AQUADEMIA
2024, 8(1), ep24001
ISSN 2542-4874 (Online)
https://www.aquademia-journal.com/

Research Article

OPEN ACCESS

Pre-service science teachers' reflections on COVID-19 control and prevention measures

Alois Matorevhu [1*], Havatidi Madzamba [1]

[1] Mutare Teachers College, Mutare, ZIMBABWE
***Corresponding Author:** amatorevhu@gmail.com

Citation: Matorevhu, M., & Madzamba, H. (2024). Pre-service science teachers' reflections on COVID-19 control and prevention measures. *Aquademia, 8*(1), ep24001. https://doi.org/10.29333/aquademia/14330

ARTICLE INFO

Received: 17 Dec. 2023

Accepted: 05 Feb. 2024

ABSTRACT

Science teacher education can positively impact society by producing pre-service teachers who have skills and attitudes to influence society to control and prevent communicable diseases like COVID-19. In the context of public health it is important to understand perceptions, beliefs and attitudes, which influence pre-science teachers' health-related behavioral intentions. This case study sought to understand factors, which influence pre-science teachers' health-related behavioral intentions. Twelve pre-service science teachers were purposively sampled at a teachers' college in Zimbabwe. A semi-structure interview guide was used to solicit information on pre-service science teachers' reflections on COVID-19 control and prevention measures. Findings show that science knowledge need to be considered collectively with science teachers' awareness of pandemic and risk infection, sustenance issues like food availability, economic status, religious beliefs, and conspiracy theories in order for them to promote disease control and prevention.

Keywords: COVID-19 pandemic, science knowledge, disease control and prevention measures, science teachers

INTRODUCTION

Science teacher education can positively impact society by producing pre-service teachers who have skills and attitudes to influence society to control and prevent communicable diseases like COVID-19. Scientific information is necessary to prevent "digital infodemic", which is the uncontrollable spread of information pollution, misinformation, and conspiracy theories (Banerjee & Meena, 2021; Mishra et al., 2020). Conspiracy theories further the view that there is a secret plan by an individual or group to do something unlawful or harmful to somebody or people. People develop conspiracy theories to explain harmful or tragic events or circumstances beyond their control (Moore, 2016). When there is an outbreak of a communicable disease like COVID-19, a multidisciplinary approach emphasizing application of science education is important to limit the spread of disease. Although health care is not the primary responsibility of teachers, but science teachers can influence students' perceptions of safe behavioral choices directly or indirectly (Nuangchalerm et al., 2022; Ramli & Susanti, 2022). For instance through the hidden curriculum, science teachers' behavioral choices like vaccination, masking up and social distancing can influence students to adopt similar behaviors. For this reason science teachers are encouraged to model safe behavioral intentions, because there is nexus between health literacy and science literacy, which can be enhanced through science education (Marimwe & Dowse, 2019; Mnguni, 2017).

Premised on scientific knowledge they possess, science teachers are considered essential in promoting public health (PH) (Marimwe & Dowse, 2019; Underwood et al., 2019). Disease control and prevention can be facilitated by science teachers through "social vaccine" administration as they interact with learners and people in communities. A social vaccine is a government and non-governmental organizations led mobilization process to promote health literacy and safe behavioral intentions through socio-cultural and structural interventions (Okan et al., 2022). Social vaccine allows health authorities to deal with social determinants of health, which include illiteracy, socio-economic factors, prevention, vaccination, disease management, countering conspiracy theories and misinformation. This empowers individuals and communities to make scientific backed health-related decisions, hence preventing spreading of diseases (Becchetti et al., 2021; Newman et al., 2012). It is evident that biomedical programs are effective in controlling and preventing diseases. However, through integration of health literacy into science education, social vaccines can be effective in preventing the spread of communicable diseases like COVID-19 (Okan et al., 2022). As literature suggests (Avafia et al., 2020; Somse & Eba, 2020), each pandemic presents lessons that could be used to manage future pandemics. For this reason it is important to make reflections on the COVID-19 pandemic period, so that

© 2024 by authors; licensee Aquademia by Modestum DOO, Serbia. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0/).

insights for future science backed pandemic control and preventative measures are developed. Therefore understanding science teachers' behavioral intentions during COVID-19 pandemic may provide useful knowledge for future pandemics control and prevention (Islami et al., 2023).

Context of the Study

COVID-19 was first reported in a wholesale food market in Wuhan City of China in December 2019 (Lake, 2020; World Health Organization [WHO], 2020). The rapid spread within and between countries of COVID-19, made it classified a Public Health (PH) emergency of international concern, requiring a systematic international response (Guy et al., 2020). The deadly combination of high severity and transmissibility of COVID-19 (Ayouni et al., 2021) implied the world had to activate, and scale-up crisis response mechanisms (Anjorin, 2020). According to WHO Director General, countries had to take a whole-of-government and whole-of-society approach to build comprehensive strategies to prevent infections, and save lives (WHO, 2020). In response to WHO directives, most countries adopted various preventive and control measures like lockdowns, social distancing, masking, quarantines, curfews, contact tracing, mass testing and isolation to contain the spread of COVID-19 (Fattahi et al., 2022; Priyadarsini & Suresh, 2020). Through sensitivity analyses, these interventions were proved to be effective in reducing transmission risk (Tang et al., 2020). Therefore countries over the world setup task forces to coordinate and oversee efforts to manage COVID-19 through these measures (Demirbas et al., 2020; Girun et al., 2020).

At the peak of COVID-19 in 2020, they were no vaccines, so it was necessary for countries to implement various preventative and control measures like movement control orders (MCOs), lockdowns, wearing face masks, personal hygiene, and physical distancing (Low et al., 2022; Zimbabwe Education Cluster, 2020). Vaccine development initiatives commenced in response to the pandemic outbreak. Compliance with COVID-19 control and preventative measures required each individual to assume responsibilities consistent with controlling the disease (Leung et al., 2003; Thomas & Suresh, 2022). According to Cori et al. (2020), public perception is important in building public trust and cooperation in preventing spread of a pandemic. Controlling and preventing pandemic outbreak goes beyond biomedical and clinical approaches, by including PH preventative measures. Individuals' social responsibility in mitigating spread of any infectious disease is subject to change in human behavior and public involvement in preventative efforts. Predictors of behavior change in relation to disease outbreak are perceived susceptibility and severity weighed against recommended behaviors to protect against the disease (Bish & Michie, 2010; Crowling et al., 2010). Thus it is important to understand human behavior and its role in controlling and preventing pandemic outbreak (West et al., 2020).

THEORETICAL FRAMEWORK

The theoretical framework for the study is rooted in the health belief model (HBM), which researchers and health practitioners use in promoting healthy behavior through various behavior change interventions (Orji et al., 2012). Created by social psychologists Irwin M. Rosenstock, Godfrey M. Hochbaum, S. Stephen Kegeles, and Howard Leventhal in the US in the 1950s, HBM guides health promotion and illness prevention initiatives (Devi et al., 2022). According to HBM, people's implementation readiness of disease control and preventative measures is influenced by beliefs about whether or not they are at risk of infection, and perceptions of benefits of taking that action (Crowling et al., 2010; Daszak et al., 2020; Seong & Bae, 2022). HBM is effective in explaining and measuring factors that motivate or prevent patients form complying with treatment by explaining the attitudes and behaviors of individuals (Daniati et al., 2021). The value an individual place on health is influenced by beliefs about the illness and its consequences. HBM focuses on understanding why people use or do not use control and preventative services or measures offered by PH departments. There are key factors, which HBM considers as influential to health behaviors (self-efficacy). The factors are perceived susceptibility to illness or disease (perceived susceptibility), belief in the severity of the consequences (perceived severity), potential positive effects of action (perceived benefits), perceived barriers to action (perceived barriers), exposure to factors, which prompt action (cues to action), and confidence in one's ability to succeed (Devi et al., 2022). HBM enables appropriate strategies to be implemented, since pandemics usually do not have cure at their outbreak. Therefore control and prevention strategies are the best interventions to mitigate pandemic risk factors (Wilson, 2022), like in the case of COVID-19.

Purpose of the Study

In the context of PH it is important to understand perceptions, beliefs and attitudes, which influence science teachers' health-related behavioral intentions (Zeyer, 2019). Understanding these factors in relation to health issues like control and prevention measures implemented during the COVID-19 pandemic, could assist in developing relevant strategies for science education to be an effective tool for promoting safe behaviors. If pre-service science teachers are to be effective after qualifying, they should exhibit during preparation, competences they would apply to teaching and learning in schools upon graduating. It is the focus of this paper to understand reflections on COVID-19 control and prevention measures of pre-service science teachers at a teachers' college in Zimbabwe.

METHODOLOGY

In this case study twelve pre-service science teachers were purposively sampled at a teachers' college in Zimbabwe to provide information based on reflections on their experiences during COVID-19 pandemic. The semi-structure interview guide that was used focused on soliciting information from the pre-service science teachers on ways in which COVID-19 pandemic spreading was controlled and prevented. Consistent with ethical considerations, all participants were informed of the purpose of the interview. Consent to be interviewed was sought; hence those pre-service science teachers who agreed to be interviewed participated.

Anonymity was ensured by assigning pseudo names to participants, and omitting identifying details to the fullest extent possible, without sacrificing rich descriptions. Immersion in data was achieved by the researcher through reading texts many times. Coded data was interpreted in the context of the purpose of the study to give them meaning. Themes, which emerged from analysis of data were used in presenting findings.

FINDINGS

Perceived COVID-19 Infection Risk

During COVID-19 pandemic, information communicated to people included risks associated with exposure to infection like health complications and death (Seong & Bae, 2022). Such information contributed to individual assessment of how high the risk of contracting the infection was, and the possibility of reducing the risk through protective measures (Daszak et al., 2020). Consistent with this perception, pre-service science teacher P8 said:

> I started masking up when I heard on TV news about the coronavirus, how it spreads and how contracting it can be reduced. This was before it was made mandatory to wear a mask and sanitizing.

Pre-service science teacher P11 gave the reason why masking was poor at the teachers' college as:

> Numbers of those infected and dying went down, so people thought they were safe without masking up. Here at college level of enforcement by way of paying small fines was not deterrent enough.

Pre-service science teacher P7 who seemed not to be aware of risks associated with contracting COVID-19 notwithstanding having a science disease prevention background said:

> COVID-19 could not be prevented by masking up. It is like any other flu. If I contracted it I would heal.

Pre-service science teacher P9 who was non-resident at college who used public transport to and from college said:

> I had to wear a mask when mixing with people because it was scientifically proven that masking reduces contracting COVID-19. I also encouraged my family members to take protective measures because they interacted with some people who either did not care about COVID- 19 or who were not aware about it.

Some pre-service science teachers' religious belief that God is in control so He would protect them from COVID-19, was exemplified by pre-service science teacher P4 who said:

> It is God who has the power to control everything, so I believe every believer in God was protected from this deadly disease.

In support of this perception pre-service science P2 said:

> I was not worried because God was and is with me for protection. All those who believe in the almighty God were and will always be protected from this and other diseases. We need to have faith and definitely we will be protected.

These responses reveal that perceived risk of COVID-19 infection by individuals determined their responses to COVID-19 control and preventative measures implementation (Cirrincione et al., 2020). It is important to note that these perceptions were premised on factors like lack of awareness of the dangers associated with COVID-19 and religious beliefs. If someone perceives low risk of infection then the person will not invoke the need to protect oneself or the society from the pandemic. It may be that low risk of fatal infection may be real, like Omicron COVID-19 virus, which had high transmissibility but, low severity. However, perception of low risk of infection might be false as pandemic may have high risk of fatal infection (severity) and high transmissibility like the Delta COVID-19 virus (Cirrincione et al., 2020).

Lack of Information on COVID-19

Non-compliance with pandemic control and preventative measures may emanate from lack of information. This was demonstrated by pre-service science teacher P5 who said, "Was COVID-19 there?" when asked whether masking up was effective in preventing spreading of COVID-19. Another pre-service science teacher P12 who reflected ignorance about the severity of the COVID-19 pandemic commented:

> We did not hear about it. The problem was that we did not get COVID-19 information on daily basis. Sometimes when I had data in my cell phone I got that information by reading news. However data is expensive so most of the times I remained in dark.

In agreement with P12, pre-service science teacher P4 said:

> There was need for intensive and extensive sharing of information on COVID-19 spreading and management to reduce its effects. Sometimes people did not mask up because of lack of information.

They were some individuals who started to understand severe outcomes of being infected with COVID-19 as health complications and death, after the government had introduced MCO and other preventive measures like social distancing, sanitising, and lockdowns. Pre-service science teacher P3 who responded in line with this commented that:

> The seriousness of COVID-19 was evident everywhere. Government made information on the pandemic available through radio, TV and awareness campaigns that the corona virus was a threat to human existence. As a result many people started to comply with control measures.

These response underscore the need for extensive information dissemination to all citizens so that they buy in implementation of pandemic control and prevention measures.

Public Confidence in Control & Preventative Measures Implemented

Pandemic control and preventative measures implemented need to instill confidence in people in that they work when they are juxtaposed with the absence of such control and preventative measures (Guo et al., 2022; Low et al., 2022). Related to this, pre-service science teacher P10 said:

> Social distancing was not practiced all times. For instance at banks and shops it was ensured that there was social distancing in queues through marked positions. However, when travelling by public transport people were closely packed, thereby violating social distancing. As a result people ended up not complying.

This response shows that for each individual to develop confidence in control and preventative measures implemented then authorities should ensure that measures are implemented by everybody all times. Enforcing control and preventative measures sometimes and sometimes not, confuses the public resulting in violation.

Similar to P10's view, pre-service science teacher P1 said:

> We read in the newspapers about many cases in which high ranking people and officials held parties and weddings in violation of social distancing and banning of gatherings. This caused other people to ignore implementing COVID-19 protective measures.

This response shows that during the COVID-19 pandemic it appeared in some instances as if authorities permitted violation of control and prevention COVID-19 measures by some people. This subsequently eroded public confidence in implementing measures to mitigate spreading of the pandemic. Therefore health authorities needed to ensure that disease control and prevention measures were always implemented by everybody as required by control and prevention procedures.

Consistency in Implementation of COVID-19 Control & Preventative Measures

Lack of trust by the public could arise due to perceived inconsistency, incompetency, objectivity, lack of empathy or sincerity in responding to a pandemic or disaster in general (Betsch et al., 2020).

Acknowledging inconsistency in applying MCO, pre-service science teacher P6 said:

> When we came to college and went back home buses were full without social distancing, so it did not help to mask up for short time while at college.

Concurring with P6 on why social distancing was said to have been violated at the teachers' college during COVID-19 pandemic, pre-service science teacher P8 said:

> There were contradictions, which happened. For instance when some of us came to college from home as non-residents we used kombis and buses for transport, and we were close to each other without social distancing. Therefore it did not make sense to start social distancing when at college. To be effective social distancing was supposed to be practiced consistently.

Pre-service science teacher P11 noted:

> Some staff members here at college sometimes neither practiced social distancing nor masked up. Therefore some pre-service teachers who did not practice social distancing might have been copying these staff members since they were role models.

This response shows that people regarded as role models should implement health practices as expected, since they have potential to influence other people in society to either comply or violate PH control and preventive measures.

Relative Importance of Personal Issues

Personal issues weighted against pandemic control measures determine people's responses to a pandemic. The need to work for survival is one driving factor that needs to be considered during MCO like lockdowns. Pre-service science teacher P1 who violated MCO fully aware of the need to prevent spreading of the pandemic based on scientific knowledge said:

> Personally I was aware of the risk of infection, but I had to violate MCO in search of food. People need to work for survival. Money for food, clothing and other things was needed during the COVID-19 pandemic. One could not get these things for free, hence the need to work. Alternatively, the government could have provided these things so that everybody stayed indoors.

Concurring with P1, pre-service science teacher P12 indicated the need to survive as the reason for moving during the COVID-19 lockdown period:

> Scientifically I knew the risks of violating MCO, but I have a family to look after. Therefore I had to move although I knew that I was violating COVID-19 regulations, so that I buy food for my family.

Aligning one's behavior consistent with application of science in disease prevention amidst a pandemic outbreak and government's restriction order is important. However from responses by pre-service science teachers P1 and P12, it depends on personal autonomy on what people see as best for themselves, which include availability of basic needs for survival like food (Low et al., 2022). The need for food is one driving factor, which best fits everybody's basic needs, hence means by which people get food should be considered during MCO like lockdowns. This suggests that if pre-service science teachers at the selected college were to fully comply with COVID-19 MCO then government was obliged to provide support, for instance providing food, so that they would stay indoors during lockdown period.

Misinformation

Prevalent among pre-service science teachers, were conspiracy theories, which further the view that there is a secret plan by an individual or group to do something unlawful

or harmful to somebody or people (Moore, 2016). In line with conspiracy theories pre-service science teacher P12 casted reservations on security of using vaccines developed within a short space of time, without enough clinical trials and information on safety. P12 said:

> I do not feel comfortable with vaccines developed in a very short time and recommended for use by humans. Will these vaccines not have long term negative health effects on humans? There are rumors that these vaccines are not genuine because they are intended to eliminate certain people in various countries. I am not sure, but this view is shared by many people over the world, as shown by information trending both in newspapers and social media platforms.

Pre-service science teacher P5 supported conspiracy theories saying:

> COVID-19 was created by some people to target certain people. It is possible that it is a kind of a war.

Asked to elaborate who were the people fighting the war and why, pre-service science teacher P5 was not able to give clarity. A noteworthy aspect of this response is that conspiracy theories are applied by individuals in society, and this determines how they respond to pandemics like COVID-19. This points to the need for information to do with a particular pandemic to be communicated in unambiguous terms, so that citizens understand and implement measures, which mitigate infection and spreading of the pandemic, through conspiracy theories.

DISCUSSION

The outbreak of COVID-19 pandemic induced control and preventative measures like national lockdowns with MCO, mandatory social distancing, face masking, and sanitizing (Obrenovic et al., 2020). This study showed that such control and preventative measures can be effective if each individual religiously adheres to prescribed PH regulations. Awareness about the risk of infection was revealed by this study to improve adherence to COVID-19 control and preventative measures. If the risk of infection is made clear through provision of accurate and current information to every individual, then people will most likely adhere to PH control measures (Pyszczynski et al., 2021). This is illustrated by some pre-service science teachers who said they started masking up before it was mandatory, after hearing on TV how COVID-19 spreads and how contracting it can be reduced. Also some participants started complying with control and preventative measures when increased government interventions signaled the wide transmission and high risk of infection by the deadly disease. This shows that people should be made aware of pandemic outbreak and how to prevent infection and its spreading. During a pandemic an individual's threatened state of mind, which comes as a result of perceived high risk of infection may cause compliance with control and preventative measures. This perception is based on high awareness about the pandemic due to information disseminated (Maravilla et al., 2022). In this regard, communication about any pandemic should ensure that every individual is aware that infection knows no boundaries. This implies anybody being rich, poor, member of any religion, color or gender or any social status remains vulnerable to infection by the pandemic. Therefore there is need for those entrusted with PH both in government and private sector, to ensure that all possible measures are used for advocacy to practice PH behaviors, which mitigate infection and subsequent pandemic spreading.

Public confidence in control and preventative measures for a pandemic develops as people evaluate the commitment demonstrated by both PH authorities and private players, against what is supposed to be done (Low et al., 2022). Pre-service science teachers in this study bemoaned inconsistency in implementing COVID-19 pandemic control and preventative measures. For instance as policy, social distancing, masking up and sanitizing were widely advocated for through various media (radio, TV, newspapers, etc.). However, contrary to policy pronouncements, overcrowding on public transport like buses, and public places was reported by pre-service science teachers in this study to have occurred during the COVID-19 pandemic. They said congestion on public transport as an example, adversely affected public confidence in the control measures, hence violation was said to be prevalent. Therefore, for individuals to develop confidence in pandemic control and preventative measures PH authorities should walk the talk consistently.

Pre-service science teachers expressed that the relative importance of social and economic issues they encountered determined their response to COVID-19 lockdown. The need to have food is one driving factor that they said needed to be considered during COVID-19 MCO like lockdown. Control and preventative measures of a pandemic like MCO can still be violated if what a person sees best outweighs the purpose of such measures. For instance if one feels the family is threatened with hunger then the viable option will be to look for food, although violating MCO. Therefore the stay at home/indoors policy which was implemented at the peak of COVID-19 infections could have worked to greater extent if families were supported with basic needs like food. This suggests that if citizens were to comply with COVID-19 MCO, then government was obliged to provide support, for instance providing each household with food. Therefore the government of each country should develop a disaster support fund meant to support citizens in times of natural disasters like pandemics, floods, cyclones etc. In other words preparedness to deal with disasters and pandemics comparable with COVID-19 should be a priority for each country (Shang et al., 2020).

During a pandemic there is need for accurate and reliable information to be communicated to all citizens in unambiguous terms, so that citizens understand measures, which mitigate infection and the spread of the pandemic (Bolsen et al., 2020; Mbakaya et al., 2017). When COVID-19 pandemic broke out, there was a proliferation of conspiracy theories. For instance some pre-service science teachers believed that COVID-19 was meant to attack particular people, and they would not be attacked because they were not targets of attack by COVID-19. These conspiracy theories guided perceptions were counterproductive, since they encouraged violation of COVID-19 control and preventative measures.

Corroborating pre-service science teachers' reliance on conspiracy theories in explaining emergency of COVID-19, is a plethora of evidence in literature. For instance, it is said the coronavirus was developed by a powerful country to disrupt economies of many countries (Duplaga, 2020). In some cases vaccines were dismissed as dangerous to people's health (Oyekan, 2021). Coronavirus is also said to be a laboratory experiment that went wrong or a deliberate leak from a research laboratory (Bolsen et al., 2020; Riechmann & Tang, 2020). Another conspiracy theory suggests that COVID-19 was made to cover-up the harmful effects of 5th generation mobile network (5G network) (Bruns et al. 2020; Goodman & Carmichael 2020). COVID-19 pandemic generated many conspiracy theories as proved by the term infodemic coined by WHO, which captures the misinformation trailing the COVID-19 pandemic (WHO, 2020), Consistent with findings from this study, conspiracy theories and misinformation caused confusion and increase in the spread of COVID-19. Therefore to effectively mitigate a pandemic there is need for quick response in identifying and engaging stakeholders, providing accurate information, prioritizing employee safety and putting in place post-pandemic recovery strategy (Knighton et al., 2020; Orsini et al., 2020). COVID-19 pandemic revealed the need for effective strategies to prevent spread of communicable diseases, through coordinated multidisciplinary effort (Islami et al., 2023).

Nexus of Science Knowledge with Pandemic Management

A surprising, noteworthy finding of this study is that notwithstanding their science knowledge about disease prevention, pre-service science teachers based their reactions to COVID-19 control and prevention on conspiracy theories and other sources of misinformation. This showed that application of science to solve problems is a function of situational conditions. In this case, issues of sustenance (food), and college staff (role models) reaction to COVID-19 determined subsequent response of the pre-service science teachers. Therefore, for science to be applied in promoting PH enabling conditions should prevail. This study concurs with Becchetti et al. (2021) in that factors like poverty, illiteracy, lack of food and misinformation promoted spread of COVID-19. Therefore pre-service science teachers' scientific knowledge about diseases and biomedical approach may not be sufficient to mitigate or prevent spread of communicable diseases. This implies that a holistic systemic approach to factors that enable science teachers to apply science in promoting PH should be made. To the contrary piecemeal approach will not work.

CONCLUSIONS

Science teachers have potential to influence other people in society to comply or violate PH control and preventive measures. Therefore as role models science teachers should exhibit health practices as expected. However, pre-service science teachers showed that science knowledge about disease control and prevention is not the only factor that should be considered for science teachers to be effective in promoting implementation of PH measures. In other words possessing science knowledge only about disease control and prevention measures is no guarantee that science teachers will promote PH based on their scientific knowledge. Other factors, which include awareness of pandemic and risk infection, sustenance issues like food availability, poverty, religious beliefs, misinformation and conspiracy theories promoted spread of COVID-19. Conspiracy theories undermine the belief that a pandemic (in this case COVID-19) exists, hence adversely affect control and preventative measures put in place by governments across the continent. Misinformation and conspiracy theories can be managed in a pandemic through government led consistent, authentic and transparent initiatives, which are embedded in policy. Such an approach builds trust between government and people, hence enhances implementation of pandemic control and preventative measures. These factors need to be attended holistically to in order to create an enabling environment for science teachers to be promoters of implementation of PH disease control and prevention measures.

Lessons for Future Pandemic Management

1. Risk of infection should be communicated in simple terms in all languages in the case of multilingual countries. This helps the public to understand the need to embrace pandemic control and preventative measures.
2. Ensuring that control and preventative measures are implemented consistent with policy pronouncements to develop public confidence in PH measures to mitigate pandemics or natural disasters.
3. Improving disaster preparedness by developing a disaster fund to provide social support during disasters like pandemics, cyclones, floods, hunger etc.
4. Provision of current and accurate information to the public, as means of countering conspiracy theories (infodemic) about disease outbreak.

Author contributions: All co-authors have involved in all stages of this study while preparing the final version. They all agree with the results and conclusions.

Funding: No external funding is received for this article.

Ethics declaration: The authors stated that the highest ethical practices were sought during the study. Written informed consents were obtained from the participants. Anonymity was ensured by assigning pseudonames to participants and omitting any personally identifying details.

Declaration of interest: The authors declare that they have no competing interests.

Availability of data and materials: All data generated or analyzed during this study are available for sharing when appropriate request is directed to corresponding author.

REFERENCES

Anjorin, A. A. (2020). The coronavirus disease 2019 (COVID-19) pandemic: a review and an update on cases in Africa. *Asian Pacific Journal of Tropical Medicine, 13*(5), 199-203. https://doi.org/10.4103/1995-7645.281612

Avafia, T., Konstantinov, B., Esom, K., Sanjuan, J. R., & Schleifer, R. (2020). A rights-based response to COVID-19: Lessons learned from HIV and TB epidemics. *Health and Human Rights Journal*.

Ayouni, I., Maatoug, J., Dhouib, W., Zammit, N., Fredj, S. B., Ghammam, R., & Ghannem, H. (2021). Effective public health measures to mitigate the spread of COVID-19: A systematic review. *BMC Public Health, 21*(1), 1015. https://doi.org/10.1186/s12889-021-11111-1

Banerjee, D., & Meena, K. S. (2021). COVID-19 as an "infodemic" in public health: Critical role of the social media. *Frontiers in Public Health, 9*, 610623. https://doi.org/10.3389/fpubh.2021.610623

Becchetti, L., Piscitelli, P., Distante, A., Miani, A., & Uricchio, A. F. (2021). European Green Deal as social vaccine to overcome COVID-19 health & economic crisis. *The Lancet Regional Health–Europe, 2*, 100032. https://doi.org/10.1016/j.lanepe.2021.100032

Betsch, C., Wieler, L. H., & Habersaat, K. (2020). Monitoring behavioral insights related to COVID-19. *The Lancet, 395*(10232), 1255-1256. https://doi.org/10.1016/S0140-6736(20)30729-7

Bish, A., & Michie, S. (2010). Demographic and attitudinal determinants of protective behaviors during a pandemic: A review. *British Journal of Health Psychology, 15*, 797-824. https://doi.org/10.1348/135910710X485826

Bolsen, T., Palm, R., & Kingsland, J. T. (2020}. Framing the origins of COVID–19. *Science Communication*, *42*(5), 1-24. https://doi.org/10.1177/1075547020953603

Bruns, A., Harrington, S., & Hurcombe, E. (2020). "Corona? 5G? Or both?": The dynamics of COVID -19 / 5G conspiracy theories on Facebook. *Media International Australia, 177*(1), 12-29. https://doi.org/10.1177/1329878X20946113

Cirrincione, L., Plescia, F., Ledda, C., Rapisarda, V., Martorana, D., Moldovan, E. R., Theodoridou, K., & Cannizzaro, E. (2020). COVID-19 pandemic: Prevention and protection measures to be adopted at the workplace. *Sustainability, 12*(3603), 2-18. https://doi.org/10.3390/su12093603

Cori, L,. Bianchi, F., Cadum, E., & Anthonj, C. (2020). Risk perception and COVID-19. *International Journal of Environmental Research and Public Health, 17*(9), 3114. https://doi.org/10.3390/ijerph17093114

Crowling, B. J., Diane, M. W. N., Dennis, K. M. I., Liao, Q., Lam, W. W. T., Joseph, T. W. T., Lau, J. T. F., Griffiths, M. S., & Fielding, R. (2010). Community psychological and behavioral responses through the first wave of the 2009 influenza A(H1N1) pandemic in Hong Kong. *The Jounal of Infectious Diseases, 202*, 867-876. https://doi.org/10.1086/655811

Daniati, N., Widjaja, G., Olallaa Gracia, M., Chaudhary, P., Nader Shalaby, M., Chupradit, S., & Fakri Mustafa, Y. (2021). The health belief model's application in the development of health behaviiors. *Health Education and Health Promotion, 9*(2), 521-527.

Daszak, P., Olival, J. K., & Li, H. (2020). A strategy to prevent future epidemics similar to 2019-nCoV outbreak. *Biosafety and Health, 2*, 6-8. https://doi.org/10.1016/j.bsheal.2020.01.003

Demirbas, D., Bozkurt, V., & Yorgun, S. (2020). Introduction: the COVID-19 pandemic and its economic, social and political impacts. In D. Dilek, B. Veysel, & Y. Sayım (Eds.), *The COVID-19 pandemic and its economic, social and political impacts*. Istanbul, Istanbul University Press. https://doi.org/10.26650/B/SS46.2020.006

Devi, B., Devi, R., Pradhan, S., & Lepcha, N. (2022). Theory at a glance: Health belief models in predicting health behaviors. *Journal of Bio Innovation, 11*(2), 410-421.

Duplaga, M. (2020). The determinants of conspiracy beliefs related to the COVID-19 pandemic in a nationally representative sample of internet users. *International Journal of Environmental Research and Public Health*, *17*(7818), 1-15. https://doi.org/10.3390/ijerph17217818

Fattahi, H., Seproo, G. F., & Fattahi, A. (2022). Effective factors in people's behaviors during COVID-19 pandemic: A systematic review and meta-synthesis. *BMC Public Health, 22*, 1218. https://doi.org/10.1186/s12889-022-13621-y

Girun, T., Lentiro, K., Geremew, M., Migora, B., & Shewamare, S. (2020). Global strategies and effectiveness for COVID-19 prevention through contact tracing, screening, quarantine, and isolation: A systematic review. *Tropical Medicine and Health, 48*, 91. https://doi.org/10.1186/s41182-020-00285-w

Goodman, J., & Carmichael, F. (2020). *Coronavirus: Bill Gates 'microchip' conspiracy theory and other vaccine claims fact-checked*. BBC News. https://www.bbc.com/news/52847648

Guo, C., Hu, X., Yuan, D., Zeng, Y., & Yang, P. (2022). The effect of COVID-19 on public confidence in the World Health Organisation: A natural experiment among 40 countries. *Globalisation and Health, 18*, 77. https://doi.org/10.1186/s12992-022-00872-y

Guy, K. R. DiPaola, S. R., Romanelli, F., & Dutch, E. R. (2020). Rapid repurposing of drugs for COVID-19. *Science, 368*, 829-830. https://doi.org/10.1126/science.abb9332

Islami, Z. A. R., Ramulumo, M., Sari, J. I., & Mnguni, L. (2023). COVID-19 prevention intentions of pre-service science teachers from South African and Indonesian universities. *EURASIA Journal of Mathematics, Science and Technology Education, 19*(8), em2305. https://doi.org/10.29333/ejmste/13426

Knighton, S. C., Zabarsky, T. F., & Donskey, C. J. (2020). Four moments for healthcare facility visitor hand hygiene. *American Journal of Infection Control, 48*(11), 1412-1413. https://doi.org/10.1016/j.ajic.2020.08.017

Lake, M. A. (2020). What we know so far: COVID-19 current clinical knowledge and research. *Clinical Medicine, 20*(2), 124-127. https://doi.org/10.7861/clinmed.2019-coron

Leung, G. M,. Lam, T. H,. Ho, L. M., Ho, S. Y., Chan, B. H. Y., Wong, I. O. L., & Hedley, A. J. (2003). The impact of community psychological responses on outbreak control for severe acute respiratory syndrome in Hong Kong. *Journal of Epidemiology & Community Health, 57*(11), 857-863. https://doi.org/10.1136/jech.57.11.857

Low, L. L., Seng Fah Tong, F. S., Ju Ying Ang, Y. J., Zalilah, A., Maimunah A., Hamid, M., Risman, S. M., Wong, T. Y., Jamalul-Lail, I. N., Kalvina Chelladorai, K., Yui Ping Tan, P. Y., Yea Lu Tay, I. Y., Awatef Amer Nordin, A. A., & Amar-Singh, H. S. S. (2022). Social responsibility perspective in public response to the COVID-19 pandemic: A grounded theory approach, *BMC Public Health, 22*, 469-480. https://doi.org/10.1186/s12889-022-12819-4

Maravilla, V., Espellita, S., Enero, G., & Alqueza, J. (2022). COVID-19 awareness, preparedness, and challenges of distance learning among teachers in Ormoc City, Philippines. *Psychology and Education: A Multidisciplinary Journal*. https://doi.org/10.5281/zenodo.6852822

Marimwe, C., & Dowse, R. (2019). Health literacy test for limited literacy populations (HELT-LL): Validation in South Africa. *Cogent Medicine, 6*(1), 1650417. https://doi.org/10.1080/2331205X.2019.1650417

Mbakaya, B. C., Lee, P. H., & Lee, R. L. (2017). Hand hygiene intervention strategies to reduce diarrhoea and respiratory infections among schoolchildren in developing countries: A systematic review. *International Journal of Environmental Research and Public Health, 14*(4), 371. https://doi.org/10.3390/ijerph14040371

Mishra, A., Sharma, D., Derashri, G., Mishra, A., & Tripathi, G. M. (2020). Awareness towards COVID-19 among medical students: A cross-sectional questionnaire based study. *Journal of Clinical & Diagnostic Research, 14*(10), LC01-LC05. https://doi.org/10.7860/JCDR/2020/45160.14140

Mnguni, L. (2017). The relationship between enrolment in biology, HIV/AIDS knowledge, and related behavior among South African schoolgirls. *Journal of Baltic Science Education, 16*(6), 898. https://doi.org/10.33225/jbse/17.16.898

Moore, A. (2016). Conspiracy and conspiracy theories in democratic politics. *Critical Review*, *28*(1), 1-23. https://doi.org/10.1080/08913811.2016.1178894

Newman, P. A., Roungprakhon, S., Tepjan, S., Yim, S., & Walisser, R. (2012). A social vaccine? Social and structural contexts of HIV vaccine acceptability among most-at-risk populations in Thailand. *Global Public Health, 7*(9), 1009-1024. https://doi.org/10.1080/17441692.2012.692388

Nuangchalerm, P., El Islami, R. A. Z., & Prasertsang, P. (2022). Science attitude on environmental conservation of Thai and Indonesian novice science teacher students. *International Journal of STEM Education for Sustainability, 2*(2), 148-155. https://doi.org/10.53889/ijses.v2i2.62

Obrenovic, B., Jianguo Du, J,. Danijela Godinic, D., Tsoy, D., Aamir, M., Shafique Khan, S., & Ilimdorjon Jakhongirov, I. (2020). Sustaining enterprise operations and productivity during the COVID-19 pandemic: "Enterprise effectiveness and sustainability model". *Sustainability, 12*(15), 5881. https://doi.org/10.3390/su12155981

Okan, O., Messer, M., Levin-Zamir, D., Paakkari, L., & Sørensen, K. (2022). Health literacy as a social vaccine in the COVID-19 pandemic. *Health Promotion International, 38*(4), daab197. https://doi.org/10.1093/heapro/daab197

Orji, R., Vassileva, J., & Mandryk, R. (2012). Towards an effective health design: An extension of the health belief model. *Online Journal of Public Health Informatics, 4*(3), e9. https://doi.org/10.5210/ojphi.v4i3.4321

Orsini, E., Mireles-Cabodevila, E., Ashton, R., Khouli, H., & Chaisson, N. (2020). How we do it: Lessons on outbreak preparedness from the Cleveland Clinic. *Chest, 158*(5), 2090-2096. https://doi.org/10.1016/j.chest.2020.06.009

Oyekan, O. A. (2021). Conspiract theories and pandemic management in Africa: Critical reflections on contexts, contradicts and challenges. *Acta Axadenca* [*Axadenca Act*], *53*(2), 38-59. **Error! Hyperlink reference not valid.**

Priyadarsini, L., & Suresh, M. (2020). Factors influencing the epidemiological characteristics of pandemic COVID-19: A TISM approach. *International Journal of Healthcare Management, 13*(2), 89-98. https://doi.org/10.1080/20479700.2020.1755804

Pyszczynski, T., Lockett, M., Greenberg, J., & Sheldon Solomon, S. (2021). Terror management theory and the COVID-19 pandemic. *Journal for Humanistic Psychology, 6*(2), 173-189. https://doi.org/10.1177/0022167820959488

Ramli, M., & Susanti, B. H. (2022). Indonesian students' scientific literacy in Islamic Junior High School. *International Journal of STEM Education for Sustainability, 2*(1), 53-65. https://doi.org/10.53889/ijses.v2i1.33

Riechmann, D., & Tang, T. (2020). *President Trump dubs COVID-19 the 'Chinese virus'– despite hate crime risks, rise in virus-related discrimination reports*. Chicago Tribune. https://www.chicagotribune.com/coronavirus/ct-nw-chinese-coronovirus-hate-speech-20200318-y5d5ti6qmjemjg3fosehxihhnu-story.htm

Seong, M., & Bae, K. (2022). A study of pandemic prevention health behavior in adults. *International Journal of Environmental Research and Public Health, 19*(13), 8181. https://doi.org/10.3390/ijerph19138181

Shang, J., Chastain, A. M., Perera, U. G. E., Quigley, D. D., Fu, C. J., Dick, A. W., Pogorzelska-Maziarz, M., & Stone, W. P. (2020). COVID-19 preparedness in US home health care agencies. *Journal of the American Medical Directors Association, 21*(7), 924-927. https://doi.org/10.1016/j.jamda.2020.06.002

Somse, P., & Eba, P. M. (2020). Lessons from HIV to guide COVID-19 responses in the Central African Republic. *Health and Human Rights, 22*(1), 371.

Tang, B., Wang X., Li, Q., Bragazzi, L. N,. Tang, S., Xiao, Y., & Wu, J. (2020). Estimation of the transmission risk of the 2019-nCoV and its implication for public health interventions. *Journal of Clinical Medicine, 9*(2), 462. https://doi.org/10.3390/jcm9020462

Thomas, A., & Suresh, M. (2022). Assessment of COVID-19 prevention and protection measures in hospitals. *Cleaner Engineering and Technology, 7*, 100440. https://doi.org/10.1016/j.clet.2022.100440

Underwood, N. L., Gargano, L. M., Sales, J., Vogt, T. M., Seib, K., & Hughes, J. M. (2019). Evaluation of educational interventions to enhance adolescent-specific vaccination coverage. *Journal of School Health, 89*(8), 603-611. https://doi.org/10.1111/ josh.12786

West, R., Michie, S., Rubin, G. J., & Amlot, R. (2020). Applying principles of behavior change to reduce SARS-CoV-2 transmission. *Nature Human Behavior, 4*(5), 451-459. https://doi.org/10.1038/s41562-020-0887-9

WHO. (2020). Coronavirus disease 2019 (COVID-19): Situation report. *World Health Organization*. https://apps.who.int/iris/handle/10665/331865

Wilson, J. (2022). The use of behavior change theory for infection prevention and control practices in health settings: A scoping review. *Journal of Infection Prevention, 23*(3), 108-117. https://doi.org/10.1177/17571774211066779

Zeyer, A. (2019). Getting involved with vaccination. Swiss student teachers' reactions to a public vaccination debate. *Sustainability, 11*(23), 6644. https://doi.org/10.3390/su11236644

Zimbabwe Education Cluster.(2020). Humanitarian response & COVID-19 sitrep. *Save the Children & UNICEF*. https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/zimbabwe_education_cluster_situation_report_4_28.05.2020.pdf