REVIEW

The impact of e-health on COVID-19 infection solutions

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ABSTRACT

E-health is a healthcare service that is being used only in the past two decades. Telemedicine, mobile e-health applications, etc. were being developed long before the covid-19 pandemic. And the study aims to investigate and evaluate the benefits of e-health services on public health during the Covid-19 pandemic.

In the search for scientific literature related to this review the US National Library of Medicine (PubMed) used MEDLINE and SportDiscus data and the terms "SARS-CoV-2", "covid-19", "e-health", and "telemedicine" were used. The relevant literature has also taken its source from the research of relevant articles from reference lists derived from data studies.

To develop e-health services and manage the covid-19 pandemic smoothly, several solutions can be implemented. With e-health solutions, people do not have to make a physical appearance in hospitals to be treated. Virtual clinics can be established and popularised. Chatbots may help people to consult and be aware of their current situation. Mobile applications may be used to assess people's body temperatures and symptoms and collect their medical data.

It is a necessity for societies and countries all around the world to develop a public e-health system to manage the covid-19 pandemic process more healthily. These systems will prevent unnecessary occupancy in hospitals, limit physical contact, and reduce virus risk both for patients and healthcare professionals.

Keywords: e-health, SARS-CoV-2, public health, Covid-19

INTRODUCTION

E-health is a healthcare service that is being used only in the past two decades. Telemedicine, mobile e-health applications, etc. were being developed long before the covid-19 pandemic. However, digital health systems were not fully adopted into human life [1-4]. The covid-19 pandemic changed the routine health system completely over a few weeks. Treating people while providing a physical distance became a challenge. Today, e-health services are being implemented in many countries to overcome these challenges

and protect public health. Diagnosis through video consultation, managing patients' conditions through online data, and using social media to direct people are promising methods of e-health. Telephone consultation, short message services, and video conferencing provide healthy communication between healthcare professionals and patients without any physical contact [5]. They are available globally and are easy to use. However, the barriers and costs of implementing e-health services are to be considered [6].

Covid-19 Pandemic

A contagious disease was identified in Wuhan City of China in December 2019 [7, 8]. The disease started locally and spread globally. In the first month of 2020, there were 83 cases detected in 18 countries [8]. The cause and origin of the disease were not detected however the spreading speed was quite high [9]. In March 2020, Covid-19 (also referred to as coronavirus) pandemic was officially declared by World Health Organisation (WHO). Researchers indicate that coronavirus is a type of virus in the Coronaviridae family. Coronaviridae family can be subcategorised into 4 genera: Alphacoronavirus, Betacoronavirus, Gammacoronavirus, and Deltacoronavirus [10]. Coronaviruses mostly spread among animals such as birds, mammals, bats, etc. However, in some cases, the host may alter and the virus infects humans [11].

According to studies, human coronaviruses originated from animals [12-14]. In the past 20 years, 3 severe types of coronaviruses are known to affect public health: SARS-CoV in 2002, MERS-CoV in 2012, and SARS-CoV-2 in 2019.

SARS-CoV-2 is categorized as lineage B betacoronavirus. Severe acute respiratory syndrome (SARS) and middle eastern respiratory syndrome (MERS) are also in this category [15-17]. The research about the genetic structure and origin of Covid-19 is not finalized. However, there is proof that the RNA genome of bat coronaviruses is quite similar to SARS-CoV-2 [18]. Genetic analysis of the Covid-19 virus suggested that there is an 85 to 96% match with bat coronavirus samples [19]. Therefore, it is considered that SARS-CoV-2 diverged from animal origin. Covid-19 only spreads among humans [20]. The modes of transmission are primarily through respiratory droplets and close interaction [21,22]. The disease has an incubation period between 1 to 14 days [23,24]. Yet, there are ongoing disagreements on the length of the incubation period. Some studies suggest that the incubation period may even extend to 19 days [25].
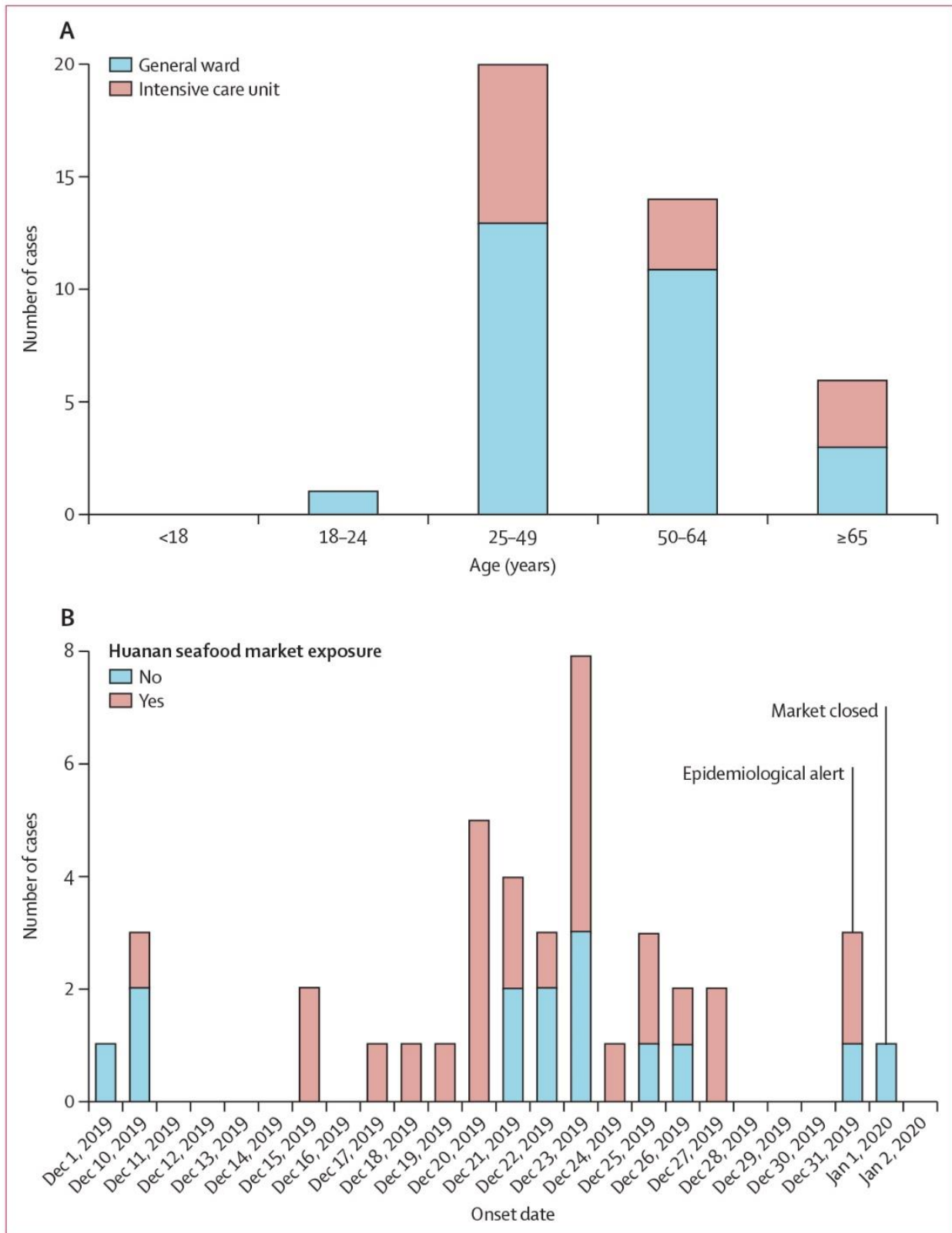
Figure 1. Date of illness onset and age distribution of patients with laboratory-confirmed 2019-nCoV infection. (A) Number of hospital admissions by age group. (B) Distribution of symptom onset date for laboratory-confirmed cases. The Wuhan local health authority issued an epidemiological alert on Dec 30, 2019, and closed the Huanan seafood market 2 days later.
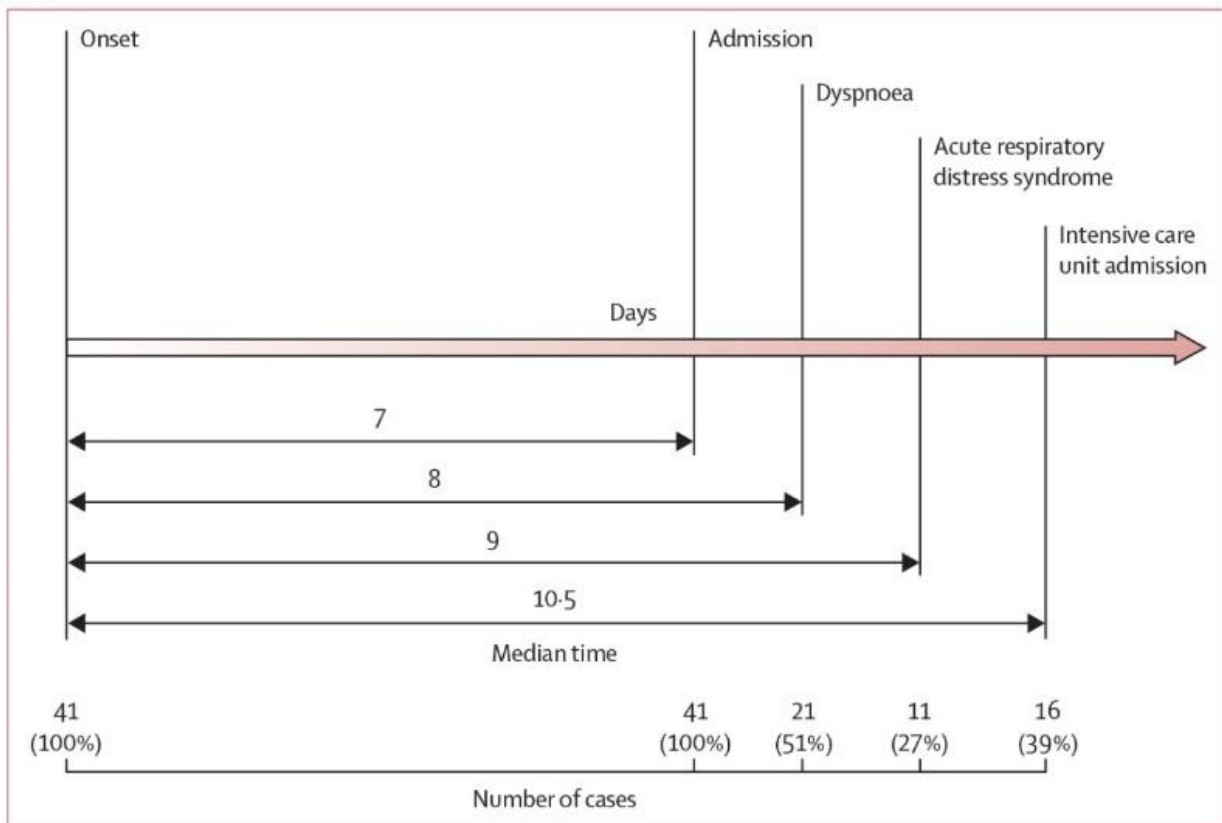
Figure 2. Timeline of 2019-nCoV cases after the onset of illness.

After the outbreak of Covid-19 in Wuhan, China, precautions, and measures were taken to prevent the disease to become a public health threat in a global sense. However, the spread was inevitable [26].

COVID-19 AND PUBLIC HEALTH

Since the emergence of the disease, new findings of symptoms are revealed. The main and most common symptoms of Covid-19 are high fever, cough, respiratory distress, muscle pain, and fatigue. Clinical manifestations of the disease also included injury to the kidneys and heart [27]. According to a study by Wang *et al*., among 138 Covid-19 cases, 36 patients had to be treated in ICU. The mortality rate in the study was identified as 4,3%. The study also demonstrated that patients of older age were at higher risk of becoming critical (Figures 1 and 2) [23]. The physical outcomes of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) can be quite severe including myocarditis, arrhythmia, heart failure, etc. Researchers reveal that even asymptomatic patients and patients with mild symptoms may suffer from these problems as an outcome of Covid-19 [28]. A study including 100 covid-19 patients concluded that 78 people suffered from heart problems and 60 people suffered from myocardial inflammation after the recovery period [29]. Another research revealed that among 1200 recovered covid-19 patients, more than half had echocardiographic abnormalities [30].

E-HEALTH STRATEGIES TO MANAGE COVID-19 PANDEMIC

Traditional healthcare systems are insufficient in the fight against pandemics. Pandemics cause challenges to overcome and existing systems are not always enough to overcome these challenges. Crises are needed to be responded to with innovative solutions to maintain public health and wellness. For instance, the inadequacies in traditional health systems were revealed during the Ebola outbreak in 2014 and the influenza outbreak in 2009 [31,32]. Since epidemics and pandemics have always been periods that demonstrated the inadequacies in health systems, the covid-19 pandemic also brings out similar conditions and challenges to be responded [33].

E-health services are newly adopted into human life. A pandemic is a great way to enhance the adaptation process and implement these systems to maintain a healthier and easier life. There is no concrete evidence indicating when the Covid-19 pandemic will be put under control. Therefore, it is crucial to operationalize innovative and permanent solutions to ease the burden on the health system. E-health tools such as video conferencing etc. may be very useful to decrease physical contact and increase access to patients in isolation [34].

All-round the world, providing healthcare to people with acute diseases has become a serious problem. With the emergence of the Covid-19 pandemic, healthcare professionals have to take extra measures to prevent their patients, colleagues, or themselves from catching the disease, meaning minimum physical contact. To minimize the people density in health institutions, nonurgent treatments are postponed or people are asked to abide by the social distance rule. Unarguably, this provides a difficult environment to treat patients [5].

Telephone cameras make enable sharing of documents. Digital services and phone applications allow for recording health information. Healthcare professionals can access patients' health history, review test results, and evaluate current conditions through e-health services. There are operating systems such as CHOIR in US and PAIN OUT in Europe that allow doctors to get feedback on patients with acute pain. Consultation and examination can be carried out in a digital environment [5].

During a pandemic, physiology is not the only threatened aspect of human life. Social distancing, quarantines, and the feeling of being at risk affect mental health as well [34]. Therefore, providing mental health care during a pandemic is equally important to manage the process. E-health methods and tools are beneficial to managing society's mental wellness. Video-conferencing psychotherapy and internet interventions are innovative therapy methods that may be very helpful during the Covid-19 pandemic. A study by Berryhill *et al.*, demonstrated that being involved in psychotherapy through videoconferencing reduces anxiety and stress [35]. Another study argued that internet interventions by therapists provide promising outcomes {36,37].

DISCUSSION

Researchers demonstrate that mental health care support through telephone video conferencing, mobile apps, social media, e-mails, and text messages help treat depression, anxiety, and PTSD significantly [38-43].

There are examples of e-health use during epidemics and pandemics that showed promising outcomes. During the Ebola outbreak, mobile apps were used to track the cases. Similarly, during the SARS outbreak, videoconferencing was used to manage the disease [32]. In the 2010 Haiti earthquake crisis, a mobile health service allowed for the data of more than 600 injured people to be gathered digitally and eased the burden off of the health system [44].

During the Covid-19 pandemic, China implemented an e-health service named Emergency Telemedicine Consultation System. The system helped monitor patients' conditions whether it is severe or mild and kept track of their progress. The system made it possible to collect the patients' data for physicians to treat and evaluate them [45].

During the covid-19 pandemic, the Singapore government used social media to manage the disease. The government made a contract with Whatsapp mobile app to provide straight and confirmed information to the public about the covid-19 disease. Moreover, other social media platforms were put into action to allow healthcare institutions to give real-time data about covid-19 to society [46].

Avera Health system in the United States allows for communication with people who demonstrate covid-19 symptoms and send healthcare personnel for home-based testing [47]. ETHAN (Emergency Telehealth and Navigation) system helps decrease people density in hospitals. Paramedics who respond to emergency calls contact doctors through video calls [48]. The system allows doctors to assess the patients' condition virtually and decreases the number of patients transferred to emergency services.

CONCLUSION

To develop the e-health services and manage the covid-19 pandemic smoothly, several solutions can be implemented. With e-health solutions, people do not have to make a physical appearance in hospitals to be treated. Virtual clinics can be established and popularised. Chatbots may help people to consult and be aware of their current situation. Mobile applications may be used to assess people's body temperatures and symptoms and collect their medical data. It is a necessity for societies and countries all around the world to develop a public e-health system to manage the covid-19 pandemic process more healthily. These systems prevent unnecessary occupancy in hospitals, limit physical contact, and reduce virus risk both for patients and healthcare professionals.

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