measures regarding quarantine, early diagnosis, and isolation of suspected/infected cases, personal hygiene practices, timely dissemination of clear and accurate information, and social distancing are the most effective prevention methods. Since the emergence of this pandemic, personal and social preventive behaviours should be trained and strictly conducted to slow down the spread of virus and curb the pandemic. Implementation of preventive measures such as social distancing and isolation minimizes the deaths, suppresses the peak, and slowdowns the rapid spread of virus until effective drugs and medicines become available.

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