COVID-19 pandemic: an assessment of risk perception and the implementation of precautionary measures in a group of primary care workers in Nigeria

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Keywords

COVID-19 • General Practice Clinic • Precautionary measures • Primary care worker • Risk perception

Summary

Introduction. *The world is currently faced with the challenge of the COVID-19 pandemic, with healthcare workers at high risk of contracting infection. This study assessed the risk perception of COVID-19 and practice of precautionary measures against its spread by primary care workers.*

Methods. *This was a descriptive cross-sectional study of primary care workers in the General Practice Clinic (GPC) of University of Benin Teaching Hospital (UBTH), Nigeria, sub-Saharan Africa. A pretested self-administered semi-structured questionnaire was employed to obtain data on Socio-demographic characteristics, Risk perception of COVID-19, and Practice of precautionary measures from the respondents. Obtained data were analysed using IBM SPSS Statistics version 22.0 (Chicago, IL, USA). Chi-square test, Ordinal regression analysis and logistic*

regression analysis were performed. A p-value of less than 0.05 was considered statistically significant. Ethical clearance was obtained from the Health Research Ethics Committee.

Results. *Most respondents (39.6%) had moderate risk perception of COVID-19. High risk perception was more frequent in females than males (27.8 vs 11.9%; Chi-square test; p-value = 0.001). Majority (76.0%) of the respondents had good practice of precautionary measures against COVID-19.*

Conclusions. *Most HCWs surveyed in this study had moderate-risk perception of COVID-19 and good practice of precautionary measures. It is recommended that formal training and retraining on Infection Prevention and Control (IPC) of infections, including COVID-19, should be regularly provided for all cadres of healthcare staff.*

Introduction

Like at various times in human history when different pandemics were experienced [1], the world is currently challenged with the COVID-19 pandemic which originated from China [2, 3] but spread to many other countries of the world, necessitating the World Health Organization (WHO) to respectively declare the disease a Public Health Emergency of International Concern (PHEIC) and a pandemic [4, 5]. Africa's first case was recorded in Egypt on the 14th of February 2020 [6], while Nigeria recorded her first case on the 27th of February 2020 [7]. Caused by a new strain of coronavirus called Severe Acute Respiratory Syndrome Corona Virus-type 2 (SARS-CoV-2), Coronavirus disease 2019 (COVID-19) is an acute respiratory and highly infectious disease that spreads through various modes, including person to person contact [2, 8], and with most infected individuals developing symptoms such as dry cough, sore throat, breathlessness, etc. [9].

COVID-19 has greatly affected individuals, families, health systems, and the governance and socio-economic state of many countries [10, 11]. Though healthcare workers have generally been exemplary frontline 'soldiers' in the global fight against the COVID-19 pandemic, not a few have died after contracting COVID-19 [12]. A report published on September 3, 2020 by Amnesty international

revealed that at least 7, 000 healthcare workers had died globally, after contracting COVID-19 [13]. In Nigeria, a report published on September 10, 2020, by WHO Africa region put the number of healthcare workers infected by COVID-19 in Nigeria at 2, 175 [14]. These unfortunate trends are not unconnected with the fact that healthcare workers are at high risk of contracting infection during pandemics [15-17]. A main source of contracting infection is usually from patients at the workplace where they come in contact with COVID-19 patients in the course of exercising their clinical duties [18]. This is usually due to poor provision of personal protective equipment, insufficient knowledge and training on Infection Prevention and Control (IPC) measures (with the resultant poor practice of precautionary measures), inability to effectively practice physical distancing in the workplace, shortage of healthcare workers (with the few available healthcare workers made to run more shifts, thus exposing them to the risk of infection), and non-disclosure by patients of their COVID-19 status [16-21]. Unfortunately, some of the infected healthcare workers may not be aware of their infective status, especially in situations where the COVID-19 screening tests are not made readily available to the healthcare workers. They may therefore unknowingly become sources of infection to their colleagues and their households.

In a nationwide linkage cohort study that assessed

the risk of COVID-19 infection amongst 158, 445 Scottish healthcare workers aged 18-65 years and 229, 905 household members, Shah and colleagues found that during the first three months of the first wave of the COVID-19 pandemic in Scotland, patient-facing healthcare workers were three times more likely to be admitted with COVID-19 than non-patient facing healthcare workers and that the risk of COVID-19 infection was doubled among household members of patient/front-facing healthcare workers [22]. The above observations and realities are likely to engender some trepidation amongst healthcare workers about their risk of becoming infected in the workplace [23]. This may also affect their practice behaviours. It is therefore important to assess their risk perception and practice of precautionary measures against the spread of COVID-19. Aim: this study sought to assess the risk perception of COVID-19 and practice of precautionary measures against the spread of COVID-19 by healthcare workers working in the primary care clinic (General Practice Clinic) of a tertiary hospital in Nigeria. This study was conducted with the hope of having a better understanding of the healthcare workers' risk perception and practice behaviours and making recommendations to improve hospital policy on infection prevention and control, safety measures and practice behaviours, as well as policies to protect the health workforce and control the rate of transmission to households and communities.

Methods

This was a descriptive cross-sectional study of healthcare workers in the General Practice Clinic (GPC) of a tertiary hospital in Nigeria, the University of Benin Teaching Hospital (UBTH). The study was conducted over a three-week period in the month of June, 2020, during the first wave of the COVID-19 pandemic. The General Practice Clinic is a primary care clinic and one of the hospital's entry points through which patients make first contact with primary care physicians (such as Family physicians) and other health professionals for their healthcare needs. The healthcare workers surveyed in this study were Medical doctors, Nurses, Pharmacists, Medical Laboratory Scientists, and other allied health professionals and health workers. A pretested self-administered semi-structured questionnaire, which took about 5 minutes to complete, was employed to obtain data from the respondents. The questionnaire was divided into the following parts: Socio-demographic characteristics, Risk perception of COVID-19, and Practice of precautionary measures against the spread of COVID-19. The question: 'How will you assess your risk of contracting COVID-19 in your workplace?', was used to assess risk perception. The respondents were requested to reply 'low', 'moderate', 'high' or 'not sure', to the question. 17 yes or no questions were used to assess the respondents' practice of precautionary measures, with each correct response scored "1" and each wrong response scored "0". The scores ranged from

0 to 17, with the respondents' practice of precautionary measures against the spread of COVID-19 classified as poor (≤ 9) or good (≥ 10).

All the obtained data were checked for completeness and were coded, grouped and analysed using IBM SPSS Statistics version 22.0 (Chicago, IL, USA). Descriptive statistics was used to obtain frequencies and percentages of the categorical variables (such as gender and marital status) of the respondents, while mean and standard deviation was used to present continuous variables. Chi-square test was used to determine association between categorical variables and risk perception and practice. Ordinal regression analyses and logistic regression analyses were performed to identify the factors predictive of risk perception and practice of precautionary measures against COVID-19 infection. A p-value of less than 0.05 was considered statistically significant. Ethical clearance was obtained from UBTH Health Research Ethics Committee. Informed written and voluntary consent was obtained before recruiting any participant. The purpose, procedure, and benefits of the study were explained to the participants. They were informed that the study had no attendant adverse effects or risks. To ensure confidentiality, the questionnaires were given coded means of identification, while the participants' names were not used during the research.

Results

SOCIODEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Out of a total of 115 healthcare workers in the General Practice Clinic of University of Benin Teaching Hospital (UBTH), 96 gave consent to participate in the study. Respondents aged 25 years and below were the least represented age group, 11 (11.5%). Most of the respondents had practiced in UBTH for 10 years and below (77.1%) and had tertiary education (Tab. I).

RISK AWARENESS AND ATTITUDE TOWARDS COVID-19

All the respondents were aware of COVID-19 and their risk of infection. Majority of the respondents (60.4%) agreed that necessary preventive and protective measures against COVID-19 had been put in place in their work place. Less than half (43.8%) of the health workers felt safe and secure at their workplace, 38.5% said they did not feel safe and secure, while 17.7% were not sure if they were safe and secure at their workplace. Only 26.0% felt like stopping work for fear of contracting COVID-19, even though sixty-three (65.6%) of the healthcare workers (HCWs) agreed that they were afraid of contracting COVID-19, while 28.1% were not afraid, and 6.3% were not sure. Only about a third (32.3%) of the respondents reported that they had received training on infection prevention and control against COVID-19. Majority of the respondents (85.4%) believed that use of personal protective equipment (PPE) can reduce the

Tab. I. Sociodemographic characteristics of respondents.

Sociodemographic characteristics	Frequency, n = 96	Percentage (100%)
Age (years)		
≤ 25	11	11.5
26-35	25	26.0
36-45	36	37.5
> 45	24	25.0
Gender		
Female	54	56.2
Male	42	43.8
Marital status		
Married	67	69.8
Single	28	29.2
Widowed	1	1.0
Religion		
Christianity	95	99.0
Traditional religion	1	1.0
Occupation		
Medical doctor	31	32.3
Administrative staff	15	15.6
Nurse	13	13.6
Pharmacist	10	10.4
Medical Laboratory scientist	10	10.4
Technician	9	9.4
Others	8	8.3
Level of education		
Tertiary	83	86.5
Secondary	12	12.5
Primary	1	1.0
Length of practice (years)		
≤ 10	74	77.1
> 10	22	22.9

Others: CHEW, health attendants, dieticians and drivers.

risk of contracting COVID-19, while 7.3% didn't and 7.3% were not sure. While 69 (71.9%) respondents used PPE at work, 27 (28.1%) did not. Most of the healthcare workers (77.1%) in this study reported that there had been COVID-19 cases in their places of work, while 12.5% were not sure. A total of 17 (17.7%) had contact with a confirmed COVID-19 case as at the time of this study, while 54 (56.3%) had no contact and 25 (26.0%) were not sure. More respondents however had contact with suspected cases of COVID-19 at the time of this study (29.1%), and 54.2% had no contact with a suspected case, while 16.6% were not sure. After contact with confirmed or suspected cases, 14.6% of respondents continued with their routine work, while 12.5% went on isolation after informing the hospital management. Only 8 (8.3%) reported that they had been infected by the virus, while 9 (9.4%) were not sure. 17 (18%) respondents had been screened for COVID-19. Of these, 7.3% were screened because they had contact with a COVID-19 patient and as part of a routine screening respectively, while 2.1, 1.0 and 1.0% were screened because they had contact with a secondary contact, with a COVID-19 positive colleague and with contaminated fluids, respectively. Only 5 (5.2%) respondents had been isolated for COVID-19.

RESPONDENTS' RISK PERCEPTION OF COVID-19

Respondents were asked to assess their perceived risk of contracting COVID-19. More of the respondents had moderate risk perception (39.6%), followed by low (29.2%) and high (20.8%). About a tenth (10.4%) of the respondents however were not sure of their risk perception. Significantly more females had high risk perception (27.8%) compared to males (11.9%) (p = 0.001). There was no significant association between age, occupation, marital status, level of education and length in practice and risk perception (Tab. II).

FACTORS ASSOCIATED WITH RESPONDENTS' RISK PERCEPTION OF COVID-19

Ordinal regression analysis (Tab. III) revealed that 'other' staff had significantly lower odds of having high risk perception compared to all other category of staff, with pharmacists having an odds ratio of 5.366 (95% CI: 1.776-6.450). Training on infection prevention and control against COVID-19 was significantly associated with reduced odds of high-risk perception (OR: -2.162; 95% CI: -3.203 - -1.120).

RESPONDENTS' PRACTICE OF PRECAUTIONARY MEASURES AGAINST COVID-19

With respect to the practice of precautionary measures against COVID-19 by respondents, most of them agreed that regular hand washing with soap and water (96.9%), use of alcohol-based hand sanitizer (88.5%), and physical distancing (61.5%) were practiced in their workplace. Regular disinfection of surfaces and fumigation were practiced in 58.3 and 55.2% of work places respectively. Majority, 52 (54.2%) always follow recommendations from health authorities on prevention of COVID-19, while 29 (30.2%) often followed recommendations. Nine (9.4%) sometimes, 4 (4.2%) rarely and 2 (2.1%) did not follow recommendations. The commonly practiced precautionary measures by the respondents include avoiding the touching of eyes, nose and mouth with unwashed hands (86.5%), washing hands regularly with soap and water for 20 seconds (85.4%), wearing face mask in public (81.3%) and use of alcohol-based hand sanitizer (80.2%). Over a quarter (27.1%) took vitamin supplements and only 3 (3.1%) reported using herbal and traditional medicines.

The average score for practice of precautionary measures against COVID-19 was 11.3 ± 2.4. Doctors (93.5%), pharmacists (90.0%) and medical laboratory scientists (90.0%) had significantly higher proportion of good practice of precautionary measures compared to other occupations (p = 0.040). A significant difference was also seen between length of practice in current workplace and practice of precautionary measures against COVID-19 (p = 0.007). Respondents who had practiced 10years or less had the highest proportion of good practice of precautionary measures (45.5%).

Analysis with binary logistic regression showed that occupation and length of practice were significant predictors of precautionary practice behaviour (p = 0.040 and 0.014 respectively) (Tab. IV).

Tab. II. Distribution of respondents' risk perception of COVID-19 by sociodemographic characteristics.

Sociodemographic characteristics	Risk perception categories				Test statistic /p-value
	Low n = 28 (29.2%)	Moderate n = 38 (39.6%)	High n = 20 (20.8%)	Not sure n = 10 (10.4%)	
Age (years) ≤ 25 26-35 36-45 > 45	4 (36.4) 6 (24.0) 13 (36.1) 5 (20.8)	4 (36.4) 8 (32.0) 16 (44.0) 10 (41.7)	2 (18.2) 9 (36.0) 4 (11.1) 5 (20.8)	1 (9.1) 2 (8.0) 3 (8.3) 4 (16.7)	Fisher's exact = 786 P = 0.548
Gender Female Male	11 (20.4) 17 (40.5)	18 (33.3) 20 (47.6)	15 (27.8) 5 (11.9)	10 (18.5) 0 (0.0)	Fisher's exact = 15.127 P = 0.001*
Marital status Married Single Widowed	17 (25.4) 10 (35.7) 1 (100.0)	18 (41.8) 10 (35.7) 0 (0.0)	14 (20.9) 6 (21.4) 0 (0.0)	8 (11.9) 2 (7.1) 0 (0.0)	Fisher's exact = 3.801 P = 0.750
Occupation Medical doctor Administrative staff Nurse Pharmacist Medical Laboratory scientist Technician Others	10 (32.3) 4 (26.7) 2 (15.4) 0 (0.0) 3 (30.0) 3 (33.3) 6 (75.0)	15 (48.4) 6 (40.0) 4 (30.8) 4 (40.0) 4 (40.0) 4 (44.4) 1 (12.5)	4 (12.9) 3 (20.0) 5 (38.5) 5 (50.0) 2 (20.0) 1 (11.1) 0 (0.0)	2 (6.5) 2 (13.3) 2 (15.4) 1 (10.0) 1 (11.1) 1 (11.1) 1 (12.5)	Fisher's exact = 20.919 P = 0.198
Level of education Tertiary Secondary Primary	23 (27.7) 4 (33.3) 1 (100.0)	35 (42.2) 3 (25.0) 0 (0.0)	17 (20.5) 3 (25.0) 0 (0.0)	8 (9.6) 2 (16.7) 0 (0.0)	Fisher's exact = 3.948 P = 0.613
Length of practice (years) ≤ 10 > 10	22 (29.7) 6 (27.3)	32 (43.2) 6 (27.3)	15 (20.3) 5 (22.7)	5 (6.8) 5 (22.7)	Fisher's exact = 5.329 P = 0.149

Others: CHEW, health attendants, dieticians and drivers; * Statistically significant.

Tab. III. Regression analysis for factors associated with risk perception of COVID-19.

	Risk perception	
	OR (95% CI)	P-value
Age (years) ≤ 25 26-35 36-45 > 45	-0.735 (-2.653-1.183) 0.611 (-0.767-1.989) -0.292 (-1.462-0.878) Ref	0.453 0.385 0.625
Gender Male Female	-0.143 (-1.006-0.720) Ref	0.745
Occupation Medical doctor Nurse Pharmacist Medical Laboratory scientist Technician Administrative staff Others	3.380 (0.401-4.369) 3.221 (1.447-6.136) 5.366 (1.776-6.450) 2.462 (0.287-4.564) 2.928 (0.246-4.399) 3.530 (0.216-4.061) Ref	0.018* 0.002* 0.001* 0.026* 0.028* 0.029*
Level of education Primary Secondary Tertiary	2.942 (-1.440-7.323) 0.979 (-0.467-2.426) Ref	0.188 0.185
Length of practice (years) ≤ 10 > 10	-0.91 (-0.312-2.776) Ref	0.118 0.057
Training on infection prevention and control Yes No	-2.162 (-3.203 - -1.120) Ref	0.000*
Constant **Adjusted R²** **P-value** **Standard error of estimate**	56.755 0.483 (48.3%) 0.000* 7.154	

Others: CHEW, health attendants, dieticians and drivers; OR: Odds ratio; CI: Confidence interval; * Statistically significant.

Tab. IV. Distribution of respondents' practice of precautionary measures against COVID-19 by their socio-demographic characteristics.

Variables	Practice of precautionary measures[a]		Test statistic /p-value	OR (95% CI)	P-value
	Good n = 73 (76.0%)	Poor n = 23 (24.0%)			
Age (years)					
≤ 25	7 (63.6)	4 (36.4)	Fisher's exact = 3.353 P = 0.340	0.664 (0.293-1.503)	0.325
26-35	20 (80.0)	5 (20.0)			
36-45	30 (83.3)	6 (16.7)			
> 45	16 (66.7)	8 (33.3)			
Gender					
Female	40 (74.1)	14 (25.9)	χ^2 = 0.262 P = 0.609	1.244 (0.484-4.946)	0.721
Male	33 (78.6)	9 (21.4)			
Marital status					
Married	52 (77.6)	15 (22.4)	Fisher's exact = 0.733 P = 0.697	0.738 (0.193-2.094)	0.658
Single	20 (71.4)	8 (28.6)			
Widowed	1 (100.0)	0 (0.0)			
Occupation					
Medical doctor	29 (93.5)	2 (6.5)	Fisher's exact = 17.174 P = 0.040*	1.394 (1.015-1.915)	0.040*
Administrative staff	10 (66.7)	5 (33.3)			
Nurse	8 (61.5)	5 (38.5)			
Pharmacist	9 (90.0)	1 (10.0)			
Medical Laboratory scientist	9 (90.0)	1 (10.0)			
Technician	4 (44.4)	5 (55.6)			
Others	4 (50.0)	4 (50.0)			
Level of education					
Tertiary	65 (78.3)	18 (21.7)	Fisher's exact = 3.988 P = 0.160	1.699 (0.393-7.399)	0.478
Secondary	8 (66.7)	4 (33.3)			
Primary	0 (0.0)	1 (100.0)			
Length of practice (years)					
≤ 10	61 (82.4)	13 (17.6)	χ^2 = 7.239 P = 0.007*	7.081 (1.496-33.519)	0.014*
> 10	12 (54.5)	10 (45.5)			

[a] Total score ranged from 0 to 17. A score of ≤ 9 was set for poor and ≥ 10 set for good practice of precautionary measures against COVID-19; Others: CHEW, health attendants, dieticians and drivers; OR: Odds Ratio; CI: Confidence Interval; * Statistically significant.

Tab. V. Further predictors of respondents' practice of precautionary measures against COVID-19.

Respondents' characteristics	OR	95% CI	P-value
Chronic medical condition	0.520	0.097-2.785	0.445
Training on infection prevention and control against COVID-19	1.814	0.445-7.389	0.407
Risk perception of COVID-19	1.797	0.785-2.601	0.108
Perceived susceptibility to COVID-19	0.656	0.330-1.306	0.230
Constant Adjusted R² P-value Standard error of estimate	28.524 0.411 (41.1%) 0.000* 8.372		

OR: Odds Ratio; CI: Confidence Interval; * Statistically significant.

Further analysis as shown in Table V showed that risk perception of COVID-19, training on infection prevention and control against COVID-19, and having a chronic medical condition were not significant predictors of practice of precautionary measures.

Discussion

This study was conducted during the first wave of the COVID-19 pandemic and was aimed at assessing the risk perception and practice of precautionary measures against COVID-19 by health care workers (HCWs) in the primary care clinic (General Practice Clinic) of a tertiary hospital in Nigeria, the University of Benin Teaching Hospital (UBTH). Concerning the respondents' risk perception of COVID-19, this study found that only about 20% of the respondents stated they had high risk, while majority stated they had moderate risk. This differs from findings among the general Ghanaian population where majority of the participants had a high-risk perception towards COVID-19 [24]. However, a study in Portugal comparing the risk perception of COVID-19 among HCWs and the general population found more HCWs (54.9%) believed they were at higher risk compared to the general population (24.0%) and it was opined that this was due to their close contact with suspected or confirmed cases of COVID-19 [25]. In the present study, only a minority had

contact with suspected or confirmed cases of COVID-19 and only twenty six percent (26%) felt like stopping work due to fear of being infected. This may explain why most of the respondents had moderate risk perception of COVID-19. Significantly more females in this study had high risk perception of COVID-19 compared to males. This is particularly interesting in the light of study findings that indicate that males have higher risk of severity and mortality from COVID-19 compared to females [26]. Younger age groups have been associated with lower risk perceptions compared to older age groups [26, 27]. This is expected as the risk of infection, severity and mortality from COVID-19 increases with age [26, 28]. This study however found that those with the least proportion of low-risk perception of COVID-19 were respondents over 45 years of age, even though a good number of them were not sure of their self-perceived risk.

A study on staff risk stratification in UBTH found that core clinical staff such as doctors and nurses made up over 75% of workers in the high-risk category [29]. In the present study however, pharmacists had the highest odds of having high risk perception (OR: 5.4; 95% CI = 1.776-6.450). Risk perception of infectious diseases has been found to correlate positively with practice of preventive health measures, especially during outbreaks [30]. This was seen in the present study as higher risk perception of the HCWs improved precautionary measure score by an odd of 1.8 (95% CI: 0.79-2.60). This was however not statistically significant (p = 0.108).

This study showed that majority of the HCWs had good practice of precautionary measures against COVID-19 (76.0%), similar to findings on Coronavirus in Uganda [31], and in Saudi Arabia [32], as well as findings in Guinea on Ebola virus [33]. The practice of preventive measures against COVID-19 differed significantly across respondents' occupation and length of practice in their current work place (p = 0.040 and 0.014 respectively). Worthy of note is that a higher percentage of respondents who worked fewer years had good practice compared to those who worked greater than 10years. This may be because more of the studied HCWs who have worked longer had poor COVID-19 knowledge. A study in Italy associated positive attitude to and practice of disinfection procedures with lower number of years of service among Nurses [34]. Over 25% of HCWs in the present study reported that they did not use personal protective equipment (PPE) at work. This is alarming as PPEs have been found to curb the spread of the disease [35]. However, this finding may be due to lack of sufficient PPEs for use by the healthcare workers, as well as the fact that only about 32.3% of the studied HCWs reported that they had training on infection prevention and control. The vast majority of respondents followed the WHO recommendation on use of facemask, hand washing, and use of alcohol-based hand sanitizer. However, fewer respondents covered their mouths when they coughed or sneezed and practiced social distancing. The practice of social distancing amongst HCWs in a health care setting may be challenging, as they are constantly in close contact with patients and other health workers in their line of duty.

Limitations

This study had some limitations, the first being that the study design used was cross-sectional and therefore causality cannot be deduced as the data were collected at one point in time. Secondly, only HCWs in the General Practice Clinic of University of Benin Teaching Hospital were surveyed, and therefore the results of this study may not be generalizable. However, the perspectives and data obtained from this study can be leveraged upon to conduct further studies and empanel policies and programmes to protect healthcare workers and guarantee workplace safety.

Recommendations

It is recommended that there should be regular and sustained supplies of personal protective equipment (PPEs) in every health facility, with healthcare staff regularly provided with the PPEs, to limit the spread of COVID-19. Furthermore, appropriate workplace safety policies and COVID-19 IPC protocols/guidelines should be put in place in every health facility, with medical doctors and other healthcare staff adequately compensated with encouraging welfare, remuneration, and insurance packages to motivate them to continuously discharge their clinical duties during the COVID-19 pandemic. It is advocated that more studies, preferably multi-centre studies, be conducted to address some of the study limitations.

Conclusions

Most of the healthcare workers (HCWs) surveyed in this study had moderate-risk perception of COVID-19 and good practice of precautionary measures. It is recommended that formal training and retraining on Infection Prevention and Control (IPC) of infections, including COVID-19, should be regularly provided for all cadres of healthcare staff to increase their knowledge and practice of precautionary measures, as well as reduce their risk of infection.

Acknowledgements

Conflict of interest statement

The authors declare no conflict of interest.

Authors' contributions

OE did the conception, design, literature search, manuscript drafting, review, editing, and preparation for intellectual content.
MA did the definition of intellectual content, literature search, and data collection.

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References

[1] LIVESCIENCE. 20 of the worst epidemics and pandemics in history. Available from: https://www.livescience.com/worst-epidemics-and-pandemics-in-history.html (Accessed on: September 16, 2020).

[2] World Health Organization. Q&A on Coronaviruses (COVID-19). Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/q-a-coronaviruses (Accessed on: September 17, 2020).

[3] World Health Organization. WHO Timeline-COVID-19. Available from: https://www.who.int/news-room/detail/27-04-2020-who-timeline---covid-19 (Accessed on: September 18, 2020).

[4] Emergency of International Concern (PHEIC) Global research and innovation forum. Available from: https://www.who.int/publications/m/item/covid-19-public-health-emergency-of-international-concern-(pheic)-global-research-and-innovation-forum (Accessed on: September 19, 2020).

[5] World Health Organization. WHO Director-General's opening remarks at the media briefing on COVID-19-11 March, 2020. Available from: https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020 (Accessed on: September 20, 2020).

[6] Nkengasong JN, Mankoula W. Looming threat of COVID-19 infection in Africa: act collectively, and fast. Lancet 2020;395:841-42. https://doi.org/10.1016/S0140-6736(20)30464-5

[7] Nigeria Centre for Disease Control.First case of CORONAVIRUS DISEASE (COVID-19) confirmed in Nigeria. Available from: https://ncdc.gov.ng/news/227/first-case-of-corona-virus-disease-confirmed-in-nigeria (Accessed on: September 20, 2020).

[8] Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, Ren R, Leung KSM, Lau EHY, Wong JY, Xing X, Xiang N, Wu Y, Li C, Chen Q, Li D, Liu T, Zhao J, Liu M, Tu W, Chen C, Jin L, Yang R, Wang Q, Zhou S, Wang R, Liu H, Luo Y, Liu Y, Shao G, Li H, Tao Z, Yang Y, Deng Z, Liu B, Ma Z, Zhang Y, Shi G, Lam TTY, Wu JT, Gao GF, Cowling BJ, Yang B, Leung GM, Feng Z. Early transmission dynamics in Wuhan, China, of novel coronavirus-Infected Pneumonia. N Engl J Med 2020;382:1199-207. https://doi.org/10.1056/NEJMoa2001316

[9] Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, Li WT, Li Y. Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. Int J Biol Sci 2020;16:1745-52. https://doi.org/10.7150/ijbs.45221

[10] Enabulele O. COVID-19 in Africa. Presented at the Virtual Annual General and Scientific Conference (Webinar-6) of the Indian Medical Association, Tamilnadu State Branch College of General Practitioners. Tamilnadu, India: 2020.

[11] Enabulele O. The COVID-19 situation in the Commonwealth and the role of the Commonwealth Medical Association. Presented at the Virtual 60th Annual General Meeting (Webinar) of the Malaysian Medical Association. Malaysia: 2020.

[12] Enabulele O. The Commonwealth Health Workforce and COVID-19 Pandemic. An opening address presented by the President of the Commonwealth Medical Association (CMA) at the 2nd COVID-19 virtual conference (webinar) organized by the Commonwealth Medical Association. 2020.

[13] Amnesty International. Global: amnesty analysis reveals over 7,000 health workers have died from COVID-19. Cited September 03, 2020. Available from: https://www.amnesty.org/en/latest/news/2020/09/amnesty-analysis-7000-health-workers-have-died-from-covid19 (Accessed on: January 4, 2021).

[14] WHO Africa. Combatting health infections in Nigeria. Cited September 10, 2020. Available from: https://www.afro.who.int/news/combatting-health-worker-infections-nigeria (Accessed on: January 04, 2021).

[15] Chou R, Dana T, Buckley DI, Selph S, Fu R, Totten AM. Epidemiology of and risk factors for coronavirus infection in health care workers: a living rapid review. Ann Intern Med 2020;173:120-36. https://doi.org/10.7326/M20-1632

[16] European Centre for Disease Prevention and Control. COVID-19 clusters and outbreaks in occupational settings in the EU/EEA and the UK. 2020. Available from: https://www.ecdc.europa.eu/en/publications-data/covid-19-clusters-and-outbreaks-occupational-settings-eueea-and-uk (Accessed on: January 6, 2021).

[17] Sattar N, Welsh P, Pell JP, Katikireddi SV, Demou E. Occupation and risk of severe COVID-19: prospective cohort study of 120 075 UK Biobank participants. Occup Environ Med 2020;78:307-14. https://doi.org/10.1136/oemed-2020-106731

[18] Nguyen LH, Drew DA, Graham MS, Joshi AD, Guo CG, Ma W, Mehta RS, Warner ET, Sikavi DR, Lo CH, Kwon S, Song M, Mucci LA, Stampfer MJ, Willett WC, Eliassen AH, Hart JE, Chavarro JE, Rich-Edwards JW, Davies R, Capdevila J, Lee KA, Lochlainn MN, Varsavsky T, Sudre CH, Cardoso MJ, Wolf J, Spector TD, Ourselin S, Steves CJ, Chan AT; COronavirus Pandemic Epidemiology Consortium. Risk of COVID-19 among front-line health-care workers and the general community: a prospective cohort study. The Lancet Public Health 2020;5:E475-83. https://doi.org/10.1016/S2468-2667(20)30164-X

[19] Burki T. Global shortage of personal protective equipment. Lancet Infect Dis 2020;20:785-6. https://doi.org/10.1016/S1473-3099(20)30501-6

[20] Kua J, Patel R, Nurmi E, Tian S, Gill H, Wong DJN, Moorley C, Nepogodiev D, Ahmad I, El-Boghdadly K. Healthcare COVID: a national cross-sectional observational study identifying risk factors for developing suspected or confirmed COVID-19 in UK healthcare workers. Peer J 2021;9:e10891. https://doi.org/10.7717/peerj.10891

[21] Zhang Z, Liu S, Xiang M, Li S, Zhao D, Huang C, Chen S. Protecting healthcare personnel from 2019-nCoV infection risks: lessons and suggestions. Front Med 2020; 14:229-31. https://doi.org/10.1007/s11684-020-0765-x

[22] A Shah ASV, Wood R, Gribben C, Caldwell D, Bishop J, Weir A, Kennedy S, Reid M, Smith-Palmer A, Goldberg D, McMenamin J, Fischbacher C, Robertson C, Hutchinson S, McKeigue P, Colhoun H, McAllister D. Risk of hospital admission with coronavirus disease 2019 in healthcare workers and their households: nationwide linkage cohort study. BMJ 2020;371:m3582. https://doi.org/https://doi.org/10.1136/bmj.m3582

[23] Liu Q, Luo D, Haase JE, Guo Q, Wang XQ, Liu S, Xia L, Liu Z, Yang J, Yang BX. The experiences of health-care providers during the COVID-19 crisis in China: a qualitative study. Lancet Glob Health 2020;8:e790-8. https://doi.org/10.1016/S2214-109X(20)30204-7

[24] Serwaa D, Lamptey E, Appiah AB, Senkyire EK, Ameyaw JK. Knowledge, risk perception and preparedness towards coronavirus disease-2019 (COVID-19) outbreak among Ghanaians: a quick online cross-sectional survey. Pan Afr Med J 2020;35:44. https://doi.org/10.11604/pamj.supp.2020.35.2.22630

[25] Peres D, Monteiro J, Almeida MA, Ladeira R. Risk perception of COVID-19 among Portuguese healthcare professionals and the general population. J Hosp Infect 2020;105:434-7. https://doi.org/10.1016/j.jhin.2020.05.038

[26] Jin JM, Bai P, He W, Wu F, Liu XF, Han DM, Liu S, Yang JK. Gender differences in patients with COVID-19: focus on severity and mortality. Front Public Health 2020;8:152. https://doi.org/10.3389/fpubh.2020.00152

[27] Oyeyemi O, Oladoyin V, Okunlola O, Mosobalaje A, Oyeyemi I, Adebimpe W, Nwuba R, Anuoluwa I, Tiamiyu A, Ovuakporie-uvo O, Adesina I, Olatunji B, Kone J, Oluwafemi Y, Obajaja C, Ajiboye A. COVID-19 pandemic: Nigerians' knowledge, perception and adherence to preventive measures. Research Square 2020. https://doi.org/10.21203/rs.3.rs-49707/v1

[28] Onder G, Rezza G, Brusaferro S. Case-fatality rate and characteristics of patients dying in relation to COVID-19 in Italy. JAMA 2020;323:1775-6. https://doi.org/10.1001/jama.2020.4683

[29] Obaseki DE, Akoria OA, Mokogwu N, Omuemu CE, Okwara BU, Ogboghodo EO. Staff risks stratification in preparation for COVID-19 in a tertiary healthcare facility in Nigeria. Pan Afr Med J 2020;35:124. https://doi.org/10.11604/pamj.supp.2020.35.2.25095

[30] Dryhurst S, Schneider CR, Kerr J, Freeman ALJ, Recchia G, van der Bles AM, Spiegelhalter D, van der Linden S. Risk perceptions of COVID-19 around the world. Journal of Risk Research 2020;23:994-1006. https://doi.org/https://doi.org/10.1080/13669877.2020.1758193

[31] Olum R, Chekwech G, Wekha G, Nassozi DR, Bongomin F. Coronavirus Disease-2019: knowledge, attitude, and practices of health care workers at Makerere University Teaching Hospitals, Uganda. Front Public Health 2020;8:181. https://doi.org/10.3389/fpubh.2020.00181

[32] Alfahan A, Alhabib S, Abdulmajeed I, Rahman S, Bamuhair S. In the era of corona virus: health care professionals' knowledge, attitudes, and practice of hand hygiene in Saudi primary care centers: a cross-sectional study. J Community Hosp Intern Med Perspect 2016;6:32151. https://doi.org/https://doi.org/10.3402/jchimp.v6.32151

[33] Raab M, Pfadenhauer LM, Millimouno TJ, Hoelscher M, Froeschl G. Knowledge, attitudes and practices towards viral haemorrhagic fevers amongst healthcare workers in urban and rural public healthcare facilities in the N'zérékoré prefecture, Guinea: a cross-sectional study. BMC Public Health 2020;20:296. https://doi.org/https://doi.org/10.1186/s12889-020-8433-2

[34] Sessa A, Di Giuseppe G, Albano L, Angelillo IF. An investigation of nurses' knowledge, attitudes, and practices regarding disinfection procedures in Italy. BMC Infect Dis 2011;11:148. https://doi.org/https://doi.org/10.1186/1471-2334-11-148.

[35] Chu DK, Aki EA, Duda S, Solo K, Yaacoub S, Schünemann HJ. Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. Lancet 2020;395:1973-87. https://doi.org/https://doi.org/10.1016/S0140-6736(20)31142-9

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