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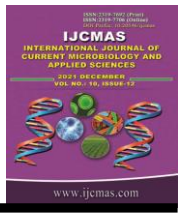

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Covid-19 Vaccine Hesitancy among Healthcare Workers: The Case of Pharmacy Staff of the Korle Bu Teaching Hospital

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A B S T R A C T

There is evidence that vaccine hesitancy is present among health care workers although various studies on covid-19 vaccination prioritizations conclude that health workers should be prioritized because they are first hand responders. This cross-sectional study audited vaccination status among different categories of pharmacy staff in the largest teaching hospital in Ghana. Vaccination status among staff was ascertained using national vaccination cards after immunization with two doses of Covishield vaccine. A total of 240 workers, representing about 96% of pharmacy staff were captured. It was found that 66% of staff had received two doses and almost 80% had received at least one dose of the Covishield vaccine. Although males were more likely to vaccinate compared to females, this was not significant (OR=1.64, 95% CI 0.91 to 2.99; p=0.104). Independent odds ratios confirmed that compared to dispensing assistants, pharmacist were almost four times as likely to vaccinate (OR=3.89, 95% CI 1.72 to 8.76; p=0.001). It was also found that for logistics purposes 151 doses of the Covishield vaccine would be needed for complete vaccination of all pharmacy staff. To improve coverage, more information on the importance of vaccination against COVID-19 should be targeted towards lower level health care workers.

Introduction

Coronavirus Disease 2019 (COVID-19), formerly known as 2019-nCov is a pandemic caused by a novel human coronavirus (SARS-COV-2), Zhu *et al.*, (2019). Persons of all ages are infected by SARS-CoV-2 and spreads through infected individuals' respiratory droplets. The disease is zoonotic. Older adults and people with underlying chronic illnesses comorbidities, on the other hand, are at a higher risk of getting serious disease. Further,

when infected, pregnant women and children are thought to be at a higher risk of getting serious disease, Wang *et al.,* (2020).

The swift spread of COVID-19 is a threat to public health necessitating the need for vaccination, Han *et al.,* (2019). Vaccines can give communal protection by limiting the spread of disease within a population, as well as provide individual protection for people who are vaccinated, Orenstein *et al.,* (2017).

The magnitude of worldwide COVID-19 vaccination inequality is currently enormous, Asundi *et al.,* (2021).Covid-19 Vaccines Global Access (COVAX) aims to accelerate the development and manufacture of COVID-19 vaccines, and to guarantee fair and equitable access for every country in the world. COVAXis co-led by the Global Allowance for Vaccines and Immunization (GAVI), the Coalition for Epidemic Preparedness Innovations (CEPI) and WHO, alongside key delivery partner UNICEF, (https://www.gavi.org/covax-facility).

However, due to supply constraints, vaccination rates in parts of Africa remain low, only 1.6 percent of the continent's population of 1.4 billion has been fully vaccinated so far, (https://www.afro.who.int/).

Data available from the European Centers for Disease Prevention and Control show that between 2.2% to 29% of health care workers have been reported as COVID-19 cases, Paris *et al.,* (2021) and some of these cases resulted in mortalities.

Healthcare workers are at particular risk due to their occupational exposure to SARS-CoV-2. Various studies on covid-19 vaccine prioritizations conclude that health workers should be prioritized because they are first hand responders, Persad *et al.,* (2021), Gollust *et al.,* (2020).

Prior to the advent of COVID-19 vaccination, a number of vaccine hesitancy (VH) groups and individuals with opposing views on vaccination pelted a lot of information (mostly negative and without credible substantiation) on media outlets. VH has attracted great attention and concern, Black and Rappouli (2010), Leask J (2011), Larson *et al.,* (2014) because it is known to adversely affect vaccine uptake leading to an increasing risk of vaccine-preventable disease outbreaks and epidemics, Dubé *et al.,* (2013).

A study in Turkey among healthcare workers revealed than less than 70% were prepared to vaccinate Kose *et al.,* (2021). This could be a major problem towards the success of COVID-19 vaccinations because healthcare workers are among those trusted to convince the general public to avail themselves for vaccination.

The pharmacist, in a research involving six European nations, has been listed among other health care workers considering the most trustworthy sources of information on medicines, Bouder *et al.,* (2015).

When health care workers are vaccine hesitant this may lead to a significant reduction in advising patients to vaccinate which may result in low vaccine uptake among those in the general population, Verger *et al.,* (2015).

In the case of COVID-19, the situation may lead to needless infections and preventable deaths. This could be very worrying, because apart from ravaging the whole globe, more virulent variants of COVID-19 have been isolated lately.

This study looked at the general vaccination level among pharmacy staff at the Korle Bu Teaching Hospital (KBTH), the third largest teaching hospital in Africa. The study focused on vaccination trends among different types of

pharmacy staff and determined the number of doses needed to vaccinate partially vaccinated and unvaccinated staff of the department since this is important for vaccine procurement and deployment.

Materials and Methods

There was a cross-section study with collection of data on vaccination status from all staff of the pharmacy department of the KBTH after they had received the first and second doses of the Astra Zeneca Covishield© vaccine. The first dose was administered from 2nd March, 2021 and the second dose started from 19th May, 2021. All staff of the Hospital were notified to vaccinate and each of them had an equal chance to be vaccinated.

Notification to all Pharmacy staff

Notification to all Pharmacy staff at KBTH was through formal letters and information on social media, predominantly through Whatsapp© messages on staff platforms.

Before vaccination started, the Public Health Unit of the KBTH developed a "COVID-19 Vaccination Roll-Out Strategy" (unpublished) and shared with all staff to ensure smooth vaccination process. Prior to the first dose, 13,000 vaccine doses were released to the KBTH by the Expanded Programme of Immunization (EPI) of the Ghana Health Service (GHS).

The vaccines were part of the consignment received under agreement between the COVAX facility, a global risk-sharing mechanism for pooled procurement and equitable distribution of COVID-19 vaccines, (https://www.gavi.org/covax-facility) and the government of Ghana. In Ghana, health care workers were among first line group targeted for COVID-19 vaccination and only those 18 years and above were vaccinated.

Ethical implications

Vaccination status and vaccine hesitance are important but do not necessarily pose any serious ethical ramifications. With COVID-19 in particular, it is important to know the vaccination status to protect the unvaccinated. The ethical implications in this study pose less than minimal risk to anyone in this study, hence ethical clearance was not sought for the study.

Study site

The KBTH is the largest hospital in Ghana and the third largest in Africa. It has a bed-capacity of about 2000 and remains the leading referral hospital in Ghana. The pharmacy department has a staff capacity close to 250. They include pharmacists, pharmacy technician/technologists, clinical psychologists, accountants, statisticians, administrative staff, dispensing assistants and porters. Due to its large size, each clinical department in the KBTH has a pharmacy attached to it. In all, there are twelve (12) such pharmacies and six (6) non-clinical units.

Data collection

In June 2021, every pharmacy unit head received a hard copy of a designed spreadsheet to fill. Information on the spreadsheet included the vaccination status of staff, gender, number of vaccinations received, reason for not vaccinating, among others. Vaccination status was ascertained only from vaccination cards issued by the Ministry of Health in collaboration with the Ghana Health Service. Prior to data collection, all staff of the pharmacy department were asked to bring along their vaccination cards. Supervision from unit heads ensured that collected data were accurate and unbiased. Completion and submission of spreadsheet by all units took three (3) days. There was a direct transfer of

spreadsheet information into STATA intercooled version 15 by two separate data entry clerks. A biostatistician validated the two data sets before formulating the final dataset for analysis.

Data analysis

Analysis involved both descriptive and inferential statistics. Descriptive statistics involved distribution (number and percentage) of the various categories of staff by sex, those with only one vaccination, those with two vaccinations, those with at least one vaccination, and those without any vaccination. All staff in this study were notified prior to vaccination and had equal opportunities to vaccinate. Further, there were enough vaccines at the vaccination sites for all staff. As a result, vaccination status was stratified as "full vaccination" and "partial/no vaccination". Inferential statistics involved both crude and adjusted odds ratios using logistic regression. Using dispensing assistants as the baseline, the odds of vaccination by other categories of staff was determined. A p-value of less than 0.05was considered as statistically significant. Data for this study is available upon request.

Results and Discussion

A total number of 240 pharmacy staff were captured using the spreadsheets. This is equivalent to about 96.0% (240/250) of the total staff number in the department. Three staff who did not vaccinate indicated that they were either pregnant or breastfeeding during the vaccination period. They were excluded from the final analysis.

Table 1 shows that among Dispensing Assistants, Pharmacists and Psychologists more females compared to males were represented in the data collection. The opposite was the case for Orderlies, Dispensing Technicians and Supporting Staff of the Pharmacy Department.

It is evident from Table 2 that about 66% of pharmacy staff had both vaccinations while almost 80% had at least one vaccination. Table 2 also shows that for logistics purposes (for future vaccination for COVID-19 using Covishield®), the Pharmacy Department would need a total of 151 shots to attain 100% coverage if all staff members will avail themselves for vaccination.

Table 3 presents crude and adjusted odds ratios for vaccination among the various pharmacy staff categories at the KBTH using DAs as the baseline group. Crude odds ratios were adjusted for sex and unit of pharmacy staff in multivariate analysis. Multivariate analysis showed that pharmacists were almost four times as likely to vaccinate compared to DAs, and this was statistically significant (OR=3.89, 95% CI 1.72 to 8.76; p-value=0.001). Dispensing Technicians were more than two times as likely to vaccinate compared to DAs but there was no significant association (OR=2.33, 95% CI 0.95 to 5.66; p-value=0.06). Although Supporting staff were almost twice as likely to vaccinate compared to DAs this was not significant (p=0.270). It was evident that sex and clinical department of pharmacy staff were confounders, and both variables had a negative confounding effect reducing the point estimates towards the null. Although multivariate analysis showed that Psychologists (OR=0.82, 95% CI 0.06 to 10.5) and Orderlies (OR=0.94, 95% CI 0.19 to 4.64) were more hesitant to vaccinate compared to DAs, this may not be the real case because of the low sample sizes of these two groups.

The odds of vaccination for male gender was 1.64 compared to females, but this was not statistically significant (95% CI 0.91 to 2.99, p-value=0.104). This sought to assess the relationship among staff of the pharmacy

department at the KBTH and their willingness to take both vaccinations for the Covishield® vaccine. It also ascertained the vaccine needs of the pharmacy department for full coverage status. It was assumed that all those with at most one vaccination had some level of vaccination hesitancy because the same information was provided to all staffs prior to vaccination and secondly, there were enough vaccines for vaccination among all staff of the pharmacy department (as well as all staff at KBTH).

To ensure there is a level playing field and improve uptake of COVID-19 vaccination in Ghana all hands were on deck. The president of the country, senior politicians, all the way to selected communities were roped-in the publicity campaign.[7]This study found male gender to be about 60% more like to vaccinate against COVID-19 as compared to females, however, this was not significant. Other studies have found female gender to be significantly more likely to report a negative COVID-19 vaccination intention, Kose *et al.,* (2021), Latkin *et al.,* (2021), Detoc *et al.,* (2020), Paris *et al.,* (2021), compared to males. One of the reasons is that there is a higher frequency and more severe adverse events in females, Klein *et al.,* (2010). Women tend to be more cautious about risks and take much longer compared to men to take decisions in such instances, Bymes *et al.,* (1999). It could also be because less females are used in clinical trials of medicines and vaccines. This calls for thorough assessment into the reasons behind female gender attitudes that result in their refusal to vaccinate against COVID-19.

In a scoping review, Biswas *et al.,* (2021) reported that males, older age, and doctoral degree holders (i.e., physicians) were more likely to accept vaccinations. Our study identified that pharmacists were almost four times as likely to take the vaccines compared to DAs. The study also showed that support staff mostly accountants were almost twice as likely to vaccinate compared to DAs, although this was not significant; Dispensing Technicians were more than two times as likely to vaccinate compared to DAs. These results clearly show that health care workers knowledge levels clearly influence vaccine uptake, and the higher the knowledge of the health worker, the more likely it is that vaccination against COVID-19 with take place. It is important to update lower grade health sector workers with the necessary information to improve vaccine uptake.

Issues of logistics are critical especially in countries deprived of COVID-19 vaccines. This study has shown the amount of vaccines that the pharmacy department would need for complete vaccination of staff. This is important to avoid wastage in procurement and save the national purse from unnecessary spending.

There were a few limitations in this study. We may not have collected data on all the confounders that are likely to have an effect on the relationship between health care workers and vaccination against COVID-19, resulting in bias for unmeasured confounding.

Sample size of some variables were low and may have led to some biased results. For example, the low sample size of psychologists (which can be confirmed by the wide confidence intervals of the measure of effect, both unadjusted and adjusted) may have led to issues with power to obtain the most appropriate results. Very little could be done about the low numbers because such caliber of staff are normally not found in large numbers at pharmacy departments. However, larger studies or pooled studies (meta-analysis) may show better results for this group of workers.

Table.1 Distribution of pharmacy staff by professional category and sex

Professional category (N=240)	Female (%)	Male (%)	Total
Dispensing Assistants (DA)	26 (74.3)	9 (25.7)	35
Orderlies	2 (22.2)	7 (77.3)	9
Pharmacists	70 (63.6)	40 (36.4)	110
Psychologists	3 (100)	0	3
Dispensing Technicians	26 (44.1)	33 (55.9)	59
Supporting Staff*	8 (33.3)	16 (66.7)	24

*Accountants, Health Administrators, Procurement staff, Statisticians, and Human Resource Staff.

Table.2 Vaccination status of pharmacy staff and projected vaccine shots needed for coverage

Number of vaccinations received	Frequency	Coverage
Two	158	65.8%
One	33	
None	49	
At least one	191	79.6%
Vaccination status of staff	Quantity needed#	
Full	-	
First dose only	33	
Not vaccination	98	
Total	131	
Grand total^	151	

^Assuming the pharmacy Department has a staff capacity of 250 and the extra 10 did not vaccinate; #Number of Covishield® vaccine shots needed for complete coverage of pharmacy department.

Table.3 Crude and adjusted odds ratios (OR) for vaccination by professional status

Profession (N=237)	Vaccination status		Crude OR		Adjustedα OR	
	Full	Partial/Nil	(95% CI±)	p-value	(95% CI)	p-value
Dispensing Assistants	15 (44%)	19 (56%)	-	-	-	-
Orderlies	4 (50%)	4 (50%)	1.27 (0.27 – 5.92)	0.764	0.94 (0.19 – 4.64)	0.941
Pharmacists	83 (76%)	26 (24%)	4.04(1.80 – 9.07)	0.001	3.89 (1.72 – 8.76)	0.001
Psychologists	1 (33%)	2 (67%)	0.63(0.05 – 7.67)	0.720	0.82 (0.06 – 10.53)	0.879
Dispensing Technicians	40 (68%)	19 (32%)	2.67(1.12 – 6.36)	0.027	2.32 (0.95 – 5.66)	0.063
Supporting Staff	15 (63%)	9 (37%)	2.11(0.73 – 6.14)	0.170	1.86 (0.61 – 5.68)	0.270

αAdjusted for sex and clinical department (unit) of pharmacy staff; ±Confidence interval

Countries in sub-Saharan African (SSA) are faced with double trouble in dealing with the COVID-19 pandemic. Firstly, there is a challenge with availability of vaccines, and secondly, vaccine hesitancy is real in SSA. This study shows that even among health workers, who are supposed to lead the rest of society in dealing with the disease, there are differences in vaccination rates. The good thing is that this study as well as others has shown a trend. It is important for public health officials to take advantage of these results and make the necessary interventions to improve COVID-19 vaccine uptake among health workers. Such gains will surely trickle down to the rest of society.

Competing Interests Statement

None of the authors has any competing interest statement to declare. All authors made significant contributions in the conceptualization, design, collection of data, data analysis, discussion and writing of the final manuscript.

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