SARS-COV- 2 Pandemic: Evaluating Early Public Health Intervention in Wuhan City, China

Abstract
Severe Acute Respiratory Virus2(SARS-COV-2) is responsible for the COVID-19 pandemic. The first cases were discovered in Wuhan, China on December 8, 2019. Globally, it has claimed over 4 million souls out of 280,000 cases as of 10 May 2020. Consequently, it caused widespread devastating social, economic, and political upheavals worldwide. This piece explores and critique the early public health response to the contagion in Wuhan, China before it snowballedinto the cataclysmic pandemic globally. By deploying mainly WHO-China reports on the nascent coronavirus, the thesis discovered that the Wuhan authority failed to stop roughly 50 percent of its population from traveling out of the city for the New Year celebration between 11 and 23 January 2020. Hence the piece argued that this uncontrolled emigration and delayeddisease response contributed substantially to the swift spread of the scourge outside Wuhan and worldwide.Other studies have focused on the mutagenic properties of the virus and its clinicalmanifestation. However, this study illuminates the significance of an early public health intervention in the control of epidemics. Anemphasis on Wuhan, China illuminates our understanding regarding theimportance ofprompt epidemic control in mitigating a full-blown pandemic.

Keywords – SARS-COV-2, COVID-19, China, Wuhan, pandemic, epidemic

INTRODUCTION

Severe Acute Respiratory Syndrome Coronavirus -2 (SARS-COV-2) is responsible for the coronavirus disease-19 (COVID-19) outbreak. This disease remains the greatest threat to humanity in the post-modern era. The human race has not witnessed massive fatalities from a single germ like SARS-COV-2 since the Spanish flu in 1918/19. As of 10 May 2020, SARS –COV-2 had accounted for over 280, 000 deaths out of over 4 million cases worldwide(WHO-Outbreak of Pneumonia due to coronaviruses, 2020).The SARS-COV-2 scourge commenced in December 2019. First cases were seen in Wuhan, China, and has since spread beyond the geographical boundaries of China, raising major global concern (Tang et al., 2020: Chaw et al., 2020).Wuhan city witnessed an upsurge of atypical pneumonia amongst its residents. The Chinese central government subsequently attributed the outbreak to the new coronavirus strain. Unfortunately, the virus diffused rapidlyto over 200 countries globally with consequent public health burden.Against the backdrop of its rapid dispersal and consequent fatalities, theWorld Health Organization (W.H.O.) labelled the contagion as a pandemic on 11 March 2020 (WHO, Outbreak of Pneumonia due to coronaviruses, 2020). Thegrand total prevalenceof global cases and mortality of surpassed China's figures on 16 March 2020 (WHO Situation Report, 2020).

There is no dearth of research focusing on the origin, transmission and other epidemiological characteristics of the nascent coronavirus (Drexler et al., 2020: Gralinsky and Menachery, 2020, Shereen et .al, 2020, Chen et al., 2020: Nikpouraghdam et al, 2020).Some researchers concentrate on the clinical attributes of thevirus. For example,Guan et al. (2020) highlighted that fever and cough were the dominant symptoms, and gastrointestinal symptom were uncommon. Similarly, Zhao et al. (2020), discovered that cough and fever were the dominant clinical manifestations of the novel virus. Some studies have outlined that SARS-

COV -2 causes milder symptoms in children with better prognosis, and common treatment (Zheng et al., 2020: Xiong et.al.,2020: Qui et al., 2020). Regarding pregnant mothers, Chen et al. (2020) discovered there were no difference in clinical symptomatology between a pregnant woman and non – pregnant ones, and they found no evidence of vertical transmission from mother to child in utero. Being a new disease with no known treatment, several clinicians have researched on a useful treatment guidelines based on observational studies(Jianjun et al.,2020: Liu et al., 2020: Fu et al, 2020: Shang et al., 2020). Subsequently, many countries had prioritized social distancing, reduced social interactions and lockdown to slow down the dispersal of the contagion.Despite extraordinary movement restrictions, social distancing measures, and lockdown orders decreed in many nations (Flaxman et al., 2020: Khosrawipour et al.,2020), thevirus has triggered devastating morbidity and mortality.To wriggle out of the social, political and economic threats of this scourge, vaccines have been widely considered as part of the tools to emancipate the wider world. (Tregoning et al.2020). In this light, the world's top pharmaceutical companiesheightenedefforts to develop effective vaccine to combat the devastating coronavirus pandemic. Some evidences have shown vaccination might slow the rate of transmission and reduce the mortality of the scourge. In the US, for instance, among patients with co-morbidities and risk factors,Moghadas et al. (2021) suggest that vaccination against COVID -19 amongst susceptible subjectscould reduce their risk of mortalities and hospitalisationtime.Relatedly,in England, Eyre et al. (2022) found out vaccination against SARS-COV-2 resulted in a smaller reduction in the transmission of the virus, though this beneficial effect reduces over time.Meng et al. (2021) argue that high China's vaccination ratereinforcedopportunities and proficienciesby enhancing the equity of vaccines and given the world community more choices.

However, despite the reported successes of vaccinations in some countries, it has not been a smooth ride for other economies. The process has been bedevilled with myriads of political, cultural and institutional challenges. Inequitable vaccines distribution, vaccine efficacy, vaccine hesitancy, and weak health systems areamong the main issues threatening the accomplishment of vaccination, especially in low income and middle-income countries (Ayenigbara et al., 2021: Mills et al., 2021: Brussow, 2021: Karafillakis et al., 2021: Mohseni Afshar, et al., 2022)

Concerning the early control of the SARS-COV2 in China and public health strategies deployed to curtail the quick spread of the virus, only a few research have delved into the subject matter.Such studies would enhance our insights regarding disease intervention designed to curtail thediffusion of epidemic diseases. Presently, there is a shortage of such researchregarding theCOVID-19 pandemic. One notable study by a group of eminent Chinese scholars explored the clinical manifestation and early response to COVID-19 infections in China (Adhikari et al., 2020). In their scoping review, they highlighted the clinical features, diagnostic evaluation and containment strategies of the first period of the outbreak. However, they failed to appraise China's early response to SARS-COV-2 epidemic. Another previousstudy hadevaluated China's reaction to SARS pandemic in 2006. It reported China's apparent lack of transparency in curtailing the contagion(Smith, 2006). Regarding SARS-COV-2, a similar review is necessary to evaluateChina's public health intervention of the eruption of COVID-19. Therefore, the focus of this study is to evaluate early China 's response to SARS- COV-2 outbreak in Wuhan, Hubei District.

Therefore, by reviewing sources from WHO-China Joint Report on COVID-19 and relevant articles from PubMed and Google Scholars on the novel COVID-19, this article intends to

assess an early Chinese disease response to SARS-COV-2 epidemic. It would illuminate our insights on the significance of prompt state intervention in the control and prevention of pandemics. This thesis would enhance our understandings on the importance of early public health response on a provincial basisto mitigate the socio-economic impacts of pandemics.

Historical Epidemiology of SARS-COV-2 Virus

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-COV-2) belongs to a large family of Coronaviruses. SARS-Coronavirus is one of the 36 Coronaviruses in the family *Coronaviridae* within the order *Nidoviridae.* Coronaviruses are single-stranded R.N.A. viruses, and they are a particular type of microorganisms transferred from animals to people. They account formany symptoms relating to common cold, lung infections as well as intestinal and neurologic ailments (Zhu et al., 2020). There are six other coronaviruses known to afflict humans, apart from SARS-COV-2. They are: HCOV-229E, HCOV-OC43, SARS-COV, HCoVNL63, HCOV-HKU1, and MERS-COV(Suet al., 2016: Chen et al.,2020). SARS occasioned the first known epidemic in humans. Coronavirus has triggered two prominent outbreaks in human history before the advent of SARS-COV-2. SARS and MERS (Middle East Respiratory Syndrome) virus were responsible for outbreaks over twenty years ago (Peiris et al., 2004:Zaki et al., 2012).

In 2003, China encountered the first episode of the SARS epidemic. From here, it diffused to over 30 countries in five continents where it accounted for 774deaths among 8,096 cases(Guan et al., 2003: K-Y Sol et al., 2003). In 2002, Guangzhou province in China had an increasing incidence of atypicalpneumonia. The first case was reported in Foshan, a city of 24km away from Guangzhou. The second case, a chef from Heyuan who worked in a restaurant in Shenzhen, was known to have regular contact with wild game foods and animals. He infected his wife, two sisters and seven hospital staff who had contact with him. From 16 November 2002 to 9 February 2003, 305 persons were infected with SARS in China. This epidemiological data included 105 health care workers(Cheng et al., 2007). The pandemic was eventually controlled in July 2003. Since 2004, no cases of coronavirus of public health concern were reported (Amirian, 2016).

However, in 2012, MERS virus emerged when a man in Saudi Arabia presented with severe uncharacteristic pneumonia (Al Omari et al., 2019).Outbreaks developed 2years later with 682 identified cases, and a high case fatality rate of 32.97% (Al Omari et al., 2019). From 2012 to 2014, health authorities identified 1364 cases in Saudi Arabia. This contagion diffused into mainland Asia from Saudi Arabia. It also diffused into Europe and North America spanning 27 economies. From 2012, the world recorded a total of 2294 laboratory-confirmed cases of MERS and 858 souls perished due to the contagion, with a case fatality ratio of 34.8%(Al Omari et al., 2019).

The narrative of the SARS-COV-2 pandemic was similar to the first emergence of the SARS virus in 2003. They shared a history of zoonotic transmission from animal to humans, which eventually triggered human-human transmission. The outbreak of unknown and atypical pneumonia first broke out on 12 December 2020 in Wuhan city, Hubei province, probably linked to a famous seafood market(Guo et. al., 2020).Many studies suggested bats as the main reservoir or vector of SARS-COV-2. Nevertheless, it appears unlikely that this virus originated from bats. The assertion that it first came from Wuhan seafood market also seems implausible. Bats are theusual repositories of coronaviruses that include SARS and MERS viruses (Guo et al., 2020: Cui et al., 2019). Even though viral gene sequencing of SARS-COV-2 done in bats and human showed 96.2% genome sequence identity (Banerjee et al.,

2019: Cui et al., 2019) bats are not available for sale at the Wuhan seafood market (Wu et al., 2020). Thus, there is a plausibility that the virus has alternative hosts such as pangolin and turtles, which share similar viral gene sequencing receptors with bats and humans (Guo et al.,2020).

Although the early history of this outbreak is suggestive of an animal to human transmission, experts believed that animal coronaviruses do not infect humans (C.D.C 2019 Coronaviruses,2020).However, historical epidemiology has proved the possibility of zoonotic transmission with the SARS and MERS epidemics. Even though most of the early sufferers share comparable narratives of contact with seafood markets, subsequent patients had no contact with wild animals. Human to human transmission soon assumed the primary form of diffusion. Human transmission occurred among family members, including friends and close relatives. Local authority subsequently detected multiple cases in traders, artisans and other professionals, including healthcare workers in Wuhan province (Li et al., 2020).

Some scholars had carried out studies concerning the demographic characteristics of COVID-19 patients. It would be early to rely solely on them becauseit appears the virus is undergoing continuous mutation. It seems both the healthy and the risk groups such as those with diabetes, ischemic heart diseases, end stage renal disease and cancer patients are susceptible to COVID-19 (Adhikari et al., 2020). Nonetheless, some studies hypothesized that the older population with background poor immune functions, particularly those with cardiac, renal and hepatic dysfunction are more susceptible (Fu et al., 2020, Li et al., 2020). Concerning the age distribution of patients, many scholars agreed the prevalent age of affectation is from 25to 89 years. In one early study, the range was between15 and 89 years with male preponderance (59%), and a median age of 59years (Huang et al., 2020). Thecharacteristic clinical presentations of the virus are fever, cough, muscle weakness, muscle pains, pneumonia, and respiratory difficulties. Less describedclinical manifestation include headache, diarrhoea, loss of smell and haemoptysis (Li. et al. 2020). Symptoms often appear for a period of two to fourteen days. The infected patients with less severe symptoms were known to recover completely within a week. Others who manifest progressive respiratory failure resulting from alveolar damage, provoked by the virus might die. Cases resulting in deaths were specifically in the middle-aged and elderly subjects, especially, those suffering from chronic conditions such as tumour, surgery, hypertension, diabetes, and coronary heart disease (National Health Commission of China, 2020).

Evaluating Early Covid-19 Response in China

From the suspected cases of atypical pneumonia on 8 December 2019 to 20 February 2020, China had taken decisive actions to identify, contain and isolate COVID-19 sufferers. The central government segregated control of epidemics at three different levels. They are National level, Case related population level and General population level. However, it is at the National level that all the policies guiding the control and prevention of the pandemics are usually formulated for other standards to implement statutorily. At the National Level, on 20 January 2020, the National Health Commission of People Republic of China issued “No 1Announcement” that officially included COVID-19 into the administration of B infectious disease and incorporated its prevention and control measures into A class (National Health Commission of China, 2020). This regulation allows medical institutes to trace, identify and isolate COVID-19 patients. Two days later, the National Health guidelines, having realized the contagious nature of the novel virus, issued instructions to prevent nosocomial infections in the medical establishment in China (National Health Commission of China, 2020). On 28 January, the National Health Body issued strategies to

massively isolate and disinfect large areas and also take such measures in rural areas targeting Hubei province and its surroundings (National Health Commission of China, 2020). In this protocol, several strategies that could contain the diffusion of the SARS-COV-2 became legalized. Such procedures included case isolation, identification, follow-up contacts and environmental disinfection as well as the use of personal preventive equipment for health professionals (Wei and Ren, 2020).

However, some gaps could be identified from the seemingly effective COVID-19 early response in China. From the time of the report of atypical pneumonia in early December to its gene sequencing on 10 January, and final promulgation of health regulations on 23 January(WHO-China Joint Report on Coronavirus, 2020: p.31), some events enhanced the spread of the contagion. Apart from the fact that Wuhan Authority was apparently ill-prepared for an outbreak, the fundamental of the state organization in China is that orders from top officials penetrate down to the lower governmental layers. The consequence is that if something goes extraordinarily wrong in the case of the ongoing pandemic, the lower layer of the government cannot act autonomously.This might explain Wuhan's apparent delay in managing the early period of the outbreak. The epidemic of SARS-COV-2 broke out in Wuhan on 8 December 2019. Nevertheless, it was first reported to W.H.O. on 3 January 2020 (WHO-China Joint Report on Coronavirus, 2020, p7, 12)) Besides, the central Chinese government failed to institute appropriate containment measure until 23 January 2020 (WHO-China Joint Report on Coronavirus, 2020, p.7). By this time, unfettered human migration from Wuhan city and non-existence of necessary public health regulation against the epidemic might have facilitated unrestrained dispersal of SARS-COV-2 from Wuhan to other provinces, and probably, the larger world.

According to the report of the W.H.O-China Joint Mission on Coronavirus Disease 2019, there was an aggregate total of 75,465 cases of COVID-19. Out of 55,924 laboratory-confirmed cases, 2114 deaths were recorded as at 20 February 2020 (WHO-China Joint Report on Coronavirus, 2020). This report further revealed that SARS-COV-2 epidemic in China grew rapidly from 10-22 of January. The documented cases peaked and plateaued from 23-27 January. From this period, the contagion had been steadily declining in Wuhan, Hubei and the whole of China (WHO-China Joint Report on Coronavirus, 2020: p. 7).Themass emigration of Wuhan residents was a likely rationale for the scenario.From 11 January up till 23 January when the lockdown became effective in Wuhan, 4.3 million (WHO-China Joint Report on Coronavirus, 2020: p. 31) nearly half of Wuhan’s population moved out for the China’s new year celebration without the opposition of the city authorities (You et al. 2021).This event contributed to the swift spread of the contagion from Wuhan to other parts of China. According to Heymann and Shindo (2020), this singular act represented a severe public health hazard that significantly enhanced the dispersal of the contagion.The overall numbers of infected subjects were strongly associated with the whole numbers of travellers from Wuhan (Tian, 2020).Wuhan is located in the central industrial hub of China, therefore having widespread transportation networks to important cities, including Beijing and Shanghai. It possesses a wide range of transport links, including rails, interstate buses and aeroplanes. The latter possibly enhanced the diffusion of the virus via both local and international flights. Hence, the dissemination of SARS-COV-2 wasrapid after most residents returned to their hometowns and villages to celebrate Chinese New Year or leaving for holidays (You et al., 2020). Therefore, the delayed health regulations, which allowed millions of Wuhan residents to travel in the wake of an epidemichave a direct influence on the peaked cases between 23 and 27 January 2020.The mass migration of Wuhan residents from 11 January, if correlated with the maturation period of two to

fourteendays of the virus, suggests a positive correlation between their migration and the peaked cases.

However, there are probable exceptions to this migration theory. For instance, there might be presence of other intermediate hosts of SARS-COV-2 in other regions of China, aside Wuhan city. These vectors might have facilitated the spread of SARS-COV -2 to humans, regardless of emigration of Wuhan residents. Besides, the incidence of COVID-19 might have been mild or unreported in other cities, their migration might have been coincidental with the eruption in adjoining areas of Wuhan. In this regard, it was plausible that some Wuhan residents contracted the infection outside their domains, and dispersed it, during their journey. Nevertheless, the remarkable migration of Wuhan residents appeared to have enhanced the dispersal of SARS –COV-2 to other parts of China, and probably, the world at large.

China's state seemed to under-estimate the devastating impacts of the virus. For instance, it was recently reported that Wuhan's COVID-19 death toll had jumped by 50percent. Health authorities in China had initially revealed 2,579 people died from COVID-19 pandemic in Wuhan before adding another 1,290 deaths, after a purported review of the case fatalities (Page and Fan, 2020). It appeared their authority under-estimated the enormity of the outbreak at the early phase.

Besides, the information dissemination and the call for international help ostensibly came late. The first cases of the contagion were reported on 8 December 2019 in Wuhan, China. Nevertheless, the central government only made an official report to W.H.O. after roughly a month, on 3 January 2020 (WHO-China Joint Report on Coronavirus, 2020: p.7) It appeared the Chinese health authorities were not exclusively transparent in the early phase of the epidemic – a similar scenario reported during SARS pandemic (Smith, 2006). The Chinese government delayed the appropriate public health actions from 8 December to 3 January for the initiation of emergency monitoring, case investigation and investigation of the seafood marketplace. Moreover, even though the Wuhan Health Commission announced the outbreak on 31 December, the central government only declared novel coronavirus was the cause on the 8 January(WHO-China Joint Report on Coronavirus, 2020: p.31: Zhang, 2021).Even the Public Security Bureaupresumably punished doctors, including the now-deceased Li Wenliang, when they tried to share news about the coronavirus with the medical community (Zhang, 2021, You et al, 2020).

However, despite the seemingly delayed disease intervention of China central government, there are vital lessons that other countries could learn from them. The Chinese reported the outbreak of SARS-COV-2 to W.H.O. about a month after its eruption in early December 2019. This represents a remarkable improvement from their SARS's management in 2003, when they reported the disease to W.H.O roughly four months after its outbreak(Zhang, 2021).Also, the present China Centre for Disease Control (C.C.D.C) is far better equipped to handle a public health crisis. They took five months before conducting the viral genome sequencing during the SARS outbreak in 2003. This time, Chinese laboratories were able to sequence SARS-COV-2 on 10 January2020, about one month after the disease erupted(Adhikari,2020).

Furthermore, having realized the initial response was possibly delayed, the Chinese government moved swiftly to control the contagion as from 23 January 2020. Wuhan and Hubei provinces were locked away from surrounding cities, and basic hygienic measures

were enforced for the teeming residents (Zhu et al., 2020: Chen et al., 2020: Deng and Peng, 2020). Through their effective surveillance system (facial identification via smartphone), it was easy to monitor compliance centrally with necessary hygienic procedures like wearing of facemasks, regular handwashing and social distancing. The use of widespread facial recognition systems apparently allowed the central government to track citizens, thereby monitoring compliance with public health regulations, including total lockdown of Wuhan and Hubei provinces. The central surveillance system also ensured easier case identification, contact tracing and more straightforward documentation of the medium of dissemination of the new virus. In this regard, the extreme proceduresdeployed by Chinaappeared fundamental to containing continuous dispersal of the contagion.

Besides, the decision to apply total lockdown to Wuhan and Hubei provinces containing approximately 11 million and 60 million people, respectively, indicates another tough strategy to mitigate the plague of SARS-COV-2 (Zhang, 2020). It is a common knowledge that viruses are not capable of an independent transmission; they depend on human interaction and movement for their diffusion. Since the novel SARS-COV-2 is not an exception, the lockdown measure was one of the game-changers in the fight against the scourge of the nascent coronavirus in China. The residents of Wuhan and Hubei provinces also deserve commendation for supporting such extreme measures in the fight against the contagion. They displayed astute patriotism and support for the Chinese Communist Party-led government. These virtues, remain immensely imperative in the fight against this deadly virus in China.

Conclusion

The epidemic of SARS-COV-2 probably came from wild animals. It plausibly broke out in the seafood markets of Wuhan city, in Hubei province, on 8 December 2019, in China. So far, it had dispersed to over 200 economies spanning five continents, and killing over 280, 000 out of over 4 million cases as at 10 May 2020. The article explored and appraised China's early interventional strategies in the fight against the novel SARS-COV-2. Among other reasons, this study argued that Wuhan's delayed initial response appeared to facilitate the diffusion of SARS-COV- 2 to other Chinese cities, and possibly the larger world. The study utilised the WHO –China Report on COVID-19 and relevant articles from PubMed and Google Scholar. It indicated that Wuhan's inability to stop the mass emigration of its residents between January 11 and January 23, 2020 was one of the contributory factors to swift spread of the contagion outside Wuhan city.

In a pragmatic sense, the Chinese government meritscommendations for their comprehensive epidemic measures through effective surveillance system, monitoring of necessary hygiene measures and lockdown of massive populations in Wuhan and Hubei provinces from 23 January 2020. It was possible that an earlier response might have prevented massive mortalities occasioned by the virus. Overall, the extensive rail, road and air networks triggered by globalization have increased the need for movement of human, goods and animals globally. This interconnectivity behoves all nations to take earlier measures to contain and control any disease of epidemic proportions in their respective domains. It is plausible that such actions might mitigate the damaging effects of pandemics in the future.

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