



Adherence to COVID-19 protocols: A comparative study of public and private hospitals in Ghana

Mohammed A. Issah, Roger A. Atinga^{*}, Anita A. Baku

Department of Health Services Management, University of Ghana Business School, Accra, Ghana

ARTICLE INFO

Keywords:

COVID-19
Protocol adherence
Public hospital
Private hospital
Ghana

ABSTRACT

Objective: This study aimed to comparatively examine how public and private hospitals adhered to the COVID-19 safety protocols, and the factors associated with, and barriers to adherence in Ghana.

Study design: A case study design drawing on quantitative and qualitative methods to determine adherence to, and barrier of adherence to the COVID-19 protocols.

Method: A sample of 283 staff participated in the quantitative study, while in-depth interviews were conducted among management staff across the public and private hospitals. Data were analyzed using descriptive statistics, independent *t*-test to compare differences in adherence and logistic regression model to identify the factors associated with adherence to the COVID-19 protocols.

Results: The regression results showed that adherence to the COVID-19 protocols in public and private hospitals were significantly associated with staff training on adherence in public (OR = 2.08; $p < 0.01$) and private (OR = 1.44; $p < 0.05$), and knowledge on adherence in public (OR = 3.12; $p < 0.01$) and private (OR = 11.45; $p < 0.01$) hospitals. Adherence to the protocol varied significantly between public and private hospitals ($0.001 > p < 0.05$), with an effect size ranging from small to large. Clients' behavioural factors and poor stocking of PPEs due to financial challenges were reported as barriers to adherence in both hospital types.

Conclusion: Adherence to the COVID-19 protocols was more pronounced in public hospitals than private hospitals suggesting the need for interventions targeting the latter to promote client and staff safety.

1. Introduction

The coronavirus 19 (COVID-19) has gained much attention worldwide because its transmission posed severe human hazard [1,2]. Ghana is no exception to adversities of the pandemic having recorded several infections and mortalities since its outbreak. Five months after the COVID-19 outbreak in China, Ghana recorded its first case on March 12, 2020 culminating in rapid transmission across regions. In response, the government enforced several mitigations including enforcement of personal hygiene, frequent hand washing, social distancing, lockdown, avoiding public gatherings, and sticking to reliable information on COVID-19 to reduce associated fear of the pandemic [3].

Healthcare organizations suffered the worse transmission proportions because of their direct involvement in case management and treatment. Health facilities instituted safety measures to compel adherence to the protocols, but they widely varied across facilities and settings. It was noted that adherence to COVID-19 protocols is a critical element of overall organizational health. Globally, violations of

workplace protection rules have led to almost a million places of workplace mishaps, the vast majority of which have occurred in production centres in low-income countries [4].

Given the occupational risk of the COVID-19, both public and private health facilities played significant roles in containing transmission of the pandemic by enforcing strict adherence to safety protocols to minimize infections and associated mortalities. Additionally, in response to the growing numbers of suspected and confirmed cases, and as part of the mechanisms to build robust healthcare systems capable of handling critical cases, the management of many hospitals in Ghana adopted several internal control measures including appointment systems, virtual consultations, and cancellation of elective procedures among others. In some hospitals, units were repurposed to case management to control transmissions as well ensure the health security of staff and clients. However, there were differences in adherence to the COVID-19 protocols across public and private hospitals [5]. It is expected that the differences in organizational structures and administrative processes of providing health services will induce differences in adherences to the

^{*} Corresponding author.

E-mail addresses: maissah004@gmail.com (M.A. Issah), raatinga@ug.edu.gh (R.A. Atinga), abaku@ug.edu.gh (A.A. Baku).

<https://doi.org/10.1016/j.puhip.2023.100463>

Received 1 June 2023; Received in revised form 15 December 2023; Accepted 20 December 2023

Available online 27 December 2023

2666-5352/© 2023 The Authors. Published by Elsevier Ltd on behalf of The Royal Society for Public Health. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

protocols between public and private hospitals [6]. This is supported by Bedoya et al. [7] study which revealed differences in adherence levels between public and private hospitals and that adherence was low in public hospitals (58 %) compared to private hospitals (82 %) [5]. However, their study felt short of establishing the magnitude of the differences in adherence and what potentially accounted for that.

An empirical assessment of the differences in COVID-19 protocol adherence between public and private hospitals is crucial to inform policy direction on how hospitals can better respond to future pandemics. Only a handful of studies in Ghana have investigated how adherence to COVID-19 safety protocols differed between public and private health facilities. Previous studies have mainly focused on knowledge and attitude towards adherence, particularly relating to the individual and organizational factors influencing prevention chains of the pandemic [7], but there is little evidence if any of differences in adherence across ownership of health facilities.

Management of organizational systems creates the environment that enable or inhibits adherence to infection prevention protocols, and public and private sector managers have different attitudes, orientation, and commitments towards enforcing adherence to the COVID-19 protocols. Studies pertaining to how managers contain health risk in organizational settings show that employee performance is affected by adherence to safety protocols [8]. Hence it is crucial to examine the differences in adherence to the COVID-19 protocols between public and private health facilities because the operational structures and processes to ensure adherence differ. Accordingly, this study sought to determine the differences in adherence to the COVID-19 protocol between public and private hospitals as well as the barriers and associated factors of adherence in Ghana.

2. Methods

2.1. Research design and study setting

A case study approach drawing data between May and November 2021 to compare adherence to the COVID-19 protocols across one public and one private hospital that were used as COVID-19 treatment and management centres in Ghana’s capital city, Accra. During the height of the COVID-19 pandemic in Ghana, Accra recorded the highest cumulative cases of about 95,682 [9]. The total cases and deaths recorded in the country as of 30th November 2021 were 130,920 and 1,455, respectively, with public hospitals recording more cases and deaths than private hospitals in the country [9]. A public hospital in this context is one owned and controlled by the government while a private hospital is a self-financing for-profit hospital.

2.2. Sampling

There were 654 and 320 health workers in the public and private hospitals respectively. Target population of the two hospitals included non-clinical staff (administrative, security and records staff), clinical staff (midwives, nurses, physicians) and clients presenting for care. Management members, security personnel and the hospital-based COVID-19 response teams were sampled purposively. Opportunistic sampling was employed to select the clinical staff based on their availability and willingness to participate in the study. Newly hired staff with less than one year job tenure were excluded. In all 283 respondents participated in the study.

2.3. Instruments and data collection

There were 22 components of the data collection questionnaire that measured adherence, facilitators of adherence, internal COVID-19 policies, knowledge on adherence and staff training on adherence. The questionnaire contained 15 statements across the constructs. The questions were placed on a five-point Likert scale ranging from: 1 = strongly

agree to 5 = strongly disagree. The outcome variable (adherence to protocols) included wearing of face masks, availability of hand sanitizers, hand hygiene, observance of physical distancing, and temperature checking. The questionnaire also contained open ended statements asking respondents to indicate the barriers to adherence of the protocols. The questionnaire was largely administered electronically using google forms. To maximise security and ensure confidentiality of the data, each respondent was given password protected access to the questionnaire. To ensure quality of the data, we routinely downloaded the real-time questionnaire responses in excel format to check for accuracy and consistency of responses as well as data completeness.

2.4. Data analysis

Principal Component Analysis (CPA) with varimax rotation was performed to narrow the set of statements into more manageable distinct constructs. The analysis produced items clustering as follows: facilitators of adherence (7 items; Cronbach’s alpha = 0.76), internal COVID-19 policies (2 items; Cronbach’s alpha = 0.75), and overall adherence (6 items; Cronbach’s alpha of 0.76) (Table 1). We also estimated Logistic Regression model (LR) to determine the factors associated with adherence to the COVID-19 protocols in the study hospitals. Logistic regression was deemed appropriate because of the binary measures of the dependent variables. While logistic regression was chosen for its suitability in modelling binary effects, we recognize its limitations and assumptions. We thoroughly reviewed the study design, data collection methods, and analytical approach to comprehensively address potential bias. To determine the differences in adherence to the protocols between the public and private hospital, an independent sample *t*-test was computed. The effect size of the difference was determined using Cohen’s D, which is a measure of the difference between each group’s mean divided by the pooled standard deviation. The magnitude of the effect size include: small effect = 0.2, medium effect = 0.5 and large effect = 0.8. A larger Cohen’s D suggests a more substantial effect [10].

3. Results

3.1. Respondents’ characteristics

Table 2 shows respondents demographic characteristics. A total of 190 (67.1 %) and 93 (32.9 %) respondents were sampled from the public and private hospitals respectively. 107 (56.3 %) females in public hospitals and 63 [67.7 %] in private hospitals dominated the study. Nurses comprised the majority of respondents in public and private hospitals, representing 65.3 % and 58.1 %, respectively.

3.2. Logistic regression results of factors associated with adherence to the COVID-19 protocols in public and private hospitals

Results in Table 3 show that staff training on adherence in the public (OR = 2.08; 95 % CI = 0.59- 1.40) and private (OR = 1.44; 95 % C.I = 0.36 - 1.87) hospitals and knowledge on adherence in the public (OR = 3.12; CI = 0.96 - 1.79) and private (OR = 1.45; CI = 0.55 - 1.69)

Table 1
Cronbach Alpha coefficients and items produced in the PCA.

Variable	Cronbach’s Alpha	Cronbach’s Alpha Based on Standardized statements	Number of statements
Facilitators of Adherence	0.757	0.761	7
Overall adherence to protocols	0.756	0.760	6
Internal COVID-19 policies	0.751	0.755	2

Table 2
Respondents' demographic Characteristics.

Characteristics	Public hospital		Private hospital	
	Frequency	Percentage	Frequency	Percentage
Gender				
Male	83	43.7	30	32.3
Female	107	56.3	63	67.7
Age [years]				
18 – 29	83	43.7	56	60.2
30 – 39	74	38.9	35	37.6
40 – 49	25	13.2	2	2.2
50 – 59	8	4.2	0	0
Education				
Certificate	6	3.2	2	2.2
Diploma	97	51	11	11.8
Degree	65	34.2	70	75.3
Masters	21	11.1	10	10.8
PhD	1	0.5	0	
Staff category				
COVID-19 Response Team	1	0.5	1	1.1
Management Members	1	0.5	2	2.2
Midwives	43	22.6	23	24.7
Nurses	124	65.3	54	58.1
Physicians	9	4.7	6	6.5
Quality Assurance	5	2.6	3	3.2
Security Persons	7	3.7	4	4.3
Tenure [years]				
1 – 5	156	82.1	87	93.5
6 – 10	29	15.3	6	6.5
>10	5	2.6		

Note: SD = Standard Deviation.

hospitals were statistically significantly associated with the COVID-19 protocol adherence. Although not statistically significant, females in public (OR = 2.43; 95 % C.I = -0.09, 0.98) and private (OR = 2.05; 95 % CI = 0.67, 1.53) hospitals were about twice more likely to adhere to the protocols. Staff aged 30-39 in public hospitals (OR = 3.28; 95 % CI = 1.07, 3.21) were three times likely to adhere to the COVID-19 protocols compared to their counterparts in private hospitals (OR = 1.58; 95 % CI = 0.46, 1.07). Similarly, staff with at least a bachelors degree (OR = 2.36; 95 % CI = 1.48, 3.72) in the private hospital showed higher adherence compared to staff with similar qualification in the public

Table 3
Logistic Regression of Factors associated with adherence to the COVID-19 protocols.

Explanatory Variables	Public hospital			Private hospital		
	Coefficients	Odds Ratio	95 % CI	Coefficients	Odds Ratio	95 % CI
Age [years]						
18 – 29[ref]						
30 - 39	1.62	3.28	1.07 - 3.21	0.64	1.58	0.46 - 1.07
40 - 49	0.67	1.31	0.34 - 0.85	0.72	1.79	-0.07 - 1.53
50 -59	0.60	0.92	-0.23 - 0.54			
Gender						
Male[ref]						
Female	0.44	2.43	-0.09 - 0.98	0.13	2.05	0.67 - 1.53
Level of Education						
Certificate[ref]						
Diploma	0.32	0.67	0.28 - 1.56	1.07	1.53	0.38 - 0.91
Degree	0.72	1.29	0.41 - 2.041	0.75	2.36	1.48 - 3.72
Masters	-0.10	0.88	0.37 - 1.74	0.52	1.13	0.23 - 0.63
PhD	0.20	1.43	0.33 - 1.46			
Facility Related Factors						
COVID-19 Response Team[ref]						
Staff training on Adherence	0.99	2.08*	0.59 - 1.40	0.25**	1.44	0.36 - 1.87
Knowledge on adherence	1.37*	3.12	0.96 - 1.79	1.12	1.45*	0.55 - 1.69

Note: *p <0.01; **p<0.05.

hospital (OR = 1.29; 95 % CI = 0.41, 2.04).

3.3. Difference in adherence to the COVID-19 protocols between public and private facilities

From Table 4, all but the first 2 domains under adherence to protocols showed statistically significant variation of adherence to protocols between public and private hospitals (p < 0.001; p < 0.05). The effect sizes of the differences were generally high for temperature checks, observance of physical distancing and staff training on adherence. Overall, the means scores suggest that the public hospital had higher adherence to the COVID-19 protocols than the private hospital.

3.4. Barriers to adherence to COVID-19 protocols in the study hospitals

The qualitative results revealed that shortage of PPEs, financial barriers, and patient factors were critical factors that constrained adherence to the COVID-19 protocols in the hospitals studied.

3.4.1. Shortage of PPEs

The findings revealed that both hospitals frequently stocked out of PPEs especially the early wave of the pandemic. Some participants indicated that shortages of PPEs was a significant barriers to careful adherence of the protocols. As noted by this participant.

“Once a while we encounter shortages. But the shortages do not affect the COVID unit of the hospital, but other units experienced shortages once in a while. Mostly the quantity demanded are not always available” (Male, Public Hospital)

Shortfalls of PPE were largely the result of lack of funds to procure and stock sufficient quantities. This was critical during the first wave of the virus where cost of PPEs was high coupled with disruptions of the global health supply chain system.

“There were a whole lot of economic issues within the COVID-19 era, so there were shortages. Nose masks were so expensive because of the way they were being imported and there was no money to buy them. This made adherence to the protocols difficult” (Male, Private Hospital)

3.4.2. Patient factors

It was noted that some patients and visitors were reluctant in

Table 4
The difference in adherence to COVID-19 protocols by hospital type.

Variable	Public		Private		Difference	
	Mean	SD	Mean	SD	P <	Cohen's D
Adherence to Protocols						
Staff wear nose masks	1.91	.947	1.66	1.15	0.050	0.237
Patient wears nose mask	2.53	1.22	2.17	1.21	0.050	0.296
Physical distancing is observed	3.43	1.25	2.27	1.38	0.001	0.881
Temperature of staff is checked	3.22	1.26	1.99	1.15	0.001	1.019
Temperature of patients is checked	2.82	1.22	1.66	1.09	0.001	1.003
Temperature of visitors is checked	3.12	1.32	1.84	1.18	0.001	1.022
Facilitators of Adherence						
Knowledge of adherence to protocols	1.69	0.93	1.57	0.71	0.050	0.145
Strategies to optimize PPEs and adherence	1.91	0.97	1.82	0.83	0.050	0.099
Staff are trained on Adherence	2.21	1.08	1.88	1.13	0.011	1.299
COVID-19 response team is instituted	1.96	1.10	1.88	0.94	0.050	0.078
Discipline on adherence to the protocols	2.55	1.12	1.90	1.10	0.001	0.586
Sensitization on adherence to the protocols	2.42	1.09	2.05	0.91	0.001	0.369
Management commitment to adherence	2.19	1.10	1.94	1.17	0.050	0.220
Internal COVID-19 policies						
Safety protocols improve adherence	2.14	1.04	1.91	1.08	0.050	0.217
COVID policies influence staff adherence	1.90	0.94	1.76	0.87	0.050	0.155

Note: P < 0.001; P < 0.05.

adhering to the protocols when they visit the hospitals due to perception that the virus does not exist. They also held religious beliefs that God will protect them even if they do not adhere to the protocols. These misconceptions and/or beliefs were the major challenges faced by the hospitals in their attempt to enforce the safety protocols.

“Patient’s relatives make things difficult. It’s not being easy trying to get patients’ relatives to wear a mask when they visit the facility and also adhere to the other protocols. Because some of them believe the virus does not exist, and so it is difficult sometimes” (Female, Public Hospital)

“Some of the patients and visitors believe that there is no need for them to wear PPEs because they don’t believe in the virus. So we do have some challenges with them, and you will have to take your time to enlighten them about the COVID-19 and make sure he or she wears the mask” (Female, Private Hospital)

4. Discussion

The findings showed that contrary to earlier studies [11,12] sex, age and level of education, were not significantly associated with adherence to protocols. Similarly, the findings contradict prior studies that social characteristics such as education is associated with personal preventive procedures amid large outbreaks in Italy [13–15]. Staff training on the protocols emerged as a significant determinants of adherence to

COVID-19 protocols in the facilities. This agrees with previous research that health providers participation in controlling and preventing infections programs reported a higher level of compliance with the COVID-19 safety protocols [16,17].

Another significant determinant of adherence to protocols to the COVID-19 was staff knowledge of COVID-19 on mitigation approaches. A recent review by public health experts reported that higher levels of knowledge about the disease outbreak and safety protocol, poor public health information, and unclear guidelines significantly affected adherence to safety protocols [14]. In this study, as with previous others, staff with the requisite knowledge about COVID-19 and its safety protocols showed high adherence to the COVID-19 safety guidelines [14].

Compared to staff and patients in private hospitals, those in public hospitals showed commitment and were likely to wear nose masks, practice physical distancing, and perform temperature checks. The effect size of the difference was consistently large for all the domains under adherence to protocols except for staff and patients wearing nose masks. This result corroborates the research findings that staff and patients adhere to protocols in government hospitals than private hospitals [18]. However, a study conducted in Kenya to observe primary healthcare infection prevention and control practices showed that personal hygiene safety measures and protocol practices were higher in private health facilities than in public health facilities [5].

The differences in adherence to protocols stemmed from the commitment of management to ensure strict adherence to protocols instituted in the hospitals. At the time of the study management of the hospitals played vital roles in organizing programs to train staff on prevention infection and ensure strict adherence the COVID-19 to protocols. This study further revealed significant variations in adherence across the hospitals. Management in public hospitals were more likely to show commitment to ensure maximum adherence, strategize to optimize the use of PPEs, train staff on adherence, sensitize staff on protocols, and institute a COVID-19 response team to increase adherence to protocols than private hospitals. These variations may be because of the staff’s positive attitude towards adherence and commitment from management to ensure strict protocol adherence.

Moreover, the COVID-19 policies implemented by management of the hospitals influenced adherence in public and private hospitals. The mean scores demonstrate that management in public hospitals was more likely to enforce policies to guide and control adherence to COVID-19 protocols than private hospitals. However, the effect size of the difference for all the domains was consistently small.

It was noted that the unavailability of COVID-19 materials was a challenge faced by the hospitals. Participants expressed dissatisfaction about the shortages of PPEs and indicated how they put their lives at risk in the facilities. This finding echo earlier studies that the lack of PPEs jeopardizes frontline health workers lives and the effectiveness of necessary public health interventions [19]. A similar study noted the lack of quality PPEs as a severe concern for healthcare workers and hospital managers [16].

The study identified patient factors from the qualitative results as barriers to strict protocol adherence. This finding corroborates the results of research that myths and beliefs were obstacles to appropriate adherence to protocols. Barriers to adherence were further compounded by misconceptions that the pandemic is being exaggerated and that there was no need for social distancing to control the COVID-19 [20]. Misconceptions and conspiratorial beliefs had gained ground in people’s minds, which risk compromising efforts to fight the virus by promoting adequate adherence to the COVID-19 safety protocols. Therefore, stakeholders must endeavour to educate the general public about the virus. High cost of PPEs coupled with financial challenges weakened the capacity of the hospitals to procure adequate quantities of nose masks, gloves, handwashing facilities, hand sanitizers and related logistics for staff and client projection. This worked out to compromise adherence to the protocols [21].

5. Conclusion

The World Health Organization (WHO) outlined several COVID-19 protocols to limit or prevent the disease's transmission among populations in organizations and communities. Wearing of face masks, practicing hand hygiene, temperature checking, and physical distancing were implemented to mitigate transmission in hospitals. But the extent of adherence to these protocols in healthcare settings and whether adherence differed across public and private health facilities is poorly documented. This is one of the few studies comparing adherence to the COVID-19 protocols in public and private hospitals. The findings identified staff training on, and knowledge of, adherence as significant factors that influenced staff adherence to the COVID-19 protocols in the hospitals. Also, the findings revealed that staff of public hospitals were more adherent to protocols than their counterparts in private hospitals. This finding may result from public hospitals' commitment to, and government's support to public institutions fight against the pandemic. In the qualitative study, shortages of PPEs, patient related factors, and financial challenges were barriers to adherence of the protocols in the hospitals.

The findings underscore the need to develop targeted educational initiatives particularly addressing the misconceptions about the pandemic to promote adherence of the protocols among patients and the wider public. Private hospitals should be supported by government and philanthropic bodies to secure adequate stock of PPEs to ensure strong adherence to the protocols. Public hospitals, meanwhile, should be supported with the COVID-19 fund established by government to ensure an uninterrupted supply of PPEs to reduce the risk to frontline health workers, and enhance overall safety of healthcare facilities.

A limitation of this study is the small sample size of one public and one private hospital and the inability to draw a balanced sample across the hospitals. Further studies should consider an equal proportional sample to observe possible changes of results. Future research should consider investigating time trends and staff adherence across multiple time points during different waves of pandemics to determine possible variability of adherence.

Funding

No funding support was received for this study.

Ethical approval

The study received ethical approval from the Ghana Health Service Ethics Review Committee under the reference number GHS-ERC025/08/21.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The authors wish to extend appreciation to the management and staff of the hospitals for their participation in the study and providing valuable information.

References

- [1] Organization WH, COVID-19 Natural Immunity: Scientific Brief, World Health Organization, 2021, 10 May 2021.
- [2] A. Saglietto, F. D'Ascenzo, G.B. Zoccai, G.M. De Ferrari, COVID-19 in Europe: the Italian lesson, *Lancet* 395 (10230) (2020) 1110–1111.
- [3] E.K.J. Dzisi, O.A. Dei, Adherence to social distancing and wearing of masks within public transportation during the COVID-19 pandemic, *Transp. Res. Interdiscip. Perspect.* 7 (2020) 100191.
- [4] A. Pan, L. Liu, C. Wang, H. Guo, X. Hao, Q. Wang, et al., Association of public health interventions with the epidemiology of the COVID-19 outbreak in Wuhan, China, *JAMA* 323 (19) (2020) 1915–1923.
- [5] O.V. Ebrahimi, A. Hoffart, S.U. Johnson, Factors Associated with Adherence to Social Distancing Protocols and Hygienic Behavior during the Covid-19 Pandemic, 2020.
- [6] M. Abed Alah, S. Abdeen, N. Selim, D. Hamdani, E. Radwan, N. Sharaf, et al., Compliance and barriers to the use of infection prevention and control measures among health care workers during COVID-19 pandemic in Qatar: a national survey, *J. Nurs. Manag.* 29 (8) (2021) 2401–2411.
- [7] G. Bedoya, A. Dolinger, K. Rogo, N. Mwaura, F. Wafula, J. Coarasa, et al., Observations of infection prevention and control practices in primary health care, Kenya, *Bull. World Health Organ.* 95 (7) (2017) 503.
- [8] G. Huynh, T.T. Tran, T.N. Nguyen, L.A. Pham, COVID-19 vaccination intention among healthcare workers in Vietnam, *Asian Pac. J. Tropical Med.* 14 (4) (2021) 159–164.
- [9] N.K. Quakyi, N.A.A. Asante, Y.A. Nartey, Y. Bediako, N.A. Sam-Agudu, Ghana's COVID-19 response: the Black Star can do even better, *BMJ Glob. Health* 6 (3) (2021) e005569.
- [10] R. Likert, A technique for the measurement of attitudes, *Arch. Psychol.* 22 (140) (1932) 55–65.
- [11] C.R. Tittle, R.J. Hill, Attitude measurement and prediction of behavior: an evaluation of conditions and measurement techniques, *Sociometry* (1967) 199–213.
- [12] J. Cohen, *Statistical Power Analysis for the Behavioral Sciences*, Routledge, 2013.
- [13] L. Carlucci, I. D'Ambrosio, M. Balsamo, Demographic and attitudinal factors of adherence to quarantine guidelines during COVID-19: the Italian Model, *Front. Psychol.* 11 (2020) 2702.
- [14] R.F. Alves, C. Samorinha, J. Precioso, Knowledge, attitudes and preventive behaviors toward COVID-19: a study among higher education students in Portugal, *J. Heal Res* 35 (4) (2020) 318–328.
- [15] A. Bish, S. Michie, Demographic and attitudinal determinants of protective behaviours during a pandemic: a review, *Br. J. Health Psychol.* 15 (4) (2010) 797–824.
- [16] S.K. Brooks, R.K. Webster, L.E. Smith, L. Woodland, S. Wessely, N. Greenberg, et al., The psychological impact of quarantine and how to reduce it: rapid review of the evidence, *Lancet* 395 (2020) 912–920.
- [17] A.Z. Abideen, F.B. Mohamad, M.R. Hassan, Mitigation strategies to fight the COVID-19 pandemic—present, future and beyond, *J. Heal Res* 34 (6) (2020) 547–562.
- [18] S. Bajaria, R. Abdul, Preparedness of health facilities providing HIV services during COVID-19 pandemic and assessment of their compliance to COVID-19 prevention measures: findings from the Tanzania Service Provision Assessment (SPA) survey, *Pan Afr Med J* 37 (Suppl 1) (2020).
- [19] A. Upadhyaya, S. Koirala, R. Ressler, K. Upadhyaya, Factors affecting COVID-19 mortality: an exploratory study, *J. Heal Res* 36 (1) (2022) 166–175.
- [20] S. Souri, Z. Nejatifar, M. Amerzadeh, F. Hashemi, S. Rafiei, Risk assessment of exposure to COVID-19 virus: a cross-sectional study among health-care workers, *Int J Hum Rights Healthc* 16 (2022) 425–433.
- [21] K. Houghton, P. Meskell, H. Delaney, M. Smalle, C. Glenton, A. Booth, et al., Barriers and facilitators to healthcare workers' adherence with infection prevention and control (IPC) guidelines for respiratory infectious diseases: a rapid qualitative evidence synthesis, *Cochrane Database Syst. Rev.* (4) (2020).