Effect of health education on knowledge and practices of infectious disease prevention among primary school teachers in Kware, Sokoto, Nigeria

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Abstract

Infectious Disease (ID) knowledge and prevention practices are key elements that ensure the students' health and well-being while in school. The students' health faces many challenges, even more so in the developing world, especially in school premises where pupils live in close proximity. Teachers are the role model of the pupils while in school, therefore, they may play a central role in ensuring the pupils' health. This research assessed the knowledge and practices of teachers and the effect of Health Education (HE) intervention on ID prevention in schools. A non-randomized, quasi-experimental study was conducted, using the consecutive sampling method. Data were collected using a structured self-administered questionnaire. Fifty-five participants were enrolled at the start, but only 50 participants completed the study. Data were analyzed using IBM SPSS version 23. The majority demonstrated poor knowledge before the intervention and, after the intervention, there was a knowledge gain from 14.5% to 98%. The practices of ID prevention in schools were poor due to other influences, such as the availability of facilities to put knowledge into practice. The primary school teachers had poor knowledge and practices on ID prevention in schools. The HE intervention yielded a statistically significant knowledge gain**.** Knowledge alone, however, is not enough for adequate practices, as most schools lack the facilities to foster ID prevention practices**.** The study suggested that the training of teachers on HE should be upheld. However, ID prevention practices can only be sustained by a commitment from the school management, and from the government through the provision of infrastructure.

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Key words: Infectious diseases prevention, health education intervention, risk factors, prevention, practices, school teachers.

Acknowledgments: The authors would like to express their appreciation for all who participated in the present study.

Funding: None.

Conflict of interest: The authors declare no potential conflict of interest.

Availability of data and materials: Data are available from the corresponding author upon reasonable request.

Ethics approval and consent to participate: Ethics approval was issued from the Usmanu Danfodiyo University Teaching Hospital (UDUTH/HREC/2018/N0. 749), the Ministry of Health (SMH/1580/V.IV), as well as from the local government health project sector to gain access to the school authorities. Permission was also obtained from the headmasters of the various primary schools to allow their teachers to participate in the study.

Informed consent: Consent forms were given to all the participating teachers.

Received for publication: 29 August 2022.
Accepted for publication: 7 November 2022.

Annals of Clinical and Biomedical Research 2022; 3:236
doi:10.4081/acbr.2022.236

Introduction

A large fraction of the world's illnesses and deaths are attributable to communicable diseases.[1] Sixty-two and thirty-one per cent of all deaths in Africa and Southeast Asia, respectively, are caused by Infectious Diseases (ID).[2]

The occurrence and severity of hygiene-related outbreaks in endemic areas are greatly enhanced by human behavior, with regard to practices of health hygiene.[3]

Epidemics or outbreaks of ID in schools not only affect teaching order, resulting in an adverse social effect, but also negatively affect the physical and mental health of young people.[4,5] Schools have reportedly been implicated in the spread of ID, especially gastrointestinal ones, high among primary school children.[6-9]

The mere provision of water supply and sanitation facilities is not enough to bring down morbidity and mortality rates;[10] water and sanitation facilities linked with hygiene behavior, though, have proven to be effective in reducing diarrheal diseases.[11]

Ill health brings about school absenteeism, leading to poor performance in class and hence reduced academic productivity of the

child. Not only that, a sick child is a potential source of diseases and outbreaks both within the school premises and outside, as many parents send their children to schools even when ill, and the spread of diseases travels very fast in the school setting.[12]

Disease prevention is closely linked to education.[13] Good health and good education are not only ends in themselves, but also means which provide the necessary tools for individuals to lead productive and satisfying lives, knowing that the child's ability to attain her or his full potential is directly related to the complementary effect of good health, good nutrition, physical activity and quality education.[14]

Children and youth are regarded as priority populations. The national development depends on the academic success and optimal health and well-being of its children and youths. Schools are important settings for comprehensive health promotion, as they exert the most influence on the lives of children and youth and, by extension, on the health and well-being of families and communities as well.[13] A study by Jourdan *et al*. on practices and representation of Health Education (HE) among primary school teachers showed that teachers in primary schools could implement an effective HE program for school children.[15] In a related study on HE of teachers in schools, Jourdan[16] showed that the training of primary school teachers mostly uses a common national framework, based on official texts that state the non-subject educational commitments of the school, in particular HE and education in environmental issues and sustainable development. Additionally, they showed that health and prevention are issues that call upon the professional competence of teachers.[16] Numerous empirical studies also showed that HE can change unhealthy attitudes and behaviors, effectively curbing ID and epidemics.[17,18] Previous hand hygiene studies have indicated that children with proper hand-washing practices are less likely to report gastrointestinal and respiratory symptoms.[19,20] Hand washing with soap has been reported to reduce diarrheal morbidity by 44%, and respiratory infections by 23%.[2] However, globally, the rates at which hands are washed with soap range from 0% to 34% of the time.[21] A study conducted by the Global Public–Private Partnership for Hand Washing (PPPHW), which included several sub-Saharan African countries (*i.e.* Kenya, Senegal, Tanzania, and Uganda), reported that only 17% of participants washed their hands with soap after using the toilet, while 45% used only water.[22] Furthermore, hygiene practices heavily influenced the students' knowledge and attitude towards hygiene, even in the setting of adequate resources and facilities.[22] A study was conducted in Senegal to investigate the reasons for the lack of hand washing in schools, and the findings included stubbornness, laziness, the rush to go to break, the time it takes away from playing and the dirt and smell of the toilets.[23] A national study on the school health system in Nigeria, conducted by the Federal Ministries of Health and Education, revealed that only 14% of headmasters indicated that pre-enrolment medical examination was mandatory in schools.[24] They revealed that the most common health conditions that contributed to absenteeism included fever (56%), headache (43%), stomachache (29%), cough/catarrh (38%) and malaria (40%).[25,26] To the best of our knowledge, no study on this subject was done previously in the Northern part of Sokoto. For this reason, we aimed to study the effect of HE intervention on the knowledge and practices of ID prevention among primary school teachers in Kware, Sokoto, Nigeria. The findings of the study will facilitate the formulation of channels through which the school pupils, government, school board and teachers put heads together in promoting health and preventing ID among the inhabitants of the school.

Materials and Methods

Study area

The Kware Local Government Area (LGA) is located in Sokoto State, with headquarters in Kware town. It is located in the Sokoto South senatorial district alongside Tangaza, Binji, Silame, Gudu, Wamakko, Sokoto North local government areas. The Kware local government area also forms a federal constituency alongside the Wamakko local government area.

It was established in July 1989, with an area of 554 km^2 and a population of 113,899 (2006 census). The projected statistics of 2019, using geometric progression, were:

$$P_t=P_0(1+r)^t$$

where:

P_t = projected population
P_0 = present population
r = common ratio

$$P_t(2019)=134,084(1+0.03)^{13}$$
$$P_t=134,084(1.03)^{13}$$
$$P_t=196,907$$

Hence, the projected population of Kware LGA in 2019 is 196,907.

The population of children in the LGA could not be found; however, the overall population for age under 15 years made up 1,759,317 (census 2006).

Study population

The study population comprises primary school teachers within Kware, Sokoto State, Nigeria.

Sampling technique

A non-randomized, one-group quasi-experimental study, using a consecutive sampling method was conducted among primary school teachers of the Kware community, in Kware town. All 55 school teachers in the district were selected and recruited after satisfying the eligibility criteria.

Inclusion criteria

Primary school teachers with at least 6 months of teaching experience, willing to participate, signing the consent and teaching within the study area were included in the study.

Exclusion criteria

Teachers with less than 6 months of experience, not teaching within the study area, or who failed to consent were excluded from the study.

Sample size determination

The minimum sample size shall be determined using the formula:

$$n=\frac{Z(1-\alpha)\sqrt{po(1-Po)}+zB\sqrt{P1(1-p1)}2}{(P1-P0)^2}$$

where:
n = minimum sample size
Z(1-α) = standard normal deviation at the significant level of 5%
ZB = one-sided percentage point of the normal distribution corresponding to 100% - the power of the study taken as 80%, hence 100-80 = 20%
Po = Null hypothesis proportion = 62% = 0.62 (from a previous study)[15]
P1 = alternative hypothesis proportion

=62%+20%
82%=0.82

P1–P0 = the differences in the expected increase in proportional of subject with adequate knowledge of health

0.82–0.62=0.20

Now substituting the values:

$$N=\frac{Z(1-\alpha)\sqrt{Po}(1-Po)+ZB\sqrt{P1}(1-P1)2}{(P1-P0)^2}$$

$$n=\frac{1.96\sqrt{0.62(1-0.62)}+0.84\sqrt{0.82(1-0.82)}}{(0.82-0.62)^2}$$

$$=\frac{1.96\sqrt{0.2356}+0.84\sqrt{0.1476}}{(0.2)^2}$$

$$n=\frac{(0.9514+0.3841)^2}{0.04}$$

n=44.6=45

Attrition rate is taken as 10% *i.e.* respondents 90% anticipated. The final sample size to be selected = 45/0.9 = 50 subjects.

Sampling technique

Fifty-five participants were calculated to be enrolled into the study. They were selected by a non- random selection based on availability and eligibility. The selection was performed from the 5 schools available in the district of Kware town in the LGA. All 55 eligible participants were selected using the consecutive method.

A structured self-administered questionnaire, pre-tested in a different primary school in Sokoto, Ibrahim Dasuki Primary School, was administered to the study participants, following self-completion of responses, the intervention was rendered in the form of "health education". After the intervention, an interval of 4 months was observed, following which the post-intervention self-administered questionnaire, containing the same set of questions as in pre-intervention, was answered by study participants.

Research assistants

The research assistants comprise of two members of the health personnel from the Comprehensive Health Centre Kware (senior community health officer and senior record officer). They were adequately trained on the study designs and methods.

Data analysis

Data were processed and analyzed using IBM Statistical Package For Social Sciences (SPSS) version 23. Descriptive results were presented as tables, the relationship between variables was tested using the chi-square test for categorical variables, and p values <0.05 were taken as significant.

The questionnaire (adopted from a previous study)[15] was checked for completeness and accurate entries. Data processing was done using the SPSS version 23. Frequency runs were done for further editing and cleansing of the e-data. Frequency distribution tables were constructed, and cross-tabulations were done to examine the relationship between categorical variables. Knowledge scores were graded as good knowledge and poor knowledge based on the number of variables. Pre-intervention and post-intervention results were also compared using the cross table, after the coding and recoding of variables.

A summary measure of central tendencies and dispersions was used for quantitative variables, knowledge grading was analyzed using univariate analysis (mean and Standard Deviation, SD). Knowledge score was analyzed using Pearson chi-square.

Scoring and grading of respondents' knowledge and types of infectious diseases, risk factors and methods of prevention

The investigator devised scoring and grading of responses on knowledge of infectious disease. One point was awarded for each correct response, and zero for each wrong response or non-response. Respondents scoring less than 50% on the knowledge of infectious disease type, risk factors and prevention methods were graded as having poor knowledge. In comparison, those with scores of 50% or more were graded as having good knowledge.

Results

Fifty teachers participated fully in this interventional study, out of the 55 enrolled at the pre-survey. The ages of the respondents ranged from 18 to 62 years (mean=35.11; SD=9.7). The majority of the respondents, 47 (85.5%), were males, more than half, 49 (89.9%), were Muslims, and less than a quarter, 32 (58.2%), were married.

The pre-intervention survey revealed the majority, 45 (81.8%), of the 55 respondents had attained the tertiary level of education. Most of the respondents, 43 (78.2), were academic staff, with most teachers, 37 (67.3), teaching art subjects. The duration of the working experience of the respondents ranged from 1 to 35 years (mean=3.89 and SD=1.718). A good proportion of the respondents, 17 (30.9%), have worked for more than 12 years, and 15 (27.3%) have worked for 1-3 years, while only 5 (9.1%) have worked for

more than 10-12 years. Table 1 shows the sociodemographic features.

Pre and post-interventions results

Table 2 showed an evident knowledge gain in some of the areas tested, which were all statistically significant, except for the knowledge gain for malaria. Overall knowledge gains from 14% to 96% were recorded.

Table 3 revealed a moderate gain in knowledge, which was statistically significant for all the parameters tested, except for food vendor hygiene, which shows a minimal gain in knowledge.

Table 4 showed statistically significant findings only in 4 areas among the tested ID prevention methods. However, good knowledge was recorded before and after the intervention, *i.e.* 89.1% and 100% respectively.

Table 5 revealed the respondents' practices of infectious disease prevention in schools: ensuring a good quality water supply was the most practiced method, 83.6%. The values appear to drop in most areas. The findings are not statistically significant.

Table 6 showed the multivariate analysis, and the results appeared not statistically significant except for religion, although with a negative association, as with the other socio-demographic variables.

Discussion

From this study, most teachers were revealed to have poor knowledge (14.5%) of types of infectious diseases common to their school community. They only showed good knowledge in a few areas, and findings are similar to a previous study by Hussein *et al*., where they reported teachers' knowledge about communicable diseases being very poor and deteriorating.[27] In this study, the lack of knowledge displayed was attributed to a lack of in-depth HE exposure by these teachers. In the current study, the majority teaches art subject, which further reduces their chance of improving their knowledge in science courses. The teachers were not being exposed to HE workshops often, and the attendance of seminars was also lacking. The education intervention yielded a robust increase in knowledge gained by the teachers. They had a good knowledge score of 96% and the test was statistically significant. This score was higher than what was obtained from the study conducted in Myanmar in 2013, where 62.9% of teachers had good knowledge of school health services, which included disease prevention knowledge.[13]

As revealed in other studies, knowledge of risk factors of ID was good both pre and post-intervention, however, in the current study, knowledge scores of 82.4% to 98% respectively were observed. Scores were much higher than in the Kurdish study findings, where the majority had a knowledge of the risk of communicable diseases of 66%. On the risk factors of ID at baseline and after the intervention, the respondents gained little more knowl-

Table 1. Socio-demographic characteristics of respondents.

Variables	Frequency (n=55)	Percent (%)
Age group (years)		
≤25.0	9	16.0
25.1-35.0	29	52.7
36.1-45.0	10	18.2
46.1-55.0	14	7.3
≥55.1	3	5.5
Sex		
Males	47	85.5
Females	8	14.5
Religion		
Islam	49	89.1
Christianity	6	10.9
Marital status		
Single	23	41.8
Married	32	58.2
Level of education		
Quranic only	1	1.8
Primary	1	1.8
Secondary	8	14.5
College of education	12	21.8
Polytechnic	14	25.5
University	19	34.6
Work description		
Academic staff	43	78.2
Non-academic staff	5	9.1
Both	7	12.7
Subjects taught		
Sciences	18	32.7
Art	37	67.3
Working experience (years)		
≤1	2	3.6
1–3	15	27.3
4–6	9	16.3
7–9	7	12.7
10–12	5	9.1
≥13	17	30.9

Table 2. Effect of intervention on the respondents' knowledge of infectious diseases in schools (correct responses). Knowledge gain was evident in some areas tested which were statistically significant, except for knowledge gain for malaria. Overall knowledge gains from 14%-96% were recorded.

Variables	Pre-intervention (n=55) frequency (%)	Post-intervention (n=50) frequency (%)	Test of significance
Malaria	36 (65.5)	32 (64.0)	X^2=0.024, p=0.876
Catarrh	5 (9.1)	39 (78.0)	X^2=51.085, p<0.001
Cough	9 (16.4)	40 (80.0)	X^2=42.614, p<0.001
Skin infection	16 (29.1)	43 (86.0)	X^2=34.457, p<0.001
Urinary tract infection	3 (5.5)	40 (80.0)	X^2=60.187, p<0.001
Diarrheal diseases	6 (10.9)	41 (82.0)	X^2=53.533, p<0.001
Knowledge grade	**Pre-intervention (n=55) frequency (%)**	**Post-intervention (n=50) frequency (%)**	**Test of significance**
Good knowledge	8 (14.5)	48 (96.0)	X^2=69.818, p<0.0001
Poor knowledge	47 (85.5)	2 (4.0)	

Table 3. Effect of intervention on respondents' knowledge of risk factors of infectious diseases in schools (correct responses).

Variables	Pre-intervention (n=55) frequency (%)	Post-intervention (n=50) frequency (%)	Test of significance
Overcrowding	34 (61.8)	46(92.0)	X^2=11.170, p<0.001
Lack of portable water	44 (80)	50 (100)	X^2=4.442, p<0.035
Poor sanitation	44 (80)	47 (94.0)	X^2=1.889, p<0.169
Food vendors	35 (63.6)	38 (76.0)	X^2=10.610, p<0.001
Unhealthy toilet	42 (76.4)	49 (98.0)	X^2=4.269, p=0.039
Lack of hand washing	46 (83.6)	48 (96.0)	X^2=4.269, p=0.039
Grading	**Pre-intervention (n=55) frequency (%)**	**Post-intervention (n=50) frequency (%)**	**Test of statistics**
Good knowledge	42 (82.4)	49 (98)	X^2=6.292, p=0.008
Poor knowledge	9 (11.6)	1 (2)	

Table 4. Effect of intervention on respondents' knowledge of prevention of infectious diseases among children in schools (correct responses).

Variables	Pre-intervention (n=55) frequency (%)	Post-intervention (n=50) frequency (%)	Test of significance
Early identification and treatment	41 (74.5)	44 (88.0)	X^2=3.075, p=0.080
School clinics	37 (68.5)	44 (88.0)	X^2=5.720, p=0.017
Limitation of students in class	43 (78.2)	46 (92.0)	X^2=3.872, p=0.049
Regular inspection of students	33 (60)	40 (80.0)	X^2=4.944, p=0.026
Isolation of the sick	36 (65.5)	39 (78.0)	X^2=2.020, p=0.155
Proper waste disposal	38 (69.1)	43 (86.0)	X^2=4.247, p=0.039
Healthy toilet	39 (70.9)	40 (80.0)	X^2=1.162, p=0.281
Proper hand washing	45 (81.8)	50 (100)	X^2=7.312, p=0.007
Immunisation	45 (81.8)	50 (100)	X^2=10.048, p=0.0226
Knowledge score	**Pre-intervention (n=55) frequency (%)**	**Post-intervention (n=50) frequency (%)**	**Test of statistics**
Good	49 (89.1)	50 (100)	X^2=5.785, p=0.016
Poor	6 (10.9)	0 (0.0)	

Table 5. Effect of intervention among respondents on practices on infectious disease prevention in schools (correct responses).

Variables	Pre-intervention (n=55) frequency (%)	Post-intervention (n=50) frequency (%)	Test of significance
Treatment of the sick students	36 (65.5)	38 (76.0)	X^2=1.400, p=0.237
Referrals	43 (78.2)	38 (76.0)	X^2=1.117, p=0.572
Regular inspection of students	37 (67.3)	35 (70.0)	X^2=0.090, p=0.764
Inspection of food canteen/vendors	32 (58.2)	28 (56.0)	X^2=0.051, p=0.821
Ensure good quality water	46 (83.6)	41 (82.0)	X^2=1.111, p=0.574
Isolation	31 (56.4)	29 (58.0)	X^2=0.029, p=0.821
Health talks with students	41 (74.5)	33 (66.0)	X^2=0.919, p=0.338
Sanitary disposal of waste	38 (69.1)	25 (50.0)	X^2=3.977, p=0.046
Regular hand washing	48 (83.7)	47 (94.0)	X^2=1.376, p=0.241
Immunisation	45 (81.8)	47 (94.0)	X^2=1.117, p=0.572

Table 6. Multivariate logistics regression on knowledge of infectious diseases and socio-demography.

Socio-demography	B	df	Sig.	95% confidence interval for Exp(B) Lower bound	95% confidence interval for Exp(B) Upper bound
Age group	-0.646	1	0.243	0.177	1.552
Sex	-0.552	1	0.680	0.042	7.892
Marital status	-1.595	1	0.193	0.018	2.237
Religion	-3.840	1	0.010	0.001	0.397
Level of education	-0.276	1	0.571	0.292	1.973
How long in practice	0.660	1	0.096	0.889	4.212

edge than what was obtained at the pre-intervention stage. The knowledge score was 92%, and since little was gained, due to previous knowledge of risk factors, the knowledge gained was not statistically significant, and this implies that knowledge gained by teachers improved generally through health education. Teachers have the added advantage of knowing of risk factors of infectious diseases probably due to what they see around the school and experience from day-to-day attention rendered to pupils, and that is a step towards achieving disease prevention in schools, as teachers are required to have the knowledge to be able to teach students about ID in schools.

On the prevention of infectious diseases in schools in this study, the majority showed knowledge on prevention practices, with most being knowledgeable on immunization and hand washing as modes of prevention of IDs with equal percentages (81%). These findings could be attributed to awareness or media sources of information. It could be a fact that some of the participants may have children of their own and may have observed it being carried out. Hand-washing also being the most cost-effective way of ID prevention could be well known to the teachers as well. These findings, however, are not statistically significant.

The isolation of sick children was found not to be widely practiced among the schools, as the majority acclaimed to the lack of facilities and also the lack of knowledge on the need to isolate certain sick students. Most of the schools do not have isolation rooms or sick bays. This was also reported from a Western Nigerian study, in which a quarter of the schools were reported to have a sick bay, with fewer still having any form of ambulance to convey sick children.[24]

The preventive practices known by respondents at the end of the study showed evidence of good knowledge at baseline. However, there was a slight increase in knowledge in some areas, and a fall in knowledge in other areas. The knowledge score was 100% not statistically significant due to the little gain in knowledge, as the initial knowledge was good (p=0.016).

When subjected to a multivariate study, the degree of association between variables revealed a negative association for most of the variables, and findings also revealed non-statistical significance except for religion, which shows a statistical significance to knowledge. However, this could be arbitrary due to the skewness of the religion distribution in favor of the Islamic faith making the majority of the population and this may explain the shift.

The respondents' practices on infectious diseases prevention in schools showed a fall in the response rates at post-intervention when compared with the pre-intervention. This means that after the HE intervention, the respondents understood the subject matter better and were able to identify the areas they lacked. At the end of the study, a rise in scores was observed only in a few areas of prevention practices. The least practiced method of prevention was hand-washing; this showed that hand-washing was one of the most identified preventive measures towards infectious diseases but least practiced. This indicated that more than knowledge is required to fully implement preventive measures, as it was also revealed in a study carried out in Australia that hand-washing knowledge is necessary, but is not entirely sufficient to ensure good hand-washing practices, as facilities are equally necessary and influence hand-washing practices.[28] Knowledge does not appear to be the only tool required in practicing ID prevention in schools, there is also a need to facilitate the teachers through the provision of facilities and the maintenance of the established facilities for the sustenance of such practices. Findings are also similar to those revealed in the Eastern part of Nigeria on the extent of hand-washing in secondary schools, which suggested that the extent of hand-washing was very poor, with a cumulative mean score of 1.31. This was attributed to a lack of facilities and quality hygiene education that would help inculcate healthy habits in them.[29]

Hand-washing is considered the singular most cost-effective way of preventing diarrhoeal diseases most school children are prone to; sustaining such practices requires commitment from all sectors, the teachers, the students, the school management/board, and the government through the provision of the required infrastructures, proper maintenance and the sustenance of educational programs to further stress on knowledge as an important factor in the sustaining disease preventive measures. A previous study on hygiene behavior in primary school students indeed showed that knowledge and awareness are some of the measures which are thought to be of the causal pathway to behavior.[30]

Conclusions

Following the intervention, there was an evident knowledge gain on ID, except for practices.

Recommendations

The gap in comprehensive knowledge on infectious disease prevention by teachers, as well as the risk factors, prevention and practices in schools demands an increased training of teachers and provision of infrastructures, in addition to a collaborative effort by the school board and the tiers of government to ensure sustainable contribution towards disease-free school programs and hence a productive stay in school.

Limitations

This study design was a one-group experimental study, no comparison was made with other groups to identify similarities or dissimilarities. Although the study participants comprise people of different settings in terms of age, ethnicity and educational qualifications, logistic regression was used to eliminate confounders.

Participants may be biased in their responses, but we explain the objective of the study and ensure them confidentiality in other to gain their trust.

What this study adds to the body of knowledge

There was evidence that educational intervention improves the knowledge of teachers on infectious diseases and methods of prevention. However, practices can only improve when equipment and infrastructures are available to foster them. Hence, both the teachers and school authorities, in conjunction with the tiers of government, are required to play their roles in ensuring the availability of resources, as well as training the teachers periodically in order to bridge the knowledge gaps, to enable them to be a role model to the students and to guide them during their period of stay in school, thereby inculcating healthy habits as they pass through primary school.

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