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KNOWLEDGE OF HEALTH WORKERS ON CHOLERA MANAGEMENT IN OYO STATE: RESULTS OF A TRAINING INTERVENTION

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ABSTRACT

Introduction: **Primary Health Care (PHC) workers are usually the frontline health workers involved in disseminating health education to the community and implementing cholera prevention and management guidelines. Given that inadequate health worker performance has been a problem in resource-limited settings such as Nigeria and poor health worker knowledge has been implicated in poor health status in developing nations, continuous training of health workers to improve their knowledge has been recommended to improve health outcomes.**

Objectives: **This study seeks to ascertain the level of improvement in the knowledge of health workers on cholera, if any, after one of such interventions was carried out in Oyo State. Similarly, the study seeks to discern the specific domains of knowledge on cholera, if any, which were significantly affected by the intervention.**

Methods: The research was conducted utilizing a pre-post study design to recruit PHC health workers from four local government areas of Oyo State between October and November 2016. Baseline and endline data were collected at both intervention and control sites using a self-administered questionnaire with sections eliciting responses to questions on general knowledge of symptoms of cholera, prevention methods, knowledge and practice of safety procedures health workers. Descriptive statistics and chi-square tests were used to present the data and test for statistical associations between categorical variables at 5% respectively.

Results: **A total of 542 health workers divided into 2 groups (intervention and control), were interviewed at baseline and at endline. At baseline, the 40-49 years age group was the most represented in the intervention arm (40.0%), the 30-39 years age group was the most represented in the control arm (34.2%). At baseline, only 35.2% of health workers in the intervention sites had good knowledge on cholera. This figure was increased to 52.7% after the intervention. This difference in proportions was also statistically significant (p=0.004). In the control sites, the opposite was observed as the proportion of health workers with good knowledge on cholera slightly reduced from 47.2% to 43.6%. This difference was however not statistically significant (p=0.563).**

Conclusion: **The results from the evaluation of the intervention show that the training significantly improved the overall knowledge of health workers. However, future training interventions can be aimed at improving knowledge of health workers on alert threshold of cholera. In addition, continuous education programs on disease and surveillance and notification should be planned for PHC workers to improve their knowledge.**

Keywords: Cholera, Primary health care, Case-fatality rates, Case management, Epidemic

INTRODUCTION

Cholera is an acute enteric infection, resulting from the ingestion of Vibrio cholera, a bacterium found in faecally contaminated water and food. The disease kills several thousands of people worldwide annually, usually due to severe dehydration caused by acute watery diarrhea. Cholera is also extremely contagious and can spread across communities within days resulting in public health epidemics with accompanying high mortality rates.[1] It has been accepted that the best form of defense against cholera remains prevention by ensuring that hygienic condition in living surroundings are maintained in order to stop the proliferation of the causative bacterium. A second important aspect to cholera control is the prompt, accurate and effective identification and management of outbreaks when they occur. In these two aspects,

health workers play a critical role in several communities as they are regarded as verified sources of health education while their job function includes disease outbreak surveillance and notification.[2,3]

However, weak health systems manned by ineffective health workers have been implicated in countries where cholera outbreaks have continued to occur.[4] For example, in Nigeria, cholera outbreaks continue to occur on a yearly basis. Similarly, it has been observed that these outbreaks in the country continue to result in case-fatality rates (CFR) of more than 1%. In 2017, a cumulative total of 4,221 suspected cholera cases and 107 deaths (CFR 2.5%), including 60 laboratory-confirmed were reported from 87 LGAs in 20 States. In the first 3 weeks of 2018, there were 210 suspected cases including two laboratory-confirmed and 16 deaths (CFR 7.6%) from 28 LGAs in nine states.[5,6] Authors have linked this persistent pattern of cholera outbreaks to poor hygiene practices, which may be exacerbated by inadequate or inaccurate health information by health workers while the high CFRs are indicators of a weak surveillance and response system.[5,7]

The state of Human Resources for Health (HRH) in Nigeria remains a challenge that could be contributing to the high incidence and CFR of cholera in the country. Most of HRH lack continued education and the necessary tools and infrastructure to carry out their jobs adequately.[8,9] According to the National Policy on Health, Primary Health Care (PHC) workers are those responsible for health education and awareness among community members, frontline cholera surveillance and in many cases cholera control and case management. Primary health care workers are the closest health care providers to the community. By virtue of the location of their duty-post at the periphery of health care delivery network, they serve the important function of 'triaging' patients at the first point of call. They are trained to treat minor ailments, administer vaccinations, refer very ill patients to the secondary and tertiary care levels and provide health education members of the community directly. Furthermore, they function as frontline disease surveillance and notification officers whose duties are to detect and report outbreaks of epidemic-prone diseases such as cholera.[10]

However, studies have shown that these health workers often lack the required knowledge to carry out their duties. For example, Aisen and Shobowale discovered that more than one-third of the health workers in their study believed that HIV could be spread through tears, feces and urine.[11] Similarly, Ebuehi *et al.* observed that although PHC workers had a high degree of awareness of emergency contraceptives, they showed a dearth of specific knowledge of the time frame for effective use, mechanism of action, legal status and correct prescription of emergency contraceptive pills.[12] Specifically, Bawa *et al.* found that PHC workers had poor knowledge of notifiable diseases and reporting procedures.[13] Other studies have shown that knowledge gaps exist with Nigeria's PHC staff, with the extent of the gaps largely influenced by factors such as cadre, experience and location.[10,14]

Continued education, retraining of health workers through workshops and seminars as well as other interventions have been suggested as methods of improving health worker knowledge and in turn, improving the health status of the community. Studies have indicated that these interventions can significantly improve knowledge of health workers and in turn reduce the cholera problem in the country.[15,16] This study sought to ascertain the level of improvement in the knowledge of health workers on cholera, if any, after one of such interventions was carried out in Oyo State. Similarly, the study sought to discern the specific domains of knowledge on cholera, if any, that were significantly affected by the intervention.

METHODS

A pre-post study design was utilised to assess the knowledge and practice of cholera prevention and management procedures among PHC workers was conducted in four local government areas of Oyo State, namely Atisbo, Itesiwaju, Iwajowa and Saki West respectively.

A baseline survey was initially carried out in October 2016 among health workers selected by simple random process in all the four LGAs. Subsequently, an intervention training was carried out in two local governments- Saki West and Iwajowa LGAs two weeks after the baseline survey while the other two LGAs maintained status quo (Figure 1). The healthcare workers interviewed included doctors, nurses, laboratory scientists, community extension workers and hospital attendants. Sequel to the training, a post-test/evaluation was carried out among health workers in the LGAs four weeks after the intervention training (Figure 1).

A minimum sample size of 271 respondents was calculated using the McNemar's test for determining sample size calculation formula in pre-post study designs. Thus, a sample size of 271 respondents for the intervention arm and another 271 for the control arm were recruited for the study. At baseline, there were 286 respondents while at endline, there were 256 respondents.

Both baseline and endline data were collected using a self-administered questionnaire designed to collect demographic information such as age as at last birthday, highest level of education completed, ethnicity etc. Questions were also asked to determine the general knowledge of respondents about symptoms of cholera as well as its prevention methods. Examples of questions asked are "What are the symptoms of cholera?" and "What do you think are the transmission routes of cholera?" Both correct and incorrect answers were mixed and respondents were asked to answer "Yes" or "No" to each one. In addition, knowledge and practice of safety procedures health workers, expected to be undertaken, during case management were assessed. These questions included asking respondents about the correct list of steps to take in the event of an outbreak and the correct reporting hierarchy. Lastly, questions relating to the respondents' knowledge and practice of disease surveillance and notification as well as training received were asked.

The frequency and type of surveillance carried out as well as which staff was responsible for surveillance formed part of this section. The questionnaire was pretested among a similar population in another LGA and revisions were made based on observations made. In order to obtain the knowledge scores, each correct response was allocated one mark while wrong answers were given zero marks. Overall scores were computed by adding up the total number of marks per respondent. Subsequently, the respondents with scores above the mean score were grouped as having "Good knowledge" while those with scores below the mean score were placed into the "Poor knowledge" category.

Data entry and analysis were carried out using Statistical Package for Social Sciences (SPSS) software version 21. Descriptive statistics such as frequencies and proportions were used to present the data. Similarly, chi-square tests were used to test for statistical associations between categorical variables at 5%.

Ethical approval for this study was obtained from the Oyo State Ministry of Health Institutional Review Board prior to the commencement of the study. Only participants who were willingly signed informed consent forms, after being satisfactorily briefed about the study, and participated in the study. Data collected included no identifiers that could be used to link individual questionnaires to specific respondents. All data were kept confidential on a password-protected computer to which only the investigators had access to.

RESULTS

The gender proportion in both arms at baseline were similar with females making up 75.2% of the intervention arm and 74.5% of the control arm. The gender distribution at endline is slightly more skewed with females making up 91.1% of the intervention arm and 86.4% of the control arm. While at baseline, the 40-49 years age group was the most represented in the intervention arm (40.0%), the 30-39 years age group was the most represented in the control arm (34.2%). At endline, the 40-49 years age group is again the most represented in the intervention arm while the 18-29 years age group is the most represented in the control arm. For both baseline and endline, currently married respondents make up the highest

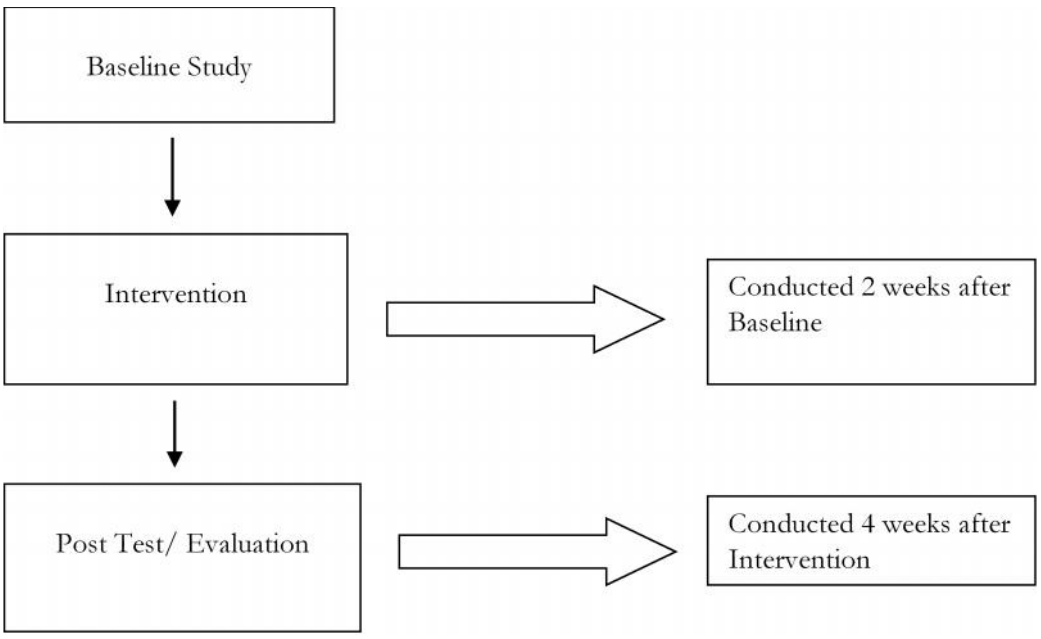

Figure 1: Schematic representation of timelines

proportion in both arms. At baseline, they represent 84.0% of the intervention arm and 78.3% of the baseline. Similarly, they make up 87.0% and 71.8% of the intervention and control arms respectively at endline. Respondents who had completed some form of post-basic education represented the majority in both arms at both baseline and endline with the exception of the control arm at endline where respondents were evenly split between completing only basic education and completing post-basic education. With respect to religion, Christians represented 58.4% of the respondents in the intervention arm at baseline and 63.0% at endline (Table 1).

knowledge on cholera. This figure was increased to 52.7% after the intervention. This difference in proportions was also statistically significant (p=0.004). In the control sites, the opposite was observed as the proportion of health workers with good knowledge on cholera slightly reduced from 47.2% to 43.6%. This difference was however not statistically significant (p=0.563).

Analysis of the knowledge categories showed that health workers at the intervention sites had statistically significant positive changes in knowledge of the causes of cholera (p=0.023) and symptoms of cholera

Table 1: Socio-demographic characteristics of respondents

Variable	Baseline (N=286)		Endline (N=256)	
	Intervention (N=125) n (%)	Control (N=161) n (%)	Intervention (N= 146) n (%)	Control (N=110) n (%)
Gender				
Female	94 (75.2)	120 (74.5)	133 (91.1)	95 (86.4)
Male	31 (24.8)	41 (25.5)	13 (8.9)	15 (13.6)
Age group				
18-29	14 (11.2)	46 (28.6)	20 (13.7)	35 (31.8)
30-39	40 (32.0)	55 (34.2)	26 (17.8)	26 (23.6)
40-49	50 (40.0)	43 (26.7)	69 (47.3)	31 (28.2)
50 and older	21 (16.8)	17 (10.6)	31 (21.2)	18 (16.4)
Marital status				
Currently single	20 (16.0)	35 (21.7)	19 (13.0)	31 (28.2)
Currently married	105 (84.0)	126 (78.3)	127 (87.0)	79 (71.8)
Educational status				
Basic education	37 (29.6)	60 (41.1)	44 (27.3)	55 (50.0)
Post-basic education	88 (70.4)	86 (58.6)	117 (72.7)	55 (50.0)
Religion				
Christianity	73 (58.4)	92 (57.1)	92 (63.0)	61 (55.5)
Islam	50 (40.0)	68 (42.2)	52 (35.6)	48 (43.6)
Traditional	2 (1.6)	1 (0.6)	2 (1.4)	1 (0.9)
Cadre				
Doctor	8 (6.4)	17 (10.6)	5 (3.4)	4 (3.6)
Nurse	37 (29.6)	64 (39.8)	29 (19.9)	30 (27.3)
CHO	18 (14.4)	13 (8.1)	27 (18.5)	5 (4.5)
CHEW	23 (18.4)	21 (13.0)	29 (19.9)	22 (20.0)
Health Assistant	23 (18.4)	32 (19.9)	48 (32.9)	47 (42.7)
Others	16 (12.8)	14 (8.7)	8 (5.5)	2 (1.8)

An assessment of the change in overall knowledge of health workers on cholera at both baseline and endline showed that health workers in the intervention arm had improved on their baseline knowledge about cholera after the intervention. At baseline, only 35.2% of health workers in the intervention sites had good

(p=0.001). The proportion of health workers who had good knowledge of the causes of cholera increased from 47.2% at baseline to 61.0% at endline. At the control sites, the proportion of health workers with good knowledge of the causes of cholera also increased from 49.7% at baseline to 55.5% at endline.

Table 2: Change in knowledge between baseline and endline on general cholera prevention and management

Variable	Intervention sites (N=271)			Control sites (N=271)		
	Baseline n(%)	Endline n(%)	p-value	Baseline n(%)	Endline n (%)	p-value
Overall						
Knowledge level						
Poor knowledge	81 (64.8)	69 (47.3)	0.004	85 (52.8)	62 (56.4)	0.563
Good knowledge	44 (35.2)	77 (52.7)		76 (47.2)	48 (43.6)	
General knowledge level per sub-category						
Nature of cholera disease						
Poor knowledge	12 (9.6)	14 (9.6)	0.998	8 (5.0)	15 (13.6)	0.012
Good knowledge	113 (90.4)	132 (90.4)		153 (95.0)	95 (86.4)	
Causes of cholera						
Poor knowledge	66 (52.8)	57 (39.0)	0.023	81 (50.3)	49 (44.5)	0.387
Good knowledge	59 (47.2)	89 (61.0)		80 (49.7)	61 (55.5)	
Symptoms of cholera						
Poor knowledge	56 (44.8)	38 (26.0)	0.001	60 (37.3)	31 (28.2)	0.120
Good knowledge	69 (55.2)	108 (74.0)		101 (62.7)	79 (71.8)	
Transmission routes of cholera						
Poor knowledge	86 (68.8)	91 (62.3)	0.265	122 (75.8)	83 (75.5)	0.952
Good knowledge	39 (31.2)	55 (37.7)		39 (24.2)	27 (24.5)	
Cholera prevention strategies						
Poor knowledge	5 (4.0)	4 (2.7)	0.564	1 (0.6)	9 (8.2)	0.001
Good knowledge	120 (96.0)	142 (97.3)		160 (99.4)	101 (91.8)	
Cholera management safety practices						
Poor knowledge	7 (5.6)	7 (4.8)	0.765	8 (5.0)	3 (2.7)	0.358
Good knowledge	118 (94.4)	139 (95.2)		153 (95.0)	107 (97.3)	

However, this difference was not statistically significant. Similarly, while the proportion of health workers with good knowledge of the symptoms of cholera increased both control (62.7%-71.8%) and intervention sites (55.2%-74.0%), the former was not statistically significant (p=0.120) while the latter was statistically significant (p=0.001).

While none of the other categories had statistically significant differences in the intervention sites, the

Table 3: Change in knowledge between baseline and endline in cholera surveillance and notification procedures

Variable	Intervention sites (N=271)			Control sites (N=271)		
	Baseline N (%)	Endline N (%)	p-value	Baseline N (%)	Endline N (%)	p-value
Know the cholera alert threshold						
Yes	20 (16.0)	29 (19.9)	0.410	27 (16.8)	55 (50.0)	0.001
No	105 (84.0)	117 (80.1)		134 (83.2)	55 (50.0)	
Who to report an outbreak to						
LGA DSNO	112 (89.6)	134 (91.8)	0.536	140 (87.0)	93 (84.5)	0.575
Others	13 (10.4)	12 (8.2)		21 (13.0)	17 (15.5)	
Standard Reporting route						
HF-LGA-State-Federal	121 (96.8)	143 (97.9)	0.554	152 (94.4)	94 (85.5)	0.012
Others	4 (3.2)	3 (2.1)		9 (5.6)	16 (14.5)	
Any training in the past year						
Yes	59 (47.2)	81 (55.5)	0.174	75 (46.6)	40 (36.4)	0.095
No	66 (52.8)	65 (44.5)		86 (53.4)	70 (63.6)	
Training on cholera outbreak						
Yes	13 (22.0)	36 (44.4)	0.006	33 (44.0)	22 (55.0)	0.261
No	46 (78.0)	45 (55.6)		42 (56.0)	18 (45.0)	

proportion of health workers with good knowledge on each category increased from baseline to endline. For example, while 96.0% had good knowledge of cholera prevention strategies at baseline, 97.3% had good knowledge at endline. At the control sites, there was a reduction in the proportion of health workers with good knowledge on the nature of cholera disease (95.0%-86.4%) and cholera prevention strategies (99.4%-91.8%) reduced from baseline to endline. Both of these differences were statistically significant.

slight increase in the proportion of respondents who knew who to report an outbreak to (from 89.6% to 91.8%), the proportion of respondents in the control arm who knew who to report an outbreak to, reduced from 87.0% to 84.5%. None of these differences in proportion between baseline and endline was statistically significant. In the intervention arm, the proportion of respondents who had received training on cholera outbreak had doubled (from 22.0% to 44.0%). This difference was statistically significant

Table 4: Association between socio-demographic characteristics and good overall knowledge among health workers

Variable	Intervention sites (N=271)			Control sites (N=271)		
	Baseline N (%)	Endline N (%)	p-value	Baseline N (%)	Endline N (%)	p-value
Gender						
Female	28 (68.3)	71 (92.2)	<0.001	51 (67.1)	41 (85.4)	0.023
Male	16 (36.4)	6 (7.8)		25 (32.9)	7 (14.6)	
Age group						
18-29	7 (15.9)	7 (9.1)	0.239	22 (28.9)	13 (27.1)	0.732
30-39	12 (27.3)	14 (18.2)		25 (32.9)	13 (27.1)	
40-49	15 (34.1)	40 (51.9)		17 (22.4)	15 (31.2)	
50 and older	10 (22.7)	16 (20.8)		12 (15.8)	7 (14.6)	
Marital status						
Currently single	5 (11.4)	11 (14.3)	0.648	23 (30.3)	10 (20.8)	0.247
Currently married	39 (88.6)	66 (85.7)		53 (69.7)	38 (79.2)	
Educational status						
Basic education	8 (18.2)	27 (35.1)	0.049	17 (22.4)	27 (56.2)	<0.001
Post-basic education	36 (81.8)	50 (64.9)		59 (77.6)	21 (43.8)	
Religion						
Christianity	24 (54.5)	53 (68.8)	0.076	45 (59.2)	27 (56.2)	0.668
Islam	18 (40.9)	24 (31.2)		30 (39.5)	21 (43.8)	
Traditional	2 (4.5)	0 (0.0)		1 (1.3)	0 (0.0)	
Cadre						
Doctor	6 (13.6)	2 (2.6)	0.002	12 (15.8)	1 (2.1)	<0.001
Nurse	14 (31.8)	18 (23.4)		34 (44.7)	11 (22.9)	
CHO	4 (9.1)	14 (18.2)		9 (11.8)	3 (6.2)	
CHEW	6 (13.6)	15 (19.5)		6 (7.9)	10 (20.8)	
Health Assistant	5 (11.4)	24 (31.2)		11 (14.5)	22 (45.8)	
Others	9 (20.5)	4 (5.2)		4 (5.3)	1 (2.1)	

Further analysis showed that the proportion of respondents who knew the correct cholera alert threshold increased from 16.0% at baseline to 19.9% at endline in the intervention sites. In the control sites, the increase in proportion of respondents who knew the cholera alert threshold was from 16.8% to 50.0%. The improvement in the control sites (p=0.001) was statistically significant while that in the intervention sites was not (p=0.410). While the intervention arm had a

(p=0.006) while on the other hand the increase in proportion of respondents in the intervention arm who had received training on cholera outbreak (from 44.0% to 55.0%) was not statistically significant (p=0.261).

In order to ascertain which socio-demographic characteristics were significantly associated with having good overall knowledge of cholera, cross-tabulations

between time of study (baseline/endline) and socio-demographic characteristics were carried out. On the intervention arm, gender, educational status and cadre showed statistically significant differences between baseline and endline proportions. For gender, while the proportion of females with good overall knowledge increased from 68.3% to 92.2%, the proportion of males dropped from 36.8% to 7.8%. Similarly, the proportion of respondents with overall good knowledge who completed only basic education rose from 18.2% at baseline to 35.1% at endline. In addition, the proportion of Community Health Officers (CHOs), Community Health Extension Workers (CHEWs) and health assistants with good knowledge also increased between baseline and endline in four main parameters for both the intervention and control arms:, nature of cholera disease, symptoms of cholera, community prevention strategies and cholera management safety practices**,** .

On the control arm, statistically significant differences were observed in all socio-demographic characteristics except age group, religion and marital status. Within age groups, the proportion of respondents with overall good knowledge in older age groups (40 years and older) while the proportion of respondents with overall good knowledge in the younger age groups (18-39 years) reduced. As found in the intervention arm, there were statistically significant increases at endline in the proportion of female respondents and respondents with only basic education.

DISCUSSION

The aim of the study was to measure the extent of improvement if any in the knowledge of cholera prevention and management procedures among Primary Health Care (PHC) workers in Oyo State following the administration of an intervention. The trends observed in the socio-demographic distribution are similar to those noticed among other studies on PHC workers in the country. For example, in both intervention and control arms, there were higher proportions of females, were between 30 and 49 years old and had completed some form of post-basic education. Other studies on PHC workers in Nigeria have also observed similar trends. [13,17] However, when compared with data from the Northern part of the country, a slight variation exists as the majority of PHC workers in the Northern region have not completed post-basic education. Similarly, lower cadre health workers were more common in both arms, an observation found in other studies in Nigeria. For example, nurses and CHEWs were the most popular health cadres found in PHC centers in a study in Northern Nigeria.[18] It has been said that countries suffering a scarcity of HRH, such as Nigeria, often have to depend on lower cadre health staff to head PHC centers in the absence of available doctors [10].

Both the intervention and control arms of the study recorded improvements over their baseline overall knowledge of cholera prevention and management procedures. However, the difference was more substantial and statistically significant in the intervention arm. This implies that the intervention produced significant improvements in the overall knowledge of health workers on cholera. This finding agrees with the findings of a number of other studies evaluating the results of interventions to improve knowledge among health workers. Dieleman *et al.* (2009) in a realist review of interventions to improve health workers' performance in low- and middle-income countries (LMICs) observed that continuing education interventions could improve knowledge of health workers in the short term.[19] In a comparable LMIC setting, another study also observed that a continuing education module helped in knowledge retention among health workers.[20]

Further breakdown into categories showed that the improvements in health worker knowledge in certain domains were more profound than in others. For example, while there was no change in the proportion of health workers in the intervention arm who correctly knew the kind of disease cholera is, there were statistically significant increases in the proportion of respondents in the intervention arm who had good knowledge of the causes and symptoms of cholera. Other studies have similarly found varying levels improvements within different domains of knowledge within an intervention. For example, Suchitra and Devi in India found out that while a one-off training only yielded short-term results in improving hand washing practices among health workers, it significantly improved the knowledge of hand washing benefits among health workers.[20] In addition, it was noticed in the intervention arm that domains where a high proportion of health workers already had good knowledge at baseline tended to have only slight improvements at best. This could be due to the health workers already perceiving that they know those domains so well that they do not pay adequate attention to them during trainings. Cercone reports that andragogy, an important adult learning theory, could be used as an effective method of maintaining the interest of adult learners throughout a training session.[21] For example, while Onyango-Ouma *et al.* reported a decrease in greetings to patients after an intervention, Rote *et al.* observed that doctors trained in an intervention were more likely to exhibit improved communication skills.[22,23]

With regards to disease surveillance, notification and reporting procedures, the control arm had a statistically significant increase in the proportion of health workers who knew the choler alert threshold. This was unlike in the intervention arm where the increase in proportion of health workers who knew the alert threshold was not statistically significant. This could be also linked to poor attention during the training sessions. Onyango-Ouma *et al.* (2001) also report that participants fared worse in certain aspects covered following a training intervention.[22] The statistically significant increase in the proportion of health workers in the intervention arm who had received training on cholera outbreak within the past year was no surprise. The control arm also experienced an increase in the proportion of health workers who had received training on cholera outbreak within the past year, but was not statistically significant. This may indicate that while some form of regular training on cholera takes place, it does not involve a wide spread of PHC staff. Regular training of all staff involved in disease surveillance and notification has been touted as one of the main ways of improving the sensitivity of the health system to cholera outbreaks.[24]

This study must be interpreted bearing some key issues in mind. First, the study was conducted based on availability of health workers at the duty post. This thus led to a varied number of participants across the baseline and endline surveys. Another limitation of this study is that it did not consider the long-term impact of the intervention, as evaluation was carried out a few weeks after the intervention. Naikoba and Hayward (2001) suggest that one-off training interventions may not have lasting efficacy in changing the behavior of health workers.[15] In addition, this study did not investigate the role other health system characteristics might have played in modifying the knowledge of health workers on cholera prevention, detection and management practices among respondents.

CONCLUSION

In resource-limited settings such as in Nigeria, Primary Health Center (PHC) workers are essential for the delivery of health interventions. However, inadequate health-worker performance is a very widespread problem, with many health workers lacking the requisite knowledge and skills required to carry out their responsibilities effectively. Regular training for PHC workers has been implemented as a means of improving knowledge retention. The results from the evaluation of the intervention show that training can significantly improve the overall knowledge of health workers. However, future training interventions can be aimed at improving knowledge of health workers on alert threshold of cholera. In addition, continuous education programs on disease and surveillance and notification should be planned for PHC workers to improve their knowledge.

Declarations

Ethics approval and Consent to participate

Ethical approval for the conduct of the study was obtained from the Department of Planning Research and Statistics, Ministry of Health, Oyo State Secretariat, Ibadan, Nigeria. Data collection analysis and presentation were performed according to standard ethical guidelines. Respondents' anonymity was ensured by removing all individual identifiers that existed from the instrument or data set. Written informed consents were sought and obtained from all migrants after thorough briefing on the objectives of the study before questionnaire administration.

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Authors' Contributions

All authors conceptualised the study. GA, IA wrote out the protocol. OB and TO conducted the literature review. OB and TO supervised the field data collection and data entry. TO drafted the initial manuscript. All authors proof-read and approved the final manuscript.

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Authors' Information

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