Non-Pharmaceutical Interventions are Measures to Control Coronavirus Disease-2019 (COVID-19) Transmission in India

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Abstract: The coronavirus disease 19 (COVID-19) is a pathogenic and transmittable viral disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and this disease emerged in December 2019 in Wuhan, China. It was later spread across the world, including the United States, Great Britain, Brazil, Russia, Germany, Spain, Italy, Iran, Pakistan, India and other countries. The whole genome of SARS-CoV-2 shared some similarity with the SARS virus, hence bat was a suspected source of the spread of this virus in China. However, human to human transfer was reported. In India, more than 300 COVID-19 cases were reported on March 21, 2020, and these numbers were increased as 892551 on July 13, 2020. These numbers of COVID-19 cases were detected from a total of 11806256 samples according to the report given by the Government of India. In India, a total of 254427 cases and 10289 deaths were recorded. Tamilnadu was another state that screened more number of COVID-19 cases, followed by Maharashtra. On July 6, 114978 COVID-19 cases were reported in Tamilnadu and 1571 deaths were recorded. In Tamilnadu alone, over 3000 COVID-19 cases were reported daily from July first week to the second week and total cases were 142798 on July 13, 2020. Among these cases, 78573 COVID-19 cases were detected in Chennai city alone accounted for about 62% of total COVID-19 cases. It was earlier believed that patients over aged 60 and less than 10 were highly vulnerable to this disease. However, this disease affected all age groups. To prevent COVID-19, no approved antiviral vaccine or drug has yet been discovered. COVID-19 is transmitted through droplets during coughing and sneezing by symptomatic and asymptomatic carriers. Non-pharmaceutical interventions such as washing hands and social distancing are effective measures to control COVID-19 transmission in India. The present study was designed to analyze the control measures of COVID-19 infection and ground reality to control the COVID-19 outbreak.

Keywords: Coronavirus, disease, prevention, control, non-pharmaceutical, challenges.

1. INTRODUCTION

In December 2019, a novel coronavirus (2019- nCoV) infection was reported in Wuhan, China and this virus has very rapidly spread across China and various countries [1, 2]. This virus has affected more than 43000 patients over 28 countries and has become an important concern throughout the world as on March 30, 2020. On July 13, a total of 12768307 cases were diagnosed globally and 566654 deaths were recorded [3]. World Health Organization (WHO) announced the name of the virus as coronavirus disease (COVID-19) in February 2020 which was previously termed as severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) [3]. Previous studies reported the possible transmission of this virus through the wild animal market, fish market and possible transmission of animal-to-human transmission, however, recent findings demonstrated that COVID-19 transmission made by human-to-human contact or droplets [4-6]. Approximately 41% of SARS-CoV-2 was presumed with hospital-related asymptomatic carriers [6]. Moreover, the outbreak of COVID-19 was declared on January 30, 2020, with that respect government has taken the essential steps to prevent the outbreak of COVID-19 globally [7]. Moreover, the outbreak of COVID-19 caused public health risk and the collective effort required to understand the spread of COVID-19 globally [8]. This disease was spread through asymptomatic carriers also [9]. Hence, the determination of COVID-19 from asymptomatic carriers is a challenging task. The recent finding indicated that quarantine was effective to reduce the incidence of severe mortality in the COVID-19 pandemic [10]. The present study was aimed to investigate non-pharmaceutical interventions to control the COVID-19 pandemic.

2. METHODS AND DATA SOURCE

The present study applied the WHO COVID-19 database, which was made available through the WHO official website.
under the title COVID-19 as data for evaluating the COVID-19 pandemic Global level. This database provided a comprehensive source of current updates on the topic. To analyze COVID-19 pandemic status in India, data were collected from the official website of the Ministry of Health and Family Welfare, New Delhi, India. These two reports were considered as Global and Country level. All research papers used in this study were accessed from Google Scholar using specific keywords and the publications only after the COVID-2019 pandemic was considered for analysis.

3. SEVERITY OF COVID-19 IN INDIA AND OTHER COUNTRIES

In December 2019, the first COVID-19 case was reported [11]. Between December 18, 2019 and December 29, 2019, five cases were hospitalized with COVID-19 syndrome and among them, one patient died [12]. In January 2020, 41 patients were admitted to Hospitals with COVID-19 positive wherein, 50% of suspects had been reported with cardiovascular diseases, hypertension and diabetes [13]. Recently, human to the human spread of COVID-19 was reported mainly due to very close contact with affected persons exposed to sneeze, cough and aerosols. These aerosols effectively penetrate the human lungs via inhalation through the mouth or nose [14]. In the light of January 22, 2020, more than 570 positive cases were reported in various cities and districts of China [15]. Out of 570 cases, a total of 17 deaths were reported according to the report from China National Health Commission. On January 24, a total of 5502 cases were reported in China, however, this was raised as 7734 on January 30, 2020 and COVID 19 slowly spread across the world, and 90 new cases have been reported from various countries, including, the United States, United Arab Emirates, Republic of Korea, Singapore, Japan, Cambodia, Sri Lanka, Nepal, Malaysia, Vietnam, Thailand, Taiwan, Philippines, Australia, India, Finland, Canada and Germany. The causality rate was about 2.2% [16]. In the US, the first case of transmission of COVID-19 through human-to-human was reported. In the United States, about 95235 deaths were reported due to COVID-19 between March 01 and May 30. The official mortality rate was about 28% higher than the official report because the number of deaths occurred before the COVID-19 diagnosis [17].

In India, more than 300 COVID-19 cases were reported on March 21, 2020 [3] and the Government of India has been taking preventive measures to crackdown this disease. In India, International flights have been suspended since March 18, 2020. On March 22, 2020, six persons died due to COVID-19, including one Italian National and all were aged over 60, but only one case was reported in Bihar state of India aged 38. On 22nd March 2020, a total of six patients were suspected with COVID-19 infection in Tamilnadu, a state of India. However, all these six patients were acquiring COVID-19 due to travelling abroad. On March 22, 2020, the seventh COVID-19 case was reported in Tamilnadu state, India and it could be noted that he returned from Spain. In some places, people were advised to be quarantine at home, however, sporadically, these people mixed with other people created panic in Tamilnadu and India. On March 24, 2020, a total of 492 COVID-19 positive cases were reported in India, out of 492, 10 people died and the mortality rate was 2.0%.

Among these positive cases, 41 suspects belonged abroad. In India, a total of 878254 COVID-19 cases were diagnosed up to July 13, 2020, and 23174 deaths were reported [3]. On July 13, Maharashtra state of India recorded a total of 254427 cases and 10289 deaths were recorded. On July 6, 114978 COVID-19 cases were reported in Tamilnadu and 1571 cases were dead. In Tamilnadu alone, over 3000 COVID-19 cases were reported daily from July first week and increased as 142798 on July 13, 2020. Among these cases, 78573 cases were detected in Chennai city accounted for about 62% of total COVID-19 cases. In a study, Tiwari et al. [18] predicted peak COVID-19 infection in India between April 2020 and May 2020 and suggested lockdown to control this pandemic. However, this was not true in the case of pandemic COVID-19, because more cases were determined in the first and second weeks of July 2020.

4. COVID-19 TRANSMISSION AND SPREAD

Only a few studies were reported on pathological features of COVID-19, however, the mechanism of spread remains unclear. The present knowledge was mainly derived from the same coronavirus type, which was mainly transmitted by respiratory fomites from human to human [19]. The asymptomatic incubation period for this disease was approximately 7 to 14 days. In China, 80,304 COVID-19 cases have reported, and total 90,870 cases were reported throughout the World as on March 3, 2020 [19]. The 10,566 COVID-19 cases were spread across various countries, including, US, Thailand, Australia, Iran, France, Italy, Korea, Japan and the Philippines [20]. Moreover, this disease seems to be zoonotic as it comes from an animal. The other two coronaviruses like, Middle East respiratory syndrome coronavirus (MERS-CoV) and severe acute respiratory syndrome coronavirus (SARS-CoV) showed a high mortality rate with 37% and 10% out of 10,000 cases respectively [19]. This implicated that these two viruses were thought to be less spread and more lethal, whereas COVID-19 spread prevailed over the world and that means the virus in the pandemic, nevertheless COVID-19 is less lethal when compared to SARS and MERS. China had experienced previously the SARS outbreak in 2003, with that experience, they initiated the effective measures to isolate the confirmed or suspected patients and made them quarantine from the infected cases [21]. On 22nd March, 2020, the Government of India advised their citizen to stay their houses, to create awareness among the general public. In Kanyakumari District of Tamilnadu state, none of the persons were positive with COVID-19 on 22 March 2020, however a patient was admitted at Kanyakumari Medical College Hospital and declared COVID-19 negative. Although train services were suspended on March 22, 2020, on the mark of COVID-19 awareness, invidiously crowd found in most of the railway stations to neglect Government guidelines. COVID-19 is transmitted through droplets formed during coughing and sneezing by symptomatic carriers and asymptomatic people [22]. The SARS-CoV-2 virus was also isolated from asymptomatic patients and affected individuals acted as a carrier for 14 days after cessation of symptoms [23]. In Tamilnadu state, India, COVID-19 cases increased in neighbouring Districts of Chennai due to the Koyambedu Market COVID-19 cluster. The active cases recorded were 8283, 6930, 6539 and 3979 in Chengalpattu,
Tiruvallur, Madurai and Kancheepuram District, respectively.

5. AGE, SEX AND DISEASE TRANSMISSION

In Wuhan, almost all reported COVID-19 adult cases were suspected with pneumonia infection. The average age was reported as 56, 55 and 49 in three independent studies [13, 24, 25]. In China, Novel Coronavirus Pneumonia Emergency Response Epidemiology Team reported that 66.7% of COVID-19 cases showed differences in degrees of pathology and the severity of infection within the age group 20 - 60 (The Novel Coronavirus Pneumonia Emergency Response Epidemiology Team, 2020). However, all age groups were susceptible to COVID-19 [22]. In South Korea, 15 infected cases were identified initially under the age group of 25-62 [26]. In a study, nine COVID-19 patients (0.9%) were aged between 0 and 14 years [27].

6. COVID-19 AND TREATMENT

There are various therapeutic options that have been suggested to treat COVID-19, however, no specific therapies are recommended to combat COVID-19 disease. This is a kind of RNA virus; hence it may have a similar expression of various proteins for replication and assembly to human immunodeficiency virus (HIV). Hence, a trial was made using the anti-retroviral drug to treat COVID-19. In recent times, ritonavir/lopinavir (LPV/r) combination was recommended to treat COVID-19, which has been previously used to treat MERS-Cov and SARS-Cov [28, 29]. Moreover, molecular docking studies and homology modelling revealed that nelfinavir, the drug for HIV, is being recommended against COVID-19 [30]. Remdesivir (RDV, GS-5734) has also been proved to be effective against COVID-19 [31, 32]. In a study, Wang et al. [25] reported that RDV could effectively inhibit COVID-19 viral infection. This drug has been successfully administered in COVID-19 patients in the US and has large scope to treat this infection [33]. In another study, Wang et al. [25] reported the effective role of chloroquine to control COVID-19 infections. Arbidol is an antiviral drug against various respiratory illness causing viruses. Recent findings revealed that arbidol can be used to treat COVID-19 infections. Clinical trials have also been conducted on coronavirus pneumonia to test the efficacy of arbidol (NCT04246242). Various findings revealed that the combination of monoclonal antibody and RDV would highly useful to treat COVID-19. In a significant development, Tian et al. [34] disclosed that CR3022, a SARSCoV-specific human mAb, could effectively bind with the COVID-19 receptor binding domain. Hence, CR3022 could be rapidly developed to treat and prevent new COVID-19 cases. In addition to these, baricitinib, a janus kinase inhibitor, could effectively affect receptor mediated endocytosis and interfere with the flow of the virus into cells, thus minimize the ability of the COVID-19 virus to infect lung cells [35]. In addition, practitioners from China used traditional Chinese medicine and also started research work on stem cell infusion therapy to treat COVID-19 infections. The positive outcome of this research work could improve COVID-19 treatment [36].

7. COVID-19 TRANSMISSION THROUGH COMMUNITY AND MITIGATION OF COVID-19 TRANSMISSION

The research revealed that COVID-19 transmission in the community and its proportion of spread towards severe illness were reported under the age group 50, but it is rather serious in immunosuppressive patients. However, the reproductive number of COVID-19 was found to be higher than that of influenza. Nonetheless, severe cases have also been reported among younger individuals. Thus far, the estimated basic reproductive number (R0) of COVID-19 is higher than that of influenza [1], but the fatality rate of COVID-19 is reportedly less. Globally, travel restrictions, quarantine of exposed persons, isolation of confirmed cases are being performed to slowing the newly introduced cases.

Non-Pharmaceutical Interventions (NPIs) have effectively reduced the number of infected persons entering the U.S. In the case of COVID-19, mitigation measures have been taken to drop the widespread transmission to the community. It could be noted that the pandemic influenza in 1918/19 was effectively controlled by the closure of schools, isolation of ill persons, mandatory wearing of masks, banning of mass gatherings and suitable hygiene measures minimized mortalities in US cities [37]. These NPIs considerably reduce transmission of disease, potentially reduced the height of the epidemic peak and considerably reduced the number of infected persons. In India, over 350 persons were infected due to COVID-19, as on March 22, the government imposed NPI. However, the states such as, Uttar Pradesh earlier imposed curfew in certain sites to control the rapid spread of COVID-19.

8. COMPLETE LOCKDOWN REDUCED COVID-19 PANDEMIC SPREAD

On March 22, India braced for a nationwide 14-h lockdown to break the spread of the novel coronavirus and almost all the state government announced effective measures to follow social distancing, the Government of India said that there was no evidence of community transmission yet in the country. On 21st March 2020, the total number of cases was 271, with 65 new cases. About 7000 people have been in contact with COVID-19 cases and they are under the scanner of the Government of India. All these affected persons have been contacted with COVID-19 cases abroad. In India, Maharashtra and Kerala were evidenced with 12 new cases, Karnataka five and Gujarat seven, on March 21. The Union government of India allowed to culture coronavirus in laboratories to initiate to develop a drug against COVID-19. On March 24, 101 cases have been reported alone in Maharashtra, which was severely affected than other states in India.

Ministry of health and welfare perspicuously says that 2% of deaths were reported in India out of 492 cases on March 24, 2020. It is reportedly less in comparison to China, Italy and Iran. It is due to the fact that people are still cooperating with government order in terms of social distancing, home quarantine, avoid crowding, wearing masks, avoid travelling, and washing fingers and hands. In spite of the
government has taken the steps presumably, people travelled abroad were not cooperative. In fact, the disease could have been transmitted from person to person by sneezing, coughing, handshaking at the airport. On March 25, a total of 562 persons were infected with COVID-19 and 11 deaths were registered. In Tamilnadu, five more COVID-19 cases were reported on March 25. Among these five cases, four were Indonesian Nationals and from Tamilnadu. These five attended a series of functions in various Mosques in Salem District in their weeklong tour, which created panic among a section of people who attended Mosque prayers. This is an example of filtering COVID-19 through people from abroad and also reflected asymptomatic COVID-19. In a travel history, a UK citizen attended a conference in Singapore, who was found as a super spreader and infected about 11 people while he stayed at a resort [38].

9. PERSONAL HYGIENE AND OTHER MEASURES TO CONTROL COVID-19

The protective measures such as face mask, hand hygiene was very useful to face pandemic COVID-19. Hygiene of hands effectively reduces the transmission of various respiratory related infections through community setting, and minimizes the risk of diseases [39]. Almost all types of coronaviruses, including COVID-19, are readily inactivated by various alcohol-based disinfectants such as bleach and hand sanitizers. Disinfection of the environment with suitable sanitizers is also effective to prevent the transmission of COVID-19. Aerosols and respiratory droplets are the risk factors to transmit COVID-19. A face mask is highly recommended to control the disease transmission and is widely recommended in countries such as, China, Taiwan, Hong Kong and India. The use of face masks may protect healthcare workers from diseased individuals. The combination of hand hygiene and face mask is shown to considerably reduce transmission of viruses and indicating that NPI is highly effective in reducing COVID-19 transmission. It is advised to use the mask for ill persons and health care associates and people in highly crowded places. The N95 mask is useful to protect people from disease transmission. In India, panic erupted after the report of COVID-19 cases in March 2020 and people started to wear masks, knowingly or unknowingly people use masks with various pore sizes, even some were infective to counter COVID-19 and even the Indian Council of Medical Research (ICMR) notified only use N95 mask. On March 21, ICMR guidelines to use the masks were suggested to suspects, relatives of COVID-19 but not others. Also in India, in the third week of March, almost all types of mask and hand wash were sold to people for their protection and on March 20, the Government of India notified “Alcohol” was an essential commodity. Students below the age of 10 are highly susceptible to COVID-19 disease. Hence, various countries announced leaves for school children. UK government announced the closure of schools on March 20, 2020. This has been instructed by the education secretary, Gavin Williamson and also instructed colleagues to follow the closure guidance [36]. In the wake of the COVID-19 outbreak, the Government of India instructed Schools and Colleges for closure.

10. TREATMENT OF ILL PATIENTS AND QUARANTINE OF EXPOSED PEOPLE

Throughout the world, as suggested by WHO, the respective government has been taking serious action to hospitalize ill patients and their close contacts are being quarantined at home or, in some cases, designated quarantines. On March 12, 2020, these effective steps were able to prevent local transmission in Taiwan, Singapore and Hong Kong. In the case of MERS and SARS, medical isolation has been easy, because the infection is severe and a very small population was infected, whereas the case of COVID-19 incidence is reverse, so it is very difficult to identify the asymptomatic person and persons with mild COVID-19 infections [40]. In this case, only the individuals should come forward to isolate themselves. Considerable attention has been paid to control COVID-19 by Central and State Government in India, however, infected Indian citizens from abroad are a big threat. However, it is interesting to note that some persons were quarantined themselves voluntarily to protect themselves and others. Within India, train service is a big cause to transmit the disease because it is an asymptomatic type of disease in some cases. Lack of a quarantine environment forced the Indian government to keep some people in their houses under the monitoring of health officials.

11. PREVENTIVE MEASURES TO CONTROL COVID-19 IN INDIA

The Government of India takes effective steps to control COVID-19. These include, washing hands thoroughly and frequently (about 15 times per day) with soap or alcohol-based hand wash. Maintain a meter distance between individuals affected by sneezing and coughing. Citizens should avoid touching nose, mouth and eyes by hands contaminated with COVID-19 droplets. ICMR instructed to carryout the COVID-19 screening test to all patients suffering from respiratory illness in India. On March 22, 2020, the Government of India imposed a travel ban over 75 districts, including 3 districts in Tamilnadu. The Union government instructed companies to allow their employees to perform their work at their homes. Religious places and tourist places were shut from March 2020. The government used health care workers to disinfect all public places. Lack of isolated wards in the Government sector results in reviewing isolated wards to meet the demand. However, central and state governments routinely give guidelines to counter COVID-19. In India, the relaxation of lockdown enhanced virus spread in June and July 2020. Relaxation of lockdown increased COVID-19 deaths in Mexico and reported 300% mortality between June 1 and July 9 [41]. In a study, Wise et al. (2020) reported the role of washing hands and social distancing to control disease transmits in the United States. Social distancing reduced the probability of contact between non-infected and infected people in the United States [42]. Distancing between infected people and non-infected people is a vital tool to reduce COVID-19 infection.

CONCLUSION

The novel coronavirus outbreak poses a serious challenge to public health, economic and public health infrastructure.
Among all measures, NPI is highly effective and should impose this in a suitable manner. Implementation of NPI in India may be effective to control COVID-19 overwhelmingly.

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REFERENCES


