Effect of Training on Knowledge and Practice of Universal Precautions among Primary Health Care Workers in Kaduna State, Nigeria.

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ABSTRACT

Background: The important role played by Primary Health Care Workers as health care providers make their safety an important health concern. Compliance with infection control guidelines and preventive measures such as Universal Precautions is critical to prevent the transmission of infectious pathogens, but such precautions are not widely used.

Aim: The study assessed the effect of training on the knowledge and practice of universal precautions among Primary Health Care Workers in Kaduna State, Nigeria.

Materials and Methods: A quasi-experimental study was carried out between September 2011 and May 2012 among 172 Primary Health Care Workers in two local government areas selected through a multi staged sampling technique. Pre-intervention data was collected from both study and control groups. Thereafter, a training intervention was carried out among the study group and after six months post-intervention data was collected in both groups. Data was analyzed using SPSS Statistics 17.0, and statistical significance was determined using t test, Chi-square test and Fishers test with P value set at < 0.05.

Results: Baseline results showed low mean knowledge scores of 3.7±3.3 and 4.6±3.2 (maximum 10) and moderate mean self-reported practice scores of 33.1± 3.8 and 32.9 ± 3.7 (maximum 42) in study and control groups respectively. Observed hand washing practices were low (11.7% and 8.9%) in study and control groups. After the intervention, there were significant improvements in mean knowledge scores (p=0.0001) and mean self-reported practice scores (p=0.001) among respondents in the study group, but no improvement in scores of respondents in control group. Observed practices of Universal Precautions for both study and control groups did not change significantly after the intervention.

Conclusion: The training significantly improved the knowledge and self- reported practice of Universal Precautions among Primary Health Care Workers in the study area.

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INTRODUCTION

In Nigeria Primary Health Care Centers (PHCCs) constitute major sites for health service delivery to the vast majority of the population and are often faced with poor funding and inadequacy of basic amenities like regular running water for safety practices. Primary Health Care services provided mainly by trained community health personnel are often rendered in unpredictable environments (inadequate infection control facilities and materials).[1] The Primary Health Care Workers (PHCWs) are thus at increased risk of occupational exposure to blood borne pathogens.

Human Immunodeficiency Virus (HIV), hepatitis B virus (HBV) and Hepatitis C virus (HCV) are a burden to healthcare delivery systems in Nigeria.[2] The Nigerian National HIV sero-prevalence sentinel reports show that HIV and Acquired Immunodeficiency Syndrome (AIDS) epidemic in Nigeria remains a public health problem of enormous magnitude.[2] Similar high rates have been reported on Hepatitis B and C,[3] thus, exposing Health Care Workers (HCWs) to risk of occupational exposure to these infections.

Practice guidelines referred to as 'Universal Precautions' (UP) were developed to enhance HCWs safety by minimizing the likelihood of exposure to blood, needles, and sharps.[4] These initiatives emerged predominantly in the United States[5] but were rapidly adopted and modified for use

in other high-income countries. Nigeria has its own national policy[6] which advocates for a nationwide adoption of UP as developed by Centers for Disease Control and Prevention (CDC).

Studies have shown that the failure to comply with UP is associated with the health professionals' knowledge and attitude regarding UP.[7-9] Universal Precautions training and practices have been shown to reduce blood and body fluid exposure substantially and are low cost solutions to reducing risk of sharp injuries and have a high likelihood of being adopted.[10]

A large literature review showed that existing literature on knowledge and practice of UP among HCWs in many developing countries has focused on hospitals and may not be applicable to PHCCs.[8,9,11,12-14] Various studies in hospitals in Nigeria have also reported poor knowledge and practice of UP among HCWs.[11,12,15] There is however a paucity of literature on studies conducted on knowledge and practice of UP among PHCWs in Nigeria. There is also a dearth of interventional studies on knowledge and practice of UP among HCWs in Nigeria. This study therefore assessed the effect of training on the knowledge and practice of UP among PHCWs in Zaria Local Government Area (LGA), Kaduna State.

MATERIALS AND METHODS

Study area

The study was carried out in Zaria and Kaduna North LGAs of Kaduna State in North Western Nigeria, each with populations of 408,198 and 357,694 respectively.[16] Zaria LGA had one tertiary hospital, two general hospitals, two comprehensive health care centers, thirteen PHCCs, twenty health clinics and twenty eight private clinics. The thirteen PHCCs had a total staff strength of 350. Kaduna North LGA is about 80km from Zaria LGA. There were two secondary health care facilities, twelve PHCCs and 62 private clinics in the LGA. The twelve PHCCs had staff strength of about 320.

Services provided by both PHCCs included outpatient, inpatient, child welfare, immunization, antenatal care, postnatal, family planning and laboratory services.

Study design

This research used a quasi-experimental study design consisting of pre-intervention, intervention and post-intervention phases and was carried out between September 2011 and May 2012.

Study population

The study population included all PHCWs who were directly involved in patient care and were at the risk of contact with blood, blood products in Zaria LGA and Kaduna LGA.

Sample size

The sample size was determined using the formula for comparison of proportions in the baseline and end point components of the study.[17]

$$n = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2 \, p_1 q_1 + p_2 q_2}{(p_2 - p_1)^2}$$

Where

$Z_{1-\alpha}$ = the standard normal deviate corresponding to the 95% confidence level

$Z_{1-\beta}$ = the standard normal deviate corresponding to the power of the study. 90% was used for the study

p_1 = proportion of HCWs with good practice of UP at baseline from a previous study = 0.4877[18]

p_2 = proportion of HCWs with good practice of UP after the intervention from a previous study = 0.7477[18]

q_1 = complimentary probability of p_1 = 1- p_1 = 0.52

q_2 = complimentary probability of p_2 = 1- p_2 = 0.26

$$n = \frac{(1.96 + 1.28)2 \, (0.25 + 0.19)}{(0.74 - 0.48)^2} = 69$$

Calculating for expected attrition of 10%= (0.01×69) + 69

$$= 6.9 + 69$$
$$= 75.9$$

Therefore, minimum sample size for each group was 76

However, all eligible HCWs in the selected PHCCs were recruited for the study, as the population of eligible PHCWs was few (91 in study group and 81 in control group).

Sampling technique

A two stage sampling technique was used to select participants. In the first stage, two LGAs (Kaduna North and Zaria) were purposively selected out of 23 LGAs in Kaduna State being that both LGAs had numerical high strength in diverse cadres of PHCWs compared to other LGAs in the state. Both LGAs also had similar population size, health facilities, educational institutions, religion and culture. A simple ballot was used to decide which of the two LGAs would be used as study and control LGAs. Zaria was selected as the study LGA and Kaduna North as the control LGA. The second stage entailed using a sampling frame derived from a list of the PHCCs in the LGAs, to select seven PHCCs by simple random sampling from each LGA (this represented 60% of the PHCCs in both LGAs). At each of the seven PHCCs all eligible PHCWs were identified and interviewed.

Data collection

Data was collected using a structured and coded interviewer-administered questionnaire designed from the Centers for Disease Control guidelines on Universal Precautions,[19] an observation check list and a health facility check list. The information collected included socio-demographic characteristics such as age, sex, years of experience in the job, level of education, type of occupation; questions about knowledge of UP such as definition of and components of UP; and practices related to UP such

as hand washing, usage of gloves, needle disposal, needle capping and use of Personal Protective Equipment (PPE). Knowledge and practice questions were scored 1 mark for a correct answer and 0 marks for a wrong answer. Likert scale type questions were used to assess practice and were scored from 1 to 3 marks from the most unfavourable to the most favourable practice. A total score was calculated for knowledge and practice. Total possible score for knowledge and practice were 10 and 42 respectively. Using an observation checklist a subset of PHCWs was observed and percentages of health workers that performed the observed procedures correctly were calculated. Checklist assessment of facilities for availability of equipment and supplies for practice of UP was done and graded (a total score above 50% was considered as adequate, while 50% and below was considered inadequate).The questionnaire was pretested in Giwa LGA a different LGA located about 30km away from Zaria LGA and adjustments were made accordingly. The questionnaires were administered by a team of 6 research assistants.

Training intervention

The training intervention was carried out over a period of two weeks among the study group using four training modules designed by the researcher after extensive literature review and mostly adapted from "Universal Precaution and Training Project Surabaya, Indonesia".[20] The modules covered epidemiology and transmission of Blood Borne Pathogens (BBP), modes of occupational exposure to BBP, concepts and techniques of UP, and post exposure management of injuries. The modules were modified to suit the level of understanding of the different cadres of health workers. The training was for a total of eight days, carried out on two alternate days per week for two consecutive weeks and for two hours per day. The methods employed in the training included lectures with the aid of audio-visuals, practical demonstrations and active group participation. Monthly follow up supervisory visits

were conducted by the researcher between the intervention and end point survey. Post-intervention data was collected 6 months after the training on the same population and using the same data collection tools and research team, as the pre-intervention survey.

Data analysis

Data collected was entered into Statistical Package for Social Sciences (SPSS) Version 17, cleaned and analysed. Data were summarized using frequencies, percentages, measures of central tendency (means) and dispersion (standard deviations). Outcome measures included changes between pre- and post-training knowledge, self-reported practice, and observed adherence to UP. Chi square test and Fisher's exact test where applicable, were used to compare the differences between the pre-intervention and post-intervention data from the study and control groups, and t test was used to test differences in means. The level of significance was set at p value < 0.05.

Ethical considerations

Ethical approval was obtained from the Ethical and Scientific Committee of Ahmadu Bello University Teaching Hospital. Permission was obtained from the Director of Primary Health Care, the Primary Health Care coordinators of LGAs and all the Supervising Heads of the selected PHCCs before the study was conducted. Informed written consent was sought from the participants before carrying out the study.

RESULTS

A total of 172 questionnaires were administered at pre-intervention and 156 questionnaires at post-intervention in both LGAs, giving an attrition rate of 9.3%. This was because some of the PHCWs that were available at the beginning of the study were not available during the intervention or at the endpoint of the study. The mean age was 37.8 ± 8.0 years in Zaria LGA and 39.1 ± 9.3 years in Kaduna North

Table I: Characteristics of respondents

Variables	Study group (n=91) Frequency (%)	Control group (n=81) Frequency (%)	Test statistic
Socio-demographics			
Age(years)			
20 -29	25 (27.6)	16 (19.8)	χ^2=6.767,df=3
30 -39	39 (42.9)	26 (32.1)	p=0.080
40 -49	21 (23.3)	27 (33.3)	
50 -59	6 (6.3)	12 (14.8)	
Sex			
Female	65 (71.4)	66 (81.5)	χ^2=2.386,df=1
Male	26 (28.6)	15 (18.5)	p=0.122
Marital Status			
Married	78 (85.7)	61 (75.3)	Fisher's=3.954
Single	9 (9.9)	12 (14.8)	p=0.272
Widowed	2 (2.2)	6 (7.4)	
Divorced	2 (2.2)	2 (2.5)	
Ethnicity			
Hausa	82 (90.1)	65 (80.2)	Fisher's =5.907
Others	5 (5.5)	13 (16.0)	p= 0.088
Yoruba	3 (3.3)	3 (3.7)	
Igbo	1 (1.1)	0 (0)	
Level of education			
None	0 (0)	3 (3.7)	Fisher's=5.263,
Primary	17 (18.7)	17 (21.0)	p=0.128
Secondary	2 (2.2)	5 (6.2)	
Post-Secondary	72 (79.1)	56 (69.1)	
(Certificate, Diploma)			
Years of practice			
<10	65 (71.4)	47 (58.0)	χ^2=3.390, df=1
≥10	26 (28.6)	34 (42.0)	P=0.066
Cadre			
CHEW	44(48.4)	27 (33.3)	Fisher's =5.641
Attendant	22(24.2)	25(30.9)	p= 0.472
Nurse/midwife	11(12.1)	12(14.8)	
Laboratory technician	6(6.6)	8(9.9)	
CHOs	5(5.5)	3(3.7)	
Pharmacy technician	2(2.2)	4(4.9)	
Others	1(1.0)	2(2.5)	
Training on UP			
Yes	24 (26.4)	21 (25.9)	χ^2=0.004,df=1
No	67 (73.6)	60 (74.1)	p=0.947

LGA. Most of the respondents in the LGAs were females, 71.4% in Zaria and 81.5% in Kaduna North. A greater proportion of respondents in the LGAs were CHEWS, 48.4% in Zaria and 33.3% in Kaduna North. Majority of the respondents, 80.2% in Zaria and 69.1% in Kaduna North had post-secondary certifications/diplomas. Most of the respondents, 71.4% in Zaria and 58.0%in Kaduna North LGAs had practiced for less than 10 years. About a quarter of respondents in both LGAs

reported they had some form of training on UP. There were no statistically significant differences in the socio-demographic characteristics of respondents in the LGAs (Table I).

Table II: Observed practice of UP among study and control groups at baseline

	Study group Frequency (%)	Control group Frequency (%)	Test statistic
	(n=60)	(n=45)	
Wash hands before attending to each patient	7 (11.7)	4 (8.9)	Fisher's, p=0.754
Wash hands after attending to each patient	18 (30)	8 (17.8)	χ2=2.062,df=1 p=0.151
Wash hands after removing gloves	52 (86.7)	44 (97.8)	Fisher's, p=0.075
Dispose needles without recapping	42 (70)	35 (77.8)	χ2=2.492,df=1 p=0.288
Dispose used needles and sharps in a sharp container/box	53 (88.3)	42 (93.3)	χ2=0.795, df=1 p=0.372
	(n=6)	(n=8)	
Wear gloves when taking blood sample	5(83.3)	7(87.5)	Fisher's, p=1.000

At pre-intervention, the mean knowledge scores of respondents were 3.7 ± 3.3 and 4.6 ±3.2 in Zaria and Kaduna LGA respectively out of a maximum score of 10, (t=-1.811, df=170, p=0.0719). The mean practice scores among respondents were 33.1 ± 3.8 and 32.9 ± 3.7 in the study and control groups respectively out of a maximum of 42, (t= 0.349,df=170, p=0.728). There were no significant differences in mean knowledge and practice scores between study and control groups. At baseline, observed hand washing practice before and after each patient contact was low in both study and control groups. Observed practices regarding disposing needles into sharp containers and washing hands after removal of gloves was high in both study and control groups (Table II).

Disposing of needles without recapping was observed in 42(70%) and 35(77.8%) of PHCWs in study and control groups. Gloves were observed to be worn in 4(80.0%) and 7(87.5%) of health workers that performed venepuncture. There were no

Table III: Comparison between pre-and post-intervention mean knowledge and mean practice scores of UP among study and control groups

Mean scores	Study group Mean±SD			Control group Mean±SD		
	Pre-inter-vention level	Post-inter-vention level	Test statistic t test	Pre-inter-vention level	Post-inter-vention level	Test statistic t test
Mean knowledge score	3.7± 3.3	7.6 ±1.1	p=0.0001	4.6±3.2	4.2 ±3.2	p= 0.435
Mean practice score	33.1 ± 3.8	35.7±3.1	p=0.0001	32.9±3.7	32.6 ±3.3	p=0.594

Table IV: Comparison between pre-and post-intervention observed practice of UP among study and control groups

Observed practices	Study group			Control group		
	Pre-inter vention level Frequency (%) n=60	Post-inter vention level Frequency (%) n=45	Test statistic	Pre-inter vention level Frequency (%) n=45	Post-inter vention level Frequency (%) n=35	Test statistic
Wash hands before attending to each patient	7(11.7)	7(15.6)	χ2=0.337 df=1 p=0.562	4(8.9)	2(5.7)	Fishers p=0.691
Wash hands after attending to each patient	18(30)	14(31.1)	χ2=0.015 df=1 p=0.903	8(17.8)	8(22.8)	χ2=0.317 df=1 p=0.573
Wash hands after removing gloves	52(86.7)	39(86.7)	χ2=0.000144 df=1 p=1.000	44(97.8)	30(85.7)	Fishers p=0.081
Dispose needles without recapping	42(70)	36(80.0)	χ2=1.346 df=1 p=0.246	35(77.8)	27(77.1)	χ2=0.005 df=1 p=0.946
Dispose used needles in a sharp container	53(88.3)	42(93.3)	χ2=0.746 df =1 p=0.388	42(93.3)	32(91.4)	Fishers p=1.000
	n=6	n=5		n=8	n=8	
Wear gloves when taking blood sample	5(83.3	)5(100)	Fisher's, p=1.000	7(87.5)	8(100)	Fisher's, p=1.000

significant differences in observed practices of both groups. Health facility check list revealed that none of the PHCCs in the study group and only 1 in the control group had adequate supply of resources for the practice of Universal Precautions. Face masks, aprons, goggles and running water were not in adequate supply in most of the facilities and none of the facilities had written UP guidelines.

After the intervention, there were significant

improvements in mean knowledge scores (p=0.0001) from 3.7±3.3 to 7.6±1.1 and mean self-reported practice scores (p=0.001) from 33.1±3.8 to 35.7±3.2 among respondents in the study group, but no significant differences in mean knowledge (p=0.435) and practice scores (p=0.594) of respondents in control group before and after the intervention (Table III).

There were no statistically significant differences in observed practices of UP between study and control groups before and after the intervention [Table IV]. Availability of resources for practice of UP at baseline and end point of the study remained the same in both study and control groups.

DISCUSSION

Knowledge is a prerequisite for positive health behaviour, including the adoption of safety practices that would minimize occupational accidents and the subsequent ill health that can emanate thereof. Baseline mean knowledge scores were low in both study and control groups, majority of respondents had low levels of knowledge on UP. The low level of knowledge observed in this study has serious implications as HCWs with insufficient knowledge of UP measures would experience higher risks of exposure to blood borne pathogens and at the same time show poor compliance with UP. The low level of awareness and knowledge among the study and control groups at baseline may be due to lack of staff training on UP. This is supported by the fact that at baseline, only about a quarter of primary healthcare workers in the study and control groups had received training in UP.

Moderate overall levels of self-reported practice in both study (33.1 out of a maximum of 42 which is 78.7% of the total possible score) and control group (32.9 out of a maximum of 42 which is 78.4% of the total possible score) was similar to findings in a study in Malaysia where mean practice score was 79.5%,[21] but higher than the levels of practice found in some other studies,[9,22,23] and lower than levels found in a study in India where mean practice scores were as

high as 83.01%.[24]

There was a significant increase in the mean knowledge score from 3.7 at baseline to 7.6 (out of a maximum of 10) at end point in the study group (p=0.0001) after the training intervention, while there was however no significant change in the mean knowledge score of respondents in the control group at end point of the study (p=0.478). The findings of the study suggest that the training intervention was successful in significantly raising the knowledge of UP among the health workers in the study group. The positive impact of the training interventions on knowledge of UP was also previously demonstrated by similar studies. A study conducted in a Primary Health Care setting in the UK reported statistically significant improvement in PHCWs' knowledge of the management of occupational exposures to blood and body fluids following a training intervention.[25] Similarly, a study conducted in Ibadan reported that participants in the study group demonstrated higher levels of knowledge associated with UP (P=0.005) after a training intervention.[26] Two other studies in China also revealed nurses' mean knowledge scores on blood-borne pathogens and UP significantly increased, from 69% to 83% and 66% to 86% respectively after a training intervention.[27,28] Both studies showed that participants in the experimental group were more knowledgeable after training interventions (p=0.001).

Following the training intervention there was a significant improvement in the mean self-reported practice score on UP from 33.1 at baseline to 35.7 at end point (maximum of 42) of the study in the study group (p=0.001), while there was no significant change in the control group. Other studies have demonstrated the positive impact of the training interventions on practice of UP among HCWs. According to Huang et al's study,[28] nurses after training reported significant improvements in self-reported behaviour (p=0.001) regarding UP than nurses in the control group. In Huang's study, the

mean behaviour score of the experimental group increased from 73.2 to 83.5 (108 point scale) while that of the control group indicated no remarkable changes. Similarly, in Wang et al's study,[27] on self-reported behaviour regarding UP, the experimental group scored significantly higher than the control group (p=0.002). The experimental group's score was 66.2 whereas the control group's was 57.9 (84 maximum) at four months follow-up.

Findings from the direct observation of PHCWs showed that there was no significant improvement in observed UP practice between the study and control groups after the intervention. This is not too different from findings of a study by Wang et al[27] who related lack of improvement to observed practice UP especially regarding usage of gloves to the cost of gloves, the negative perception of using gloves because they may interfere with nursing procedures or lead to patients' complaints and inadequate organizational safety culture or policies. This was in contrast to the study by Huang et al,[28] which reported significant improvements in all parameters of observed practice. The lack of significant improvement in observed UP practice in this study contrasted with that of the self-reported UP practice of the HCWs, which showed significant improvements in the study group after the intervention. This could be due to HCWs over reporting on practices they had learned in the training. Lack of available resources for the practice of UP could also be responsible for lack of improvement in observed practice in the study group after the intervention as supported by findings from the facility check list that showed inadequate supplies and equipment for practice of UP even after the intervention.

CONCLUSION

Primary Health Care Workers in the study and control groups had low levels of knowledge about Universal Precautions at pre-intervention. The levels of self-reported practice of Universal Precautions were moderate and levels of observed hand washing practice were low among the Primary Health Care Workers in the study and control groups at pre-intervention. The training intervention significantly improved the knowledge and self-reported practice of Universal Precautions among Primary Health Care Workers of the study area.

RECOMMENDATIONS

In the light of the findings of the study it is recommended that:

1. There is a need for management of the PHCCs to support and make provision for periodic training on UP for all the categories of staff in the PHCCs to update and improve their knowledge and practice.

2. We recommend that UP guidelines should be made available to PHCWs in all PHCCs to remind them to incorporate UP into their routine daily practices.

3. Efforts should be made by the management of the PHCCs to ensure availability of supplies and equipment required to enable adherence to UP and promote a safety culture.

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