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A STUDY ON VACCINATION HESITANCY CAUSED BY MISINFORMATION IN HONG KONG

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ABSTRACT

COVID-19 vaccination prevents the disease from spreading in society and aids to control the pandemic. However, there is vaccination hesitancy in which people are reluctant to get vaccinated. This paper discusses the general problems of vaccination hesitancy throughout the world and the specific problems in the societal context of Hong Kong, including the reasons why anti-vaxxers and political objectors refuse vaccination. Because one major reason for vaccination hesitancy is the misinformation on the Internet, the aim of this study is to collect and analyze the misinformation posted in the popular online discussion forum in Hong Kong. The content analysis of 3,310 messages shows most people are concerned about the safety and side effects of vaccines. Moreover, insufficient confidence in the vaccine manufacturers and confusing information influence the vaccination rate. Finally, the paper suggests a way to addressing vaccination hesitancy through sharing clear and accurate information to correct the improper one.

Contribution/ Originality: This paper discusses the general problems of vaccination hesitancy and the specific problems in the societal context of Hong Kong. It suggests ways to alleviating these problems through analysis of misinformation and sharing correct information.

1. INTRODUCTION

Before the pandemic of SARS-coronavirus in 2003, coronavirus was considered causing low impact on human health and did not receive much attention. Because of genome recombination and genetic diversity, COVID-19 was found in China at the end of 2019 and this led to consequent infections over the world. Since the beginning of the pandemic of COVID-19, there are millions of deaths and the nations that seriously suffer from the disease include Turkey, Ukraine, the United Kingdom, Russia and the United States while in South-East Asia, the death rates are high. Vaccination is important to resist the pandemic and development of vaccines has begun globally. Commonly used COVID-19 vaccines include Sinovac's CoronaVac, Gamaleya's Sputnik V, Oxford-AstraZeneca, Moderna-mRNA and Pfizer-BioNTech-Comirnaty. These vaccines can reduce death rates and hospitalization (Fiolet, Kherabi, MacDonald, Ghosn, & Peiffer-Smadja, 2021). The United Kingdom, the United States, the United Arab Emirates and Israel are the most active countries that vaccinate their citizens.

The COVID-19 pandemic is a global hazard that has the huge economic, social and health impact. Governments in various nations have implemented several restrictions to control and reduce the spread of the pandemic (Han et al., 2020). In addition, vaccination strategies are important to alleviate disease burdens and reduce the strains on demand of healthcare system (Belongia & Osterholm, 2020). Despite the documented effectiveness and safety of vaccination, vaccine hesitancy becomes an arising worldwide concern, and it was recognized by the World Health Organization as one global health threat in 2019 (World Health Organization, 2019a).

Vaccines are recognized as an important means to prevent COVID-19 from spreading (Polack et al., 2020). To ensure sufficient vaccination rate for herd immunity is the greatest challenge. Vaccine hesitancy is the refusal or reluctance to be vaccinated although vaccines are available. This is becoming more problematic in recent years. For

example, about 19% of 7,000 European respondents in a survey were unsure about getting vaccinated (Larson et al., 2016) and about 7% claimed they would not get vaccinated. Only 65% of respondents in a British sample got vaccinated willingly. Governments should be prepared to tackle COVID-19 vaccine hesitancy (Murphy et al., 2021). The COVID-19 vaccines are different from previous vaccines in many aspects including potential side effects, effectiveness, innovative techniques, and development speed. People may be concerned about these new aspects when considering vaccination.

Vaccination is an effective way to prevent the disease from spreading and reduce associated complications. Vaccine acceptance among all populations is not straightforward (Habersaat & Jackson, 2020). For example, in the United States, 20% of the research participants declined the vaccine (Thunstrom, Ashworth, Finnoff, & Newbold, 2020). In the United Kingdom and the United States, parents show high reluctance of their children's vaccination (Lima, Hwang, Cha, & Cha, 2020). A global study shows the potential acceptance of vaccine in 19 countries and 71.5% of the total population state their acceptance of vaccine. But there are differences in acceptance rates from below 55% in Russia to about 90% in China (Lazarus et al., 2021). Some reasons may be relevant to a higher vaccine acceptance such as reducing the undesirable effects of the vaccine (Kreps et al., 2020). In China, recommendations from doctors influence vaccine acceptance (Malik, McFadden, Elharake, & Omer, 2020; Wang et al., 2020) and healthcare workforces are more willing to get vaccinated than the general public (Fu et al., 2020).

Vaccine hesitancy is still poorly understood because of multidimensional features (De Figueiredo, Simas, Karafillakis, Paterson, & Larson, 2020). Potential barriers to vaccine acceptance include the political, sociocultural and individual factors such as roles played by the media and governments, belief in health officials, and the availability of vaccines. Various models have been developed to integrate vaccination behaviors. There are several theoretical models that examine vaccine hesitancy psychologically (Larson, Jarrett, Eckersberger, Smith, & Paterson, 2014). A framework of 5C antecedents of vaccination is developed to incorporate and expand available models. The 5C model provides a useful tool for both practice and research and predicts vaccination behavior and intention. The model describes five vaccination antecedents: confidence, complacency, constraints, calculation and collective responsibility (Betsch et al., 2018). Firstly, confidence is about the belief in the effectiveness and safety of vaccines. Secondly, complacency is the perceived risk of diseases that are prevented by vaccines. Thirdly, constraints are the physical and psychological barriers like affordability and accessibility. Fourthly, calculation is the engagement in search for anti-vaccination information that may result in reduction of vaccination willingness. Finally, collective responsibility is inclination to guard others with vaccination that leads to herd immunity.

This 5C model helps to understand vaccination behaviors across different populations and vaccines. It is important to study psychological factors to understand vaccination hesitancy to increase the potential competence of the public health information. These five drivers explain variance in vaccination behaviors. Earlier research shows unemployed individuals, younger adults, women and people with a lower socioeconomic position are relatively reluctant to be vaccinated (Malik et al., 2020; Rhodes, Hoq, Measey, & Danchin, 2021). Higher vaccination intention is related to higher perceived vaccine safety and efficacy and more positive beliefs (Karlsson et al., 2021; Sherman et al., 2021). In a survey (Reinhart, 2020) 37% of respondents argued that COVID-19 vaccines were rushed and 12% mistrusted all vaccines. Poorer and less educated individuals are more likely to hesitate vaccine (Funk & Tyson, 2020). Conspiracy theories, personal freedom and disgust about blood are associated with vaccine hesitancy (Hornsey, Harris, & Fielding, 2018). Populist politicians may undermine community trust in authorities and reduce vaccination confidence (Kennedy, 2019). In Israel, people at risk from the pandemic are likely to get vaccinated (Dror et al., 2020). In the United Kingdom, vaccine refusal is younger, and mistrustful of scientists (Skinner, 2020). In general, issues related to vaccine hesitancy include political differences, pragmatic concerns, scientific mistrust, and medical fears.

Vaccines are vital to reduce the negative impact of the COVID-19 pandemic. This study aims to access the difficulties regarding COVID-19 vaccination in Hong Kong to find out the population's attitudes to vaccination during the public health crisis. This is to provide insights into designing an effective communication campaign to increase relevant knowledge in the public. The rest of the paper will reveal vaccine hesitancy and the specific problems in Hong Kong. Then, the misinformation found by content analysis will be presented and discussed. Finally, ways to addressing misinformation are suggested.

2. VACCINE HESITANCY

Because of the COVID-19 pandemic, millions of people are infected and significant economic damage is inflicted globally (Jin et al., 2021; Rigby, 2021; World Health Organization, 2019b). In December 2020, a number of new vaccines against COVID-19 were introduced (Polack et al., 2020) and governments initiated vaccination programme of a mass scale for their citizens (National Health Service (NHS), 2021; World Health Organization, 2020).

However, some people are reluctant to get vaccinated and express anti-vaccination information in various channels like online media (Wang, McKee, Torbica, & Stuckler, 2019). Vaccine hesitancy is the situation in which people delay or refuse vaccination for any cause (Dubé et al., 2013). This definition includes the antivaxxers against vaccination and careful individuals who delay their vaccination time (Dubé et al., 2013). For example, there are about 40% of adults are with vaccine hesitancy in the United States (Reinhart, 2020) and 16% in the United Kingdom (Skinner, 2020). In 2020, a survey studied 19 countries and vaccine hesitancy was found to vary from 10% in China to 45% in Russia (Lazarus et al., 2021).

Vaccination provides significant health benefits to people. There are differences in vaccination strategies in countries. For example, children attending public schools have to be vaccinated in the United States despite philosophical and religious allowances (Olive, Hotez, Damania, & Nolan, 2018). Sentiments against vaccination are also different globally. For instance, in Italy, negative sentiment spreads and leads to an enlarged infection rate but combatted effectively by political responses extending compulsory vaccination (Signorelli, 2019).

A debate is prompted by these new vaccines on a question whether vaccination should be mandatory for citizens (Pennings & Symons, 2021; Savulescu, 2021). The Western countries' governments protect freedom of people and make vaccination free and voluntary for people (Federal Public Service (FPS) Health, 2021; The Budapest Times, 2021). People who are not sure or reluctant to get vaccinated are considered hesitant. This raises a question of how to increase willingness of people to receive COVID-19 vaccination (Dror et al., 2020).

Even though vaccines play a key role of infectious disease prevention in human populations, there are many detractors against vaccination. They deny the benefits and advantages of vaccines at a risk based on side-effects and composition of vaccines. Just one year after the COVID-19 outbreak, the scientific community achieved vaccines against it. This should be sufficient to increase the positive opinions on vaccination for herd immunity. Nevertheless, there is high volume of manipulated and misleading information rapidly spreads on the Internet generally and on social media particularly.

The arguments against vaccines are usually about vaccines' adverse effects on the most common social media like Facebook, Instagram, YouTube and Twitter (Allcott & Gentzkow, 2017; Bora, Das, Barman, & Borah, 2018; Fung et al., 2016) that can reach many people to spread misinformation and generate fear (Rubin & Wessely, 2020) to lead to the perception that vaccination is threat (Evrony & Caplan, 2017). These kinds of information are public health threats (Bennett & Livingston, 2018). They can cause anomalous behaviors at social and individual levels because of these conspiratorial thoughts.

The Internet is the major channel in which antivaccine groups spread their messages through social media, web pages and blogs. People cannot ignore the usage of information technologies that can analyze and evaluate people's viewpoints stated on social media to influence public attitudes. Biased or false information is spreading in the social networks during the pandemic to enhance free dialogues and interactions between users (Burki, 2020; Jamison et al., 2020; McStay, 2016). The usage of social networks to disperse and spread information is undeniable in society.

3. SPECIFIC PROBLEMS IN HONG KONG

Hong Kong is now battling outbreaks of Omicron. This puts the emphasis on the vaccination rate that is one of the lowest in the developed world. Hong Kong's elderly is a consistent concern and only about 30% of citizens who are 80 or above have received the first dose. Hong Kong recently started inoculating children who are 5 to 11 years old but this has not reached a significant rate. With strict social distancing measures and border controls, Hong Kong avoided the COVID-19 outbreak in last two years. However, recently Omicron triggers an explosion of infections. In just a few weeks, the outbreak is rapidly exhausting the medical system in Hong Kong. Isolation wards run out of beds and patients wait in parking lots and sidewalks of hospitals during the coldest time of the year. Officials took actions slowly to prepare for a broader outbreak and did not tackle misinformation about vaccines promptly.

There are two major groups of people refusing the vaccination in Hong Kong. The first one is anti-vaxxers, who do not deny the advantage of the vaccination but believe that they should not get COVID-19 vaccination. The reason is related to the medical history of Hong Kong that survived SARS outbreak in 2003 without vaccine that was unavailable simply. Personal hygiene, social distancing and wearing masks were sufficient to fight against SARS. When the COVID-19 pandemic attacked, Hong Kong people were ready to follow exactly the same practices to protect themselves. The lesson learnt from SARS made people believe that vaccines are also not necessary for COVID-19 with a relatively lower death rate. Many Hong Kong people are also concerned about the side effects and safety of the vaccines even though trial results are not consistent with this misbelief.

The second group is political objectors, who reject vaccination because of their lack of confidence in the government. Because of doubt in the government programmes, the advantages of vaccines are not believed. They think the government forces citizens to get vaccinated to please the China government and they do not follow what the government asks to do so. The human rights are another concern expressed by this group with growing fears over freedom. The dissatisfied policies of the government also prompt people to refuse vaccination during the pandemic. Criticized policies include inappropriate quarantine arrangements, unscientific rules of social distancing, refusal to entirely close borders across China and slow reaction at the beginning of the pandemic.

To promote vaccination, the government, for example, relaxed social distance rules for vaccinated ones who might gather in a bigger group at restaurant. The government also decided that vaccinated people would take a shorter period of quarantine if they have been risky places or are close contacts of infected people. In addition, the government attempted to arrange a travel bubble with Singapore for vaccinated Hong Kong people. Despite of these incentives, the distrust level is still high, and this limits possible policy alternatives available for the government. The government keeps explaining that there is no scientific evidence to prove the side effects of vaccines. But it is not convincing enough for people to accept the government's argument (see Figure 1).

Figure 1. Official promotion of vaccination in Hong Kong.

4. RESEARCH METHOD AND RESULT

Contented analysis was applied in this study. A total of 3,310 messages posted in *Hong Kong Golden Discussion Forum* (https://forum.hkgolden.com/) in the period between 1 Jan 2021 and 31 Dec 2021 were collected for analysis. This online forum is famous and popular in Hong Kong and people like to discuss and share ideas on various topics including vaccination (see Figure 2). The major language used in this forum is Cantonese (i.e., one of Chinese dialects commonly used in South China).

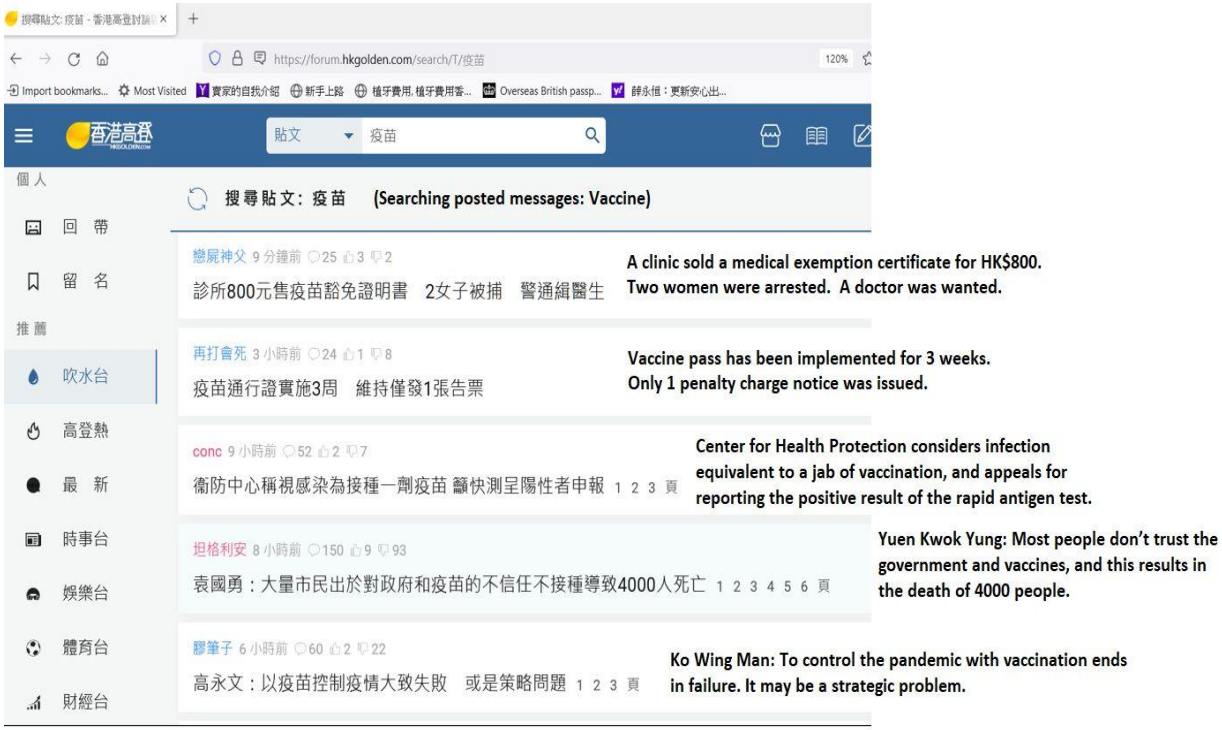

Figure 2. Examples of messages about vaccines in Hong Kong Golden discussion forum.

The criteria for selecting messages for content analysis are those containing the keywords about "vaccine", "vaccination", "CoronaVac", "Pfizer", "BioNTech", "Comirnaty", etc. Content analysis involved various coders categorizing the selected messages into a number of reasons (mainly misinformation) for not getting vaccinated. This study manually classified messages and found out the reasons shown in Table 1. The total of percentages is larger than 100% because a message might mention two or more reasons for not getting vaccinated.

Based on the results of content analysis, most people in Hong Kong think vaccine is unsafe and risky and are concerned about the side effects (including death) of vaccination. In addition, people do not feel confident with the manufacturers and find information from the government confusing. Moreover, people think they are not physical fit for vaccination or delay it until the pandemic is over. Besides, some minor reasons include DNA modification caused by vaccines, and even harmful and unusual gradients such as tracking devices and micro-chips in vaccines.

Table 1. Reasons for refusing vaccination found in Hong Kong Golden discussion forum.

Reasons for refusing vaccination	Percentage of the total messages
1. Vaccine is unsafe because it was developed too rapidly without sufficient research	84.3%
2. The health condition of an individual is not suitable.	78.7%
3. After getting vaccinated, an individual gets a higher risk of being sick from other diseases.	76.4%
4. If an individual has been infected and recovered, it is not necessary to get vaccinated.	76.3%
5. There are serious side effects of vaccines.	71.6%
6. There is confusing vaccine information from the government.	70.5%
7. There is no confidence in manufacturers of vaccines and/or their countries of origin.	67.7%
8. There are harmful ingredients in vaccines.	67.0%
9. People get no confidence in the government's recommendations.	66.4%
10. There are serious cases of side effects or death after vaccination.	65.7%
11. An individual has a strong immunity against the disease without problem.	62.3%
12. People are waiting for a better vaccine in the future and do not get vaccinated now.	54.7%
13. After natural infection, natural immunity is better than vaccine immunity.	50.5%
14. Vaccines do not always work so that an individual should not bother to get vaccinated.	50.3%
15. An individual may delay vaccination until the pandemic is over.	50.3%
16. Vaccines cause the disease of COVID-19 actually.	45.5%
17. The vaccination arrangement (e.g. location of the venue) is not convenient.	34.6%
18. Vaccines can cause infertility.	30.2%
19. An individual only needs one dose of the vaccination for protection against COVID-19.	23.4%
20. Vaccines can change DNA of an individual.	17.5%
21. Vaccines contain tracking devices.	15.6%
22. After getting vaccinated, an individual will test positive for COVID-19.	14.5%
23. There are micro-chips in vaccines.	10.3%

Note: https://forum.hkgolden.com/.

The vaccine hesitancy is attributed to misinformation about the side effects and efficacy of vaccines, and public distrust of the government. Although Hong Kong records more deaths caused by COVID-19 recently than it did in last two years, some people are still reluctant to get vaccinated. In Hong Kong, getting vaccinated is convenient but highly complacent because of perception that COVID-19 is not a critical health risk to Hong Kong people, who are more prone to vaccine skepticism and conspiratorial interpretation of any public health initiative associated with the government. Media reporting on incidents and deaths after vaccination is common although some are with little connection to vaccines. This contributes to the distrust of vaccination although there is scientific evidence proving its safety worldwide.

5. WAYS TO ADDRESSING VACCINE HESITANCY

COVID-19 vaccine confidence can be affected by the spread of misinformation on the Internet like social media. Information gaps are the main reason for such misinformation, and it is critical to understand, reason and fill in such gaps. Misinformation may be false information shared by people without intention of misleading others or the ones who disseminated with bad intention deliberately. Most misinformation focuses on vaccine effectiveness, safety, and development.

To address misinformation about vaccines, it is necessary to learn about why and how it is evolving and spreading in a community. First, we may collect and analyze misinformation that circulates through both traditional and social media to monitor and identify any trend. This is helpful to understand and analyze misinformation, information voids, content gaps and perceptions. Second, to address common questions, we may share clear and accurate information that is easy to be found. This can be performed through social media, websites and other channels in which people look for relevant information. It is also necessary to use other methods (like radio) to reach those with limited access to the Internet. This is to share details like hours and addresses about vaccination events in the community. Third, to boost credibility and chance of being accepted over misinformation, we may use trusted messengers. Community organizations and religious leaders are more helpful to release proper information to people who do not visit the website of the health department or believe public health professionals.

To address misinformation, it is necessary to lead with the true facts and provide correct information. This is to make right information more memorable than wrong one. Moreover, alerts and warnings may be given to people to explain reasons for facts that have been misinterpreted. The following is an example.

Misinformation: COVID-19 vaccines will create the virus of COVID-19 in your body.
Fallacy: Some people believe and say that the COVID-19 vaccines create COVID-19. This is false. After being vaccinated, people may feel sick, and this is a signal that protection against the disease is developed.
Fact: COVID-19 vaccines help the immune system to identify, memorize and fight the virus. This process may cause fever, chills or other symptoms that are normal and indicate the body is building protection.

The following steps can be taken to collect and analyze misinformation and prevent its spread. First, we collect, for example, comments and inquiry logs of social media to find out the information sources of jurisdiction. Regularly gathering these data is necessary for analysis. Second, we may maintain a list of social media influencers to monitor misinformation, content gaps and perceptions. Third, we maintain rumor logs to trace circulation of misinformation and its development over time. Finally, insights are developed. It is useful to know what vaccination-related questions asked by people, what attitudes associated to behaviors of vaccination, what misinformation is spreading, and how people interpret communication from public health organizations.

6. CONCLUSION

Vaccination is an efficient way to preventing infection and reducing death rates of various infectious diseases (Osterholm, Kelley, Sommer, & Belongia, 2012). But in 2019, vaccine hesitancy, a behavior of refusing vaccines, was considered by the World Health Organization a global health treat. Vaccine hesitancy was most prominent in the uptake of influenza vaccine and in 2019 in the United States about half the population did not get influenza vaccine (Centers for Disease Control and Prevention, 2019). There are three major factors relevant to vaccine hesitancy. First, there are difficulties to access the vaccine (World Health Organization, 2015). Second, people do not recognize a need for vaccination. Third, there is a lack of confidence in vaccines.

The study in this paper found a number of reasons for people refusing vaccination in Hong Kong. In general, vaccine reluctance is higher in Asia-Pacific region in which people do not fear COVID-19 because of early containment success. In Hong Kong, the situation is further complicated by political distrust stemming from street protests in 2019. The government urges people to get vaccinated and imposes rules that require vaccination proof to enter supermarkets, shopping malls and restaurants. Such worries are caused by the misinformation about vaccination that spreads quickly in Hong Kong, where people may select the vaccine developed by BioNTech and Pfizer. Some reports on deaths after vaccination turned into rumors that circulated extensively on social media and WhatsApp groups although officials did not attribute such fatalities to vaccination. The government is slow to correct misconceptions about the efficacy and side effects of vaccines. When misinformation is circulating and no one clarify it, people do not take a risk to get vaccinated. Thus, this paper suggests a way to addressing vaccine hesitancy. The basic principles are to collect and analyze misinformation, and then share clear and accurate information boosted by trusted messengers.

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