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Effectiveness of training program on attitude and practice of infection control measures among nurses in two teaching hospitals in Ogun State, Nigeria

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Abstract:

BACKGROUND: Infection control has become a major concern in the health-care system and health-care workers, particularly nurses are at high risk of infection. This study, therefore, examined the effect of a training program on attitude and practice of infection control among nurses in two tertiary hospitals in Ogun State, Nigeria.

MATERIALS AND METHODS: This study adopted a pretest–posttest quasi-experimental design. The sample consisted of 87 participants. The experimental group consisted of 42 registered nurses from Babcock University Teaching Hospital, Ogun state, Nigeria, while the control group consisted of 45 registered nurses from Olabisi Onabanjo University Teaching Hospital, Sagamu, Nigeria. The instrument for data collection was attitude toward components of infection control questionnaire ($r = 72$) and practice of infection control questionnaire ($r = 76$). Data were analyzed using SPSS version 21.0 (SPSS Inc. Chicago IL, USA).

RESULTS: Findings showed that the mean age in the experimental group was 34.92 ± 8.9 while the control group was 47.43 ± 6.6. The average years of experience for the experimental group were 10.42 ± 9.9 while that of the control group were 21.89 ± 8.7. Responses on attitude showed that 30 participants (69%) had positive attitude in the experimental group compared to 21 participants (46.7%) in the control group. The mean difference was 4.02. Significant difference was observed between mean attitude score of participants in the experimental group and control group ($P = 0.03$), between mean practice score ($P = 0.001$), and between self-reported and observed practices ($P = 0.000$).

CONCLUSION: The training was effective in improving attitude and practice of infection control. Adequate provision of structured training programs on infection control measures is recommended.

Keywords:

Attitude, infection control, practice, training program

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Introduction

Background to the study

Infection control is an aspect of health-care delivery that deals with the curtailment of the spread of infection within the health-care setup, be it from patient to patient, patient to staff, staff to patient, or staff to staff. According to the World Health Organization (WHO),[1] health-care workers generally are at risk of infection because they constantly come into contact with infected materials such as tissues, fluid, blood, and blood products. Based on the WHO report,[1] health-care-associated infection

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is a major global safety concern for both the patients and caregivers. The situation of health-care-related infection in developing countries has been estimated to affect 5%–15% of hospitalized patients[2] and up to 50% of patients in the critical care units.[3] In Nigeria, specifically, the rate of health-care-associated has been reported to be high.[4]

In a study conducted by Jain *et al*.[5] on infection control practices among doctors and nurses in a tertiary hospital in India, it was found that there was a lack of knowledge and practice regarding basic infection control.

In a similar study by Sharma and George,[6] involving 130 nurses, it was found that the staff nurses had good knowledge of standard precautions but low practices of the same; in this study, knowledge was found to be associated with practices. van der Berg and Daniels,[7] in their study among undergraduate nursing students in South Africa, found that there was a lack of knowledge regarding standard precautions and self-practice of standard precautions was poor. They concluded that there is a need for an organized training program on standard precaution as well as ensuring its compliance for the safety of all. Kotwal and Taneja[8] found that compliance with standard precautions among their participants was poor. Some of the reasons for noncompliance with standard precautions were too busy, it may offend patients, and my colleagues do not use it. They concluded that these attitudinal problems needed to be addressed because of the risk nonadherence poses to the society at large. In a similar study by Adejumo and Olatunji,[9] they found from their study that 87.6% of their respondents had experienced sharp injury at work. The causes of sharp injury range from noncompliance with recommended procedures and personal behavioral risks. There is a need for competency and up-to-date attitude in the caring role to minimize and promote infection control. This study, therefore, focuses on attitude and practice regarding infection control measures among nurses in two teaching hospitals in Ogun State, Nigeria.

Theoretical/conceptual framework-precede model

The acronym "precede" stands for predisposing, reinforcing, enabling, constructs in educational diagnosis, and evaluation. For long, the Precede Model developed by Green *et al*.[10] has served as a conceptual framework in health education plans aimed at diagnosing the health problems of a community, understanding the factors that influence the people's behavior, and developing interventions to promote healthy behavior. The "precede" model has four phases. This study considered the educational diagnostic components of the model to conceptualize the behavioral problem involved with nonadherence to the components of standard precautions. The intervention designed addressed the following: importance of infection control and components of standard precautions; transmission-based precautions; handwashing, patient care equipment, decontamination, cleaning, and sterilization; personal protective equipment (PPE); injection safety and handling sharps; and health-care waste management. The method of teaching involved lecture, demonstration, discussion, and use of visual aids. The intervention produced concern-arousing and action-stimulating impetus for participants' involvement and commitment that is essential to promote adherence to standard precautions.

This study considered the educational diagnostic components of the model which include predisposing factors, enabling factors, and reinforcing factors. The predisposing factors include level of knowledge, attitudes, and perceptions of participants about components of standard precautions. Enabling factors include acquisition of skills through the intervention and provision for requirements used for standard precautions such as water, antiseptic lotions, safety boxes, and PPE.

Reinforcing factors include supervision by hospital infection control nurses, benefits of adherence to standard precautions. Once the factors that influence human behavior have been focused and addressed in the intervention, the participants would be able to carry out the procedures adequately and adhere to infection control measures. This would reduce the risk of transmission of blood-borne and other pathogens in the hospital.

Materials and Methods

This study was carried out between January and June 2017. This study used pretest–posttest quasi-experimental design. This design was considered appropriate because the collection of baseline data allowed the researcher to be relatively confident inferring that posttest differences occur as a result of the intervention.[11] The population for this study included registered nurses in the two teaching hospitals in Ogun State, Nigeria. The inclusion criteria comprised the following: selection of nurses at different cadre from each ward/unit; nurses on the morning, afternoon, and night duties that were willing to participate; and nurses working at the site clinic that were willing to participate. Exclusion criteria include nurses who have been trained on infection control. Simple random sampling technique was used to select the experimental group and control group. The total number of nurses that met the inclusion criteria for the experimental group and control group was 125 and 190 participants, respectively.

The sample size is calculated using Kish's (1995) formula.

$$N = \frac{\left(Z_{\alpha} + Z_{\beta}\right)^2 \times 0.5 \times 0.5}{(0.3)^2}$$

The proportionate stratified random sampling technique was then used to select the participants. Thirty-five percent of the nurses in each ward or unit were used for the selection of the experimental group while 24% of nurses in each ward or unit were used for the selection of the control group. The reason for the disparity was because the two teaching hospitals did not have the same number of nurses. Moreover, the experimental group has 232 beds while the control group has 300 beds. Moreover, it would allow the researchers to have the same number of participants for both experimental group and control group. Based on the proportion above, both the experimental intervention group and the control group were 45 participants each.

This study made the use of self-report questionnaire developed by Askarian; Mclaws and Meylan,[12] Wang,[13] and Li and Wany,[14] with the instrument for eliciting responses on modifications. The instrument for eliciting responses on practices has a reliability value of 0.93 using Cronbach's alpha (R). The instrument consisted of five sections: A, B, C, D, and E. Section A elicited responses on demographic variables of participants such as age, gender, marital status, and educational qualification among others. Section B elicited information on participant's attitudes toward standard precautions. The items were developed by the researchers. The total number of items was II. Modified Likert's scale was used. This includes strongly agree, agree, disagree, and strongly disagree.

The maximum possible score was 44. Low score (1–21) signifies negative attitude and high score (22–44) signifies positive attitude. Section C elicited information participants' practice of standard precautions. The items were 19 in number. The questionnaire elicited responses on practice of handwashing, PPE, injection safety as well as cleaning, disinfection, and waste management. The response column of the questionnaire was modified into a scale of 0–3 points; O = never, 1 = seldom, 2 = sometimes, and 3 = always. High score signifies excellent practice, while low score signifies poor practice. The mean practice score for the experimental group and control group were compared. Section D elicited information on participant's exposure/injury experiences. Section E was the observation checklist for the practice of standard precautions. The responses columns were the same as in Section D. The items were 21 in number, and the highest possible score was 63. The essence of this checklist was to compare the self-report questionnaire on practice with the observed practice.

The questionnaire was pretested on 20 nurses at another teaching hospital in a different state in the southwestern region of Nigeria. The data collected were used to estimate the reliability of the instrument using Cronbach's alpha (R) to bring out the internal consistency and construct validity of the instrument. The Cronbach's alpha values for attitude and practice were found to be 0.72 and 0.76.

The nurses in charge of each ward/unit of the experimental group were informed about objectives, and course of the study they were told to inform the nurses on their wards/units about the training program and the objectives of the study and to compile the list of participants that would be interested based on the inclusion and exclusion criteria discussed earlier. They were also told that they would serve as research assistants that would administer the observation checklist to the participants in the experimental group postintervention. The control group was also visited, but they were not exposed to any training program.

In the intervention sessions, the participants were exposed to four modules. Each module was held once in a week and lasted for four consecutive weeks. The details of the training comprised the following.

First week: The researchers met the experimental group as scheduled. The researchers introduced communicated the objectives of the training programs and the nature of the study and also encouraged participants to be present for all the training modules. Written consent was obtained from the participants. Pretest questionnaire was administered. This was followed by the content of Module 1 which includes the importance of infection control, chain of infection, and components of standard precautions. The session lasted for 90 min. The method of teaching includes lecture, demonstration, and use of visual aids.

Second week: They were exposed to contents of Module 2 which consisted of hand hygiene, patient care equipment, and preparation of different strengths of hypochlorite solution from JIK (3.5%). The researchers visited the control group. No training was given to the participants. The researchers went to various wards/units to meet the participants. The objectives of the study were communicated to them. Interested participants were given the written consent form to complete. This was followed by the administration of the pretest questionnaire and the same was collected on the spot after completion. Participants were also informed that they would complete the posttest questionnaire after 4 weeks.

Third week: They were exposed to contents of Module 3 which consisted of PPE.

Fourth week: They were exposed to the contents of Module 4 which consisted of injection safety and health-care waste management. They were told to come back after 2 weeks for posttest which was the same as pretest.

Evaluation of intervention session was done 2-week postintervention. All the participants were given the posttest to complete and they were collected immediately. The researchers also visited the control group in their various wards/units to administer the posttest and were collected immediately. The completed questionnaire was collected, coded, and analyzed. Descriptive statistics such as frequency counts, percentages, tables, mean scores, and standard deviation were used to analyze demographic data of participants and research questions. Inferential statistics of *t*-test were used to test the two hypotheses generated at 0.05 level of significance.

Ethical approval for this study was obtained from the two teaching hospitals. The participants were assumed of confidentiality of the data collected that it was for research purposes. Participants' anonymity was ensured. The participants were assured of no harm and that the training would improve their knowledge about infection control.

Results

All the participants that took part in the pretest also took part in the posttest. The results of data analysis are presented in tables.

Table 1 shows that the mean for age in the experimental group was 34.92 and standard deviation (SD) 8.99 while the control group was 47.43 and SD 6.60. There were more females in the control group than the experimental group. The control group had higher mean years of experience than the experimental group.

In the postintervention, Table 2 shows that in the experimental group, 30 participants (69.0%) had positive attitude compared to 21 participants (46.7%) in the control group. Mean difference for the experimental group was 4.02, while in the control group, it was 1.67. This indicates that the training has effect on participants' attitude.

The result in Table 3 shows that $t = 3.83$, df = 85, $P = 0.03$. This indicates that there is a significant difference in the mean attitude score of infection control between experimental group and control group.

The results in Table 4 shows that $t = 3.414$, df = 85, and $P = 0.001$. This indicates that there is a significant difference in the mean practice score of infection control between experimental group and control group. Hence, the null hypothesis is rejected.

The results in Table 5 show that $t = 7.877$, df = 82, and $P = 0.000$. This indicates that there is a difference between self-reported and observed practices of infection control in the experimental group.

Table 1: Demographic data of participants

Variables	Category	Experimental group (*n*=42), frequency (%)	Control group (*n*=45), frequency (%)
Age (years)	24-29	13 (31.0)	-
	30-35	14 (33.3)	2 (4.4)
	36-41	8 (19.0)	6 (13.3)
	42-47	3 (7.1)	14 (31.1)
	48-53	1 (2.4)	14 (31.1)
	54-59	2 (4.8)	9 (20.0)
	60 and above	1 (2.4)	-
	Total	42 (100.0)	45 (100.0)
	Mean±SD	34.92±8.99	47.43±6.60
Gender	Male	9 (21.4)	2 (4.4)
	Female	33 (78.6)	43 (95.6)
	Total	42 (100.0)	45 (100.0)
Marital status	Single	16 (38.1)	-
	Married	24 (57.1)	43 (95.6)
	Widowed	2 (4.8)	2 (4.4)
	Total	42 (100.0)	45 (100.0)
Religion	Christianity	41 (97.6)	40 (88.9)
	Islam	1 (2.4)	5 (11.1)
	Total	42 (100.0)	45 (100.0)
Years of experience	1-5	16 (38.1)	3 (6.7)
	6-10	15 (35.7)	2 (4.4)
	11-15	2 (4.8)	5 (11.1)
	16-20	2 (4.8)	8 (17.8)
	21-25	2 (4.8)	9 (20.0)
	26-30	2 (4.8)	10 (22.2)
	31-35	1 (2.4)	8 (17.8)
	36 and above	2 (4.8)	-
	Total	42 (100.0)	45 (100.00)
	Mean±SD	10.42±9.95	21.89±8.72
Educational qualification	RN only	1 (2.4)	-
	RN, RM	12 (28.6)	23 (51.1)
	B.NSC	21 (50.0)	11 (24.4)
	M.SC	2 (4.8)	3 (6.7)
	Others	6 (14.3)	8 (17.8)
	Total	42 (100.0)	45 (100.0)
Position	NO II	27 (64.3)	4 (8.9)
	NO I	4 (9.5)	1 (2.2)
	SNO	4 (9.5)	2 (4.4)
	PNO	2 (4.8)	9 (20.0)
	ACNO	2 (4.8)	4 (8.9)
	CNO	2 (4.8)	25 (55.6)
	Assistant Director	1 (2.4)	-
	Total	42 (100.0)	45 (100.0)

SD=Standard deviation

Table 2: Descriptive statistics showing pre- and postintervention of responses of participants' attitudes toward infection control in the experimental group and control group

Attitude toward infection control	Preintervention		Postintervention	
	Experimental group, frequency (%)	Control group, frequency (%)	Experimental group, frequency (%)	Control group, frequency (%)
Negative	30 (69.0)	32 (71.1)	12 (31.0)	24 (53.3)
Positive	12 (31.0)	13 (28.9)	30 (69.0)	21 (46.7)
Total	42 (100.0)	45 (100.0)	42. (100.0)	45 (100.0)
Mean	35.28±3.18	34.35±4.76	39.30±4.56	36.02±3.49
Mean difference	4.02			1.67

Table 3: *t*-test showing differences between the mean attitude score of participants in the experimental group and control group

Variable	*n*	df	Mean±SD	*t*	*P*	Remark
Experimental group	47	85	39.3±4.56	3.83	0.03	Significant
Control group	45		36.2±3.49			

SD=Standard deviation

Table 4: *t*-test showing differences between the mean practice score of participants in experimental group and control group

Variables	*n*	df	Mean±SD	*t*	*P*	Remark
Intervention	42	85	53.19±3.79	3.414	0.001	Significant
Control	45		47.49±10.18			

SD=Standard deviation

Table 5: *t*-test showing differences between self-reported and observed practices of infection control in the experimental group

Variables	*n*	df	Mean±SD	*t*	*P*	Remark
Self-reported	42	82	59.286±3.278	7.877	0.000	Significant
Observed	42		53.191±3.795			

SD=Standard deviation

Discussion

Demographic data of participants

Due to the current economic recession in the country, only few young nurses were employed. This accounted for the distribution of nurses according to their age and years of experience. On gender, in the experimental group and control group, the percentage of females was 78.6% and 95.6%, respectively. This distribution may be due to the fact that there is preponderance of women in nursing profession.

Both experimental group and control group have nurses with higher degrees in different specialty areas. This may be due to the fact that both hospitals were tertiary health facilities where they require the services of nurses in various specialty areas to meet the needs of the hospitals as training institutions.

Training program and attitude of participants

The findings of this study on attitude toward infection control show that in the postintervention of the experimental group, 30 participants (69.0%) had positive attitude compared to 21 participants (46.7%) in the control group. The mean difference for experimental group was 4.02, while in the control, it was 1.67. This indicates that the training is effective in improving participants' attitude in the experimental group. Furthermore, results also revealed significant differences in the mean attitude score between experimental group and control group.

This finding supports previous study by Razaee *et al*.,[15] in a study conducted among medical students, in which the results showed that the training program improved knowledge, attitude, and performance of hand hygiene practices in short and long time. This finding is consistent with the findings of Hong and Jang,[16] who investigated the effect of handwashing education program on knowledge, attitude, and performance of handwashing among prepracticum nurses. They found that the experimental group showed a significant increase in their attitude and performance of handwashing after the intervention. The result is also similar to a study which assessed the effect of training on hospital waste management by Sharma and George.[6] It was found that the training program increased the knowledge as well as the sense of responsibility resulting in change in attitude and practice toward hospital waste management which is a means of controlling infection.

Training program and practice of participants

The hypothesis testing revealed that $P = 0.001$. This indicates that there is a significant difference in the mean practice score of infection control between participants in the experimental group and control group. Hence, the null hypothesis is rejected in favor of alternative hypothesis, and the researcher concluded that there is a significant difference in the mean practice score of infection control between experimental group and control group. This result is in agreement with the findings of Taha,[17] in which the training program is effective in increasing nurse midwives' application of standard precautions during labor. Before the training, the mean score for applying standard precautions was 40.9%; but after the training program, the mean score rose to 52.2%.

The finding supports previous study by Temesgen and Demissie,[18] in which the participants that received in-service training on infection control had good practice and more knowledgeable than those who were untrained. The researchers also concluded that training on tuberculosis infection control was a predictor of good knowledge and knowledge was a predictor of good practice.

The hypothesis testing shows that there is a significant difference between self-reported practice and observed practice of infection control in the experimental group. This is because the mean score of self-reported practice was higher than that of observed mean practice. It could be deduced that the participants rated themselves higher, but the observed rating was more objective because it was done by the research assistants.

From the discussions, it could be seen that the importance of training and retraining cannot be overemphasized for instance; Nwozichi *et al*.[19] reported that training program was effective in enhancing knowledge about Ebola virus disease. Suchitra and Lakshim Devi,[20] in their study conducted in India, on impact of education on various categories of health-care workers' knowledge, attitude, and practices on health-care-associated infection observed that with the progress of time, there was decline in the scores of participants in their study when the postintervention assessment was carried out. Immediately, after the intervention, there was an increase in the number of participants having good and excellent performance. However, after the exposure of participants to the training modules, the questionnaires were administered postintervention at intervals of 6, 12, and 24 months, and a decline in score was observed. This showed that in the course of time, people tend to forget what they have learned, and thus, it means that there is a need for retraining and reawakening. In consonance with the findings of this study, Nwozichi also reported that training program is effective in enhancing the knowledge of testicular cancer and testicular self-examination among students.[21]

There are some factors that are responsible for the decline in the score of participants or factors that made them to forget what they learned. Green *et al*.,[10] in the precede model which is the framework for this study, classified the factors into three as follows: predisposing, enabling, and reinforcing. These factors influence human behavior. Predisposing factors include level of knowledge, attitudes, and perceptions of participants about infection control. It was the training program that made the experimental group to have a mean gain of 4.02 on attitude in Tables 2 and 5 and 70 on attitude in Table 3. Enabling factors include acquisition of skills through the training program. The skills acquired include handwashing, donning and doffing of PPE, preparation of different strengths of hypochlorite solution using JIK 3.5%, injection safety, cleaning decontamination and sterilization, and health-care waste management. Provision of requirements used for infection control such as water antiseptic lotions, PPE, and safety boxes are among the enabling factors. Reinforcing factors refer to influences that the significant others have on people's behavior. Reinforcing factors may include social rewards, incentives, or punishment as well as supervision by the infection control nurse.

When all the factors are addressed in the training program, this would lead to infection risk reduction which was the researchers' experience in this study.

Limitations

There was three participants' mortality in the experimental group. Due to the nature of the study, a small sample size was used. The small sample size has reduced the generalizability of the findings. Therefore, a similar study should be conducted among registered nurses in other teaching hospitals in Nigeria, to get the general picture as regards the effect of a training program on infection control practices in Nigerian health institutions.

Conclusion

A structured training program is effective in improving nurses' knowledge and perception about infection control. Findings from this study showed that after the training, nurses' attitude and practice toward infection control were enhanced. This study has shown that training program is very effective and all nurses should be exposed to infection control training to equip them with necessary knowledge and skills with which to fight against spread of infection in the health-care setting. Health-care administrators should see the need to make policies that are engendered to enhance the working conditions of the nurse and provide necessary training needed to ensure that infection control practices are upheld. A similar study should be conducted on other category of health workers in the two teaching hospitals.

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Conflicts of interest

There are no conflicts of interest.

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