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## Research Article

# Healthful School Environment: A Comparative Study of Public and Private Primary Schools in Ogun State, Nigeria

## Abstract

**Introduction:** A healthy school environment (physical, biological and socio-cultural) serves as a major determinant of health and greatly influences the individual's level of intellectual growth and development. This study was therefore designed to assess the school environmental health services in both private and public primary schools in Ogun state Nigeria.

**Methods:** The study was a comparative cross-sectional survey of Private and Public Primary Schools in Ogun state, Nigeria conducted between February and May, 2014 in Ogun State, Nigeria using a multi-stage sampling technique. Participants in the study were interviewed using a structured questionnaire, which was administered by a trained interviewer. Data collected was analyzed using the SPSS version 20.0.

**Results:** A total of 360 head teachers served as respondents for the study. Dust bins and waste paper baskets were available in 58 (32.2%) Public Schools and 123 (68.3%) Private Schools ( $\chi^2= 46.946$ ,  $P= 0.001$ ). About half, 90 (50.0%) and 97 (53.9%) in Public and Private Schools respectively use a bore hole or a mono pump as their source of water supply and 14 (7.8%) Public Schools and 30 (16.7%) Private Schools make use of well water ( $\chi^2= 33$ ,  $P= 0.001$ ). A ratio of 1 toilet to greater than 90 pupils was however observed in 58 (32.2%) and 29 (16.1%) Public and Private Schools respectively ( $\chi^2= 39.283$ ,  $P= 0.001$ ). 81% of the Schools in this study practiced open dumping/ burning as their method of waste disposal with the Public Schools more than the Private Schools, 162 (90.0%) Public Schools and 128 (71.1%) Private Schools ( $\chi^2= 46.22$ ,  $P= 0.001$ ). Ventilation was adequate in 81% of the schools and controllable in 71%. Students were sitting on the floor in 27% of the schools in the study population.

**Conclusion:** The study shows that the environmental health situation in Nigerian schools is poor. There is the need for patrol teams to inspect and monitor the activities of the schools in Nigeria and other developing countries. Security has become a major issue in school health care.

## Introduction

Healthful School Environment is one of the interrelated aspects of the School Health Programme. The concept "Healthful School Environment" denotes all the consciously organized, planned and executed efforts to ensure safety and healthy living conditions for all members of the school community. A healthy school environment (physical, biological and socio-cultural) serves as a major determinant of health and greatly influences the individual's level of intellectual growth and development.

The objectives of a Healthful School Environment are to create a healthy and safe learning environment in the school,

provide adequate safe water supply and sanitation facilities for use in the schools. The physical school environment encompasses the school building and all its contents including physical structures, infrastructure, furniture and the use and presence of chemicals and biological agents; the site on which a school is located and the surrounding environment including air, water and materials with which children may come into contact, as well as nearby land uses, roadways and other hazards [1]. The American Academy of Paediatrics defines a 'healthful school environment' as one that protects students and staff against immediate injury or disease and promotes prevention activities and attitudes against known risk factors that might lead to future disease or disability [2].

WHO estimates that between 25% and 33% of the global burden of disease can be attributed to environmental risk factors. About 40% of the total burden of disease due to environmental risks falls on children under the age of 5 years [3]. Respiratory infections are the most common among all diseases in children and pneumonia is the primary cause of childhood mortality worldwide. Indoor and outdoor air pollution may be to blame for as much as 60% of the global burden of disease brought by respiratory infections [4]. Diarrhoeal diseases, the second most global illness affecting young children and a major cause of death in lower income countries, are closely linked with poor sanitation, poor hygiene and lack of access to safe and sufficient supplies of water and food [5]. Each year nearly two million children die of diarrhoeal diseases caused by unsafe water supplies, sanitation and hygiene. Interventions such as simple hand washing have been shown to reduce sickness from diarrhoeal diseases by up to 47%, and could save up to one million lives [5].

Malaria, the most deadly of mosquito transmitted diseases kills over one million people each year, the majority of these deaths occur in African children [6]. In endemic areas, 60% of all school children may suffer from malaria [7]. Standing water and poor waste management in schools increase the risk of vectors breeding and spreading near the school environment [1]. Schools sited adjacent to pools of water and wetlands are more susceptible to mosquito-borne diseases.

In high income countries, road traffic injuries are the most common cause of death among children aged 5-14 and account for approximately 10% of deaths in this age group. In low and middle income countries, they are the fifth leading cause of death in the same age group behind diarrhoeal diseases, lower respiratory infections, measles and drowning [8]. Therefore, schools located near busy roads or water bodies, landfills, construction sites have increased risks of these types of injuries. Falls and injury within school grounds can occur as a result of poorly maintained schools or poor construction management.

Human excreta are the biggest source of disease producing organisms including parasites, bacteria and viruses. Success in eliminating faecal material from the school environment is dependent on: informed and responsible students, supervision of young pupils, a fence or structure to stop animals from defecating in areas where children play, toilets conveniently located- reliable, clean, odour-free, private and well maintained [9]. Separate facilities for girls can reduce dropout rates during or before menses [9]. Baseline information on School Health Programme as reported in most parts of the country is poor [10-12]. This study was therefore designed to assess the school environmental health services in both private and public primary schools in Ogun state Nigeria. This has implications in the environmental health care of the school children and protects students and staff against immediate injury or disease and promotes prevention activities and attitudes against known risk factors that might lead to future disease or disability

## Materials and Methods

### Study area

The State has Twenty (20) Local Government Areas (LGA). Each LGA is headed by an Executive Chairman. It has three (3) Senatorial Districts and is divided into four (4) geo-political

zones. The projected population of the State as at 2012 is 5.1 million. The people of the State belong to the Yoruba ethnic group of South-West Nigeria. The main ethnic groups of the State are Egbas, Ijebus, Remos, Yewas, Eguns and Aworis. A greater proportion of the State lies in the tropical rain forest zone [13].

Ogun State was created on February 3<sup>rd</sup> 1976 out of the defunct Western Nigeria. The State is named after Ogun River which runs right across it from North to South. Ogun state is situated on latitude 7.00°N and longitude 3.35°E in the Greenwich Meridian. It covers a total land area of 16,409.26 square kilometers within the South West region of the country. It is bounded in the north by Oyo and Osun States, in the east by Ondo State, in the west by the Republic of Benin which makes it an access route to the expansive market of the Economic Community of West African States (ECOWAS) and in the south by Lagos State and the Atlantic Ocean. The State Capital Abeokuta, lies about 100km north of Lagos State, Nigeria's business Capital [13].

### Study design

The study design was a comparative cross sectional study that assessed the School Health Programme in Public and Private Primary schools in Ogun State.

### Inclusion criteria

All fully registered Public and Private primary schools in the selected LGAs

### Exclusion criteria

All schools that are not fully registered in the selected LGAs

All schools operating a boarding system in the selected LGAs

### Sample size

A prevalence of 40.4% of Private Schools compared to 31.0% of Public Schools [14] was used to estimate the sample size using the formula for comparative study proportions between two groups [15].

$$N = \frac{Z_{\alpha} \sqrt{P_1(1-P_1)} + Z_{\beta} \sqrt{P_2(1-P_2)}}{(P_1 - P_2)^2}$$

Where  $P_1$  = Proportion of Private Schools with School Health Programme from Previous study = 40.4%

$P_2$  = Proportion of Public Schools with School Health Programme from Previous study = 31.0%

$Z_{\alpha}$  = Standard normal deviate corresponding to the probability of type I error  $\alpha$  at 5% level of significance = 1.96

$Z_{\beta}$  = Standard normal deviate corresponding to the probability of making type II error  $\beta$  at 20%, Power at 80% = 0.84

$P_1 - P_2$  = Minimum difference in proportions between Private and Public Schools which will be considered significant at 10%.

$$N = \frac{1.96 \times \sqrt{[0.404(1-0.404)]} + 0.84 \times \sqrt{[0.31(1-0.31)]}}{(0.404 - 0.31)^2}$$

N= 153

Thus, a minimum sample size of 153 Head Teachers is required per group. However, correcting for possible 10% Non-responses, Incompletely filled questionnaires and other unforeseen problems with Data collection,  $n=n/(1-f)$

$$N = 153/1-0.1 = 170$$

The calculated Sample size N was rounded up to 180 per group. Thus a total of 360 Head Teachers were studied.

### Sampling technique

A Multi-stage Sampling technique was employed.

Ogun State consists of three (3) Senatorial Districts. Ogun East, Ogun Central and Ogun West.

#### Stage I

There are nine (9) Local Government Areas in Ogun East Senatorial District. These are Sagamu, Ikenne, Remo-North, Ijebu-Ode, Odogbolu, Ijebu- North, Ijebu- East, Ijebu- North East and Ogun Waterside. Sagamu Local Government Area was selected into the study using Simple Random Sampling method by balloting.

There are six (6) Local Government Areas in Ogun Central Senatorial District. These are Ifo, Ewekoro, Obafemi/ Owode, Odeda, Abeokuta North and Abeokuta South. Abeokuta South Local Government Area was selected into the study using Simple Random Sampling method by balloting.

There are five (5) Local Government Areas in Ogun West Senatorial District. These are Imeko Afon, Yewa North, Yewa South, Ado Odo/ Ota, Ipokia. Ado-Odo/Ota Local Government Area was selected into the study using Simple Random Sampling by balloting.

#### Stage II

In each Local Government Area selected, 60 Public Primary Schools and 60 Private Primary Schools were recruited into the study by listing all the Public Schools and all the Private Schools and then randomly selecting 60 each into the study.

### Data collection instruments and technique

**Questionnaire:** A self-administered semi-structured Questionnaire with open and closed ended questions for the Head Teachers was designed for the study. The Pre-tested Questionnaire was administered to the 360 Head Teachers. It addressed the following:

**Section A:** Socio-economic and Demographic characteristics such as age, sex, marital status, highest educational qualification and length of time as a Head Teacher. This section gave insight into the Respondents' socio-economic and demographic background.

**Section B:** This section assessed some of practices of School Health Programme by the Head Teachers in their various

Schools. The section served to augment the main Instrument that was used to assess Practice of School Health within the Schools which was the Observational Checklist.

### Observational checklist

The Observational Checklist was adapted from the School Health Programme Evaluation Scale<sup>1</sup> by Nwadiulo et al., and the Federal Ministry of Education's Sanitary Inspection Form. The Checklist covered all the Domains of the School Health Programme within the Schools. It was the main Instrument that evaluated the Practice of School Health Programme as it checked the presence or absence of School Health Programme activities as witnessed within the Schools. It assessed the presence or absence of personnel, structures, equipment needed for effective practice of School Health Programme.

### Data collection process

The Instruments for Data Collection: a self-administered semi-structured questionnaire for the Head Teachers and an Observational Checklist for the Schools were pre-tested in ten (10) Public and ten (10) Private Primary Schools in Ibadan North East Local Government and modified as appropriate. Twenty (20) Research assistants were recruited and trained in the correct use of the Questionnaire and the Checklist for the Project. Identification tags with pictures were issued to the Research Assistants to facilitate School Entry.

School entry was made by approaching the Head Teacher and the Project carefully explained to them. Once the Head Teacher consented by signing the Informed Consent form, he/she was given a copy of the Questionnaire to fill in the presence of a Research Assistant who explained grey areas when necessary. At no point would the Head Teacher be left to fill the Questionnaire alone. Two other Research Assistants would then inspect the School with the Observational Checklist to assess practice of School Health Programme usually in the company of a Teacher nominated by the Head Teacher or alone. Both Instruments were subsequently collected and stored and the consenting Head Teacher thanked for the cooperation. Data was collected over a three (3) month period.

### Analysis of results

Quantitative Data collected was checked for errors, cleaned, entered and analyzed using the SPSS version 15.0. Data was summarized with proportions and means and presented using frequency tables. Inferential statistics to test for associations between variables was done using the chi-square test. T-test was used to compare the difference between the mean knowledge scores of the Public and Private Schools' Head Teachers.

Observational Checklist was essentially used to measure Practice of School Environmental Health Programmes in the Schools.

### Ethical consideration

Consent to conduct the study was obtained from the ethical committee of the Olabisi Onabanjo University Teaching

Hospital, Sagamu. Approval was also obtained from the Permanent Secretary of the Ogun State Ministry of Health and the Local Government Authorities of Sagamu, Abeokuta-South and Ado-Odo/Ota Local Governments respectively. Written informed consent was obtained from all the participants after study objectives were explained to them. They were assured that participation was voluntary and they would incur no loss if they decided not to participate.

Study participants were assured of strict confidentiality and this was indicated on the questionnaire. Data collected was only used for research purposes and was kept confidential on a password protected computer. Research assistants were also trained not to disclose the information divulged by the respondents during the interview. Anonymity was assured as names or any other personal identifying information was not required from subjects. Those who declined from the study were politely dismissed.

## Results

### Socio-demographic characteristics

The overall mean age of all the Head Teachers was 45.7±9.9 years. The Socio-demographic Characteristics of the respondents is as shown in table 1.

### Adequate water supply and proper waste disposal

Dust bins and waste paper baskets were available in Public Schools and 123 (68.3%) Private Schools. This was a statistically significant finding. ( $X^2= 46.946$ ,  $P= 0.001$ ). About half of the respondents in both groups in Public and Private Schools respectively use a bore hole or a mono pump as their source of water supply. However there is a significant difference in how Public Schools and Private Schools make use of well water ( $X^2= 33$ ,  $P= 0.001$ ). Significantly more of the Public and Private Schools respectively had their water source >200meters outside the School ( $X^2=10.982$ ,  $P=0.004$ ). Eighty-one percent of the Schools in this study practiced open dumping or burning as their method of waste disposal. The Public Schools use this significantly more than the Private Schools. ( $X^2= 46.22$ ,  $P= 0.001$ ).

Water closet/ septic tank was used by most of the Public Schools and Private Schools. Significantly more of the Public Schools practiced surface (bush/water) method of waste disposal ( $X^2= 58.013$ ,  $P= 0.0001$ ). Gender differentiated toilets were absent in 66.1% of Public Schools and 52.2% of Private Schools ( $X^2= 7.186$ ,  $P= 0.007$ ). It was also observed that soap for hand washing was unavailable in 87.2% and 55.6% of Public and Private Schools studied ( $X^2= 44.186$ ,  $P= 0.001$ ).

**Table 1:** Characteristics of respondents' socio-demographic variables.

Characteristics	Public schools n=180 (%)	Private schools n=180 (%)	Total N = 360 (%)	Test statistic value ( $\chi^2$ )	P-value
<b>Age at last birthday</b>					
21-30	0 (0.0)	30 (16.7)	30 (8.3)		
31-40	2 (1.1)	110 (61.1)	112 (31.1)		
41-50	31 (17.2)	30 (16.7)	61 (16.9)		
51-60	147 (81.7)	9 (5.0)	156 (43.3)	2.250	0.001
>=60	0 (0.0)	1 (0.6)	1 (0.3)		
<b>Sex</b>					
Male	39 (21.7)	51 (28.3)	90 (25.0)	1.809	0.179
Female	141 (78.3)	129 (71.7)	270 (75.0)		
<b>Marital status</b>					
Single	5 (2.8)	31 (17.2)	36 (10.0)		
Married	152 (87.8)	144(80.0)	302 (83.9)	25.803	0.001
Separated/divorced	3 (1.7)	1 (0.6)	4 (1.1)		
Widowed	14 (7.8)	4 (2.2)	18 (5.0)		
<b>Religion</b>					
Christianity	155 (86.1)	158( 87.8)	313 (86.9)		
Islam	24 (13.3)	20 (11.1)	44 (12.2)	0.966	0.617
Others	1 (0.6)	2(1.1)	3 (0.8)		
<b>Ethnicity</b>					
Hausa	0 (0.0)	0 (0.0)	0 (0)		
Ibo	18 (10.0)	32 (17.8)	50 (13.8)	5.343	0.069
Yoruba	158 (87.8)	141 (78.3)	299 (83.1)		
Others	4 (2.2)	7 (3.9)	11 (3.1)		
<b>Highest educational qualification</b>					
Masters degree	8 (4.4)	17 (9.4)	25 (6.9)		
University degree	98 (54.4)	93 (51.7)	191 (53.1)	7.417	0.060
Certificate from college of education	69 (38.3)	59 (32.8)	128 (35.6)		
Teacher's training school certificate	5 (2.8)	11 (6.1)	16 (4.4)		
<b>How long have you been a head teacher</b>					
1-5 years	93 (51.7)	98 (54.4)	191 (53.1)		
6-10 years	35 (19.4)	47 (26.1)	82 (22.8)		
11-15 years	20 (11.1)	19 (10.6)	39 (10.8)	6.804	0.078
>15 years	32 (17.8)	16 (8.9)	48 (13.3)		

State of the toilet area was good in only 12.2% Public Schools and 23.9% Private Schools ( $X^2= 8.280$ ,  $P= 0.004$ ). Toilet to Pupil Ratio of  $1 < 30$  was observed in just 5.6% Public Schools and 23.9% Private Schools. A ratio of 1 toilet to greater than 90 pupils was however observed in 32.2% and 16.1% Public and Private Schools respectively ( $X^2= 39.283$ ,  $P= 0.001$ ). The differences in these findings were statistically significant.

### Building status and safety measures

Old walls with leaking roofs were found significantly more in Public Schools than Private Schools ( $X^2= 45.995$ ,  $P= 0.001$ ). Floors were worn out, broken and dusty in 31.7% and 10.6% Public and Private Schools respectively. Significantly more of the Public Schools than Private Schools of the floors were flat and non-glossy ( $X^2= 31.595$ ,  $P= 0.001$ ). It was observed that the ceilings of 10.6% Public Schools and 7.8% Private Schools were absent ( $X^2= 23.592$ ,  $P= 0.001$ ). About 28.9% of Public Schools and 3.9% of Private Schools had seats provided for them in the schools ( $X^2= 41.050$ ,  $P= 0.001$ ).

School fences were absent in 65% of Public Schools and

17.8% of Private Schools ( $X^2= 82.732$ ,  $P= 0.0001$ ). One hundred and seventy eight (98.9%) of Public Schools and 149 (82.8%) of Private Schools did not have a fire extinguisher available in their school premises ( $X^2= 1.011$ ,  $P= 0.0001$ ). Flooding/ open drainages were present in 47.2% and 31.1% Public and Private Schools respectively in one form or the other ( $X^2= 9.805$ ,  $P= 0.002$ ). This was also statistically significant. Sports field were found in 71.7% of Public Schools as against 51.1% of Private Schools. This difference was statistically significant. ( $X^2= 16.043$ ,  $P= 0.001$ ) (Tables 2-4).

### Discussion

This study set out to compare the School Health Programme in Public and Private Primary Schools in Ogun State, Nigeria. The importance of a good and functional School Health Programme as a component of Primary Health Care in the overall development of children and the citizenry of a nation cannot be over emphasized. Healthful School Environment deals with conditions within the school that are most conducive to optimal physical, mental and emotional health, safety of pupils, satisfactory relations amongst pupils, teachers,

**Table 2:** Practice of healthful school environment in public and private schools.

Practice	Public schools n=180 (%)	Private schools n=180 (%)	Total N = 360 (%)	Test statistic value ( $\chi^2$ )	P-value
<b>Water supply</b>					
Pipe borne	17 (9.4)	34 (18.9)	51 (14.2)	33	0.001
Bore hole/mono pump	90 (50.0)	97 (53.9)	187 (52.0)		
Wells	14 (7.8)	30 (16.7)	44 (12.2)		
Surface water	3 (1.7)	0 (0.0)	3 (0.8)		
None	56 (31.1)	19 (10.5)	75 (20.8)		
<b>Distance of water supply</b>					
Within the school	72 (40.0)	94 (52.2)	166 (46.1)	10.982	0.004
<200 meters outside school	67 (37.2)	67 (37.2)	134(37.2)		
>200 meters outside school	41 (22.8)	19 (10.6)	60 (16.7)		
<b>Refuse disposal</b>					
Open dumping/burning	162 (90.0)	128 (71.1)	290 (80.6)	22.56	0.001
Controlled tipping	12 (6.7)	44 (24.5)	56 (15.6)		
Incineration	6 (3.3)	8 (4.4)	14 (3.8)		
<b>Sewage disposal</b>					
Surface (bush/water)	20 (11.1)	3(1.7)	23 (6.4)	58.013	0.001
Bucket	6 (3.3)	2 (1.1)	8 (2.2)		
Pit/trench	114 (63.3)	67 (37.2)	181 (50.3)		
Water closet/septic tank	40 (22.3)	108 (60.0)	148 (41.1)		
<b>Gender differentiated toilets</b>					
Yes	61 (33.9)	86 (47.8)	147 (40.8)	7.186	0.007
No	119 (66.1)	94 (52.2)	213 (59.2)		
<b>Toilet rolls available</b>					
Yes	135 (75)	169 (93.9)	304 (84.4)	24.445	0.001
No	45 (25)	11 (6.1)	56 (15.6)		
<b>Soap for hand wash available</b>					
Yes	23 (12.8)	80 (44.4)	103 (28.7)	44.186	0.001
No	157 (87.2)	100 (55.6)	257 (71.3)		
<b>State of toilet and toilet area</b>					
Poor	158 (87.8)	137 (76.1)	295 (81.9)	8.280	0.004
Good	22 (12.2)	43 (23.9)	65 (18.1)		
<b>Toilet pupil ratio</b>					
None	66(36.7)	44 (24.4)	110 (30.6)	39.283	0.001
1>90	58 (32.2)	29 (16.2)	87 (24.2)		
1:61-90	12 (6.7)	24 (13.3)	36 (10.0)		
1:46-60	17 (9.4)	18 (10.0)	35 (9.77)		
1:31-45	17 (9.4)	22 (12.2)	39 (10.8)		
1:<30	10 (5.6)	43 (23.9)	53 (14.2)		

**Table 3:** Practice of healthful school environment in public and private schools.

Practice	Public schools n=180 (%)	Private schools n=180 (%)	Total N = 360 (%)	Test statistic value ( $\chi^2$ )	P-value
<b>Sitting comfort</b>					
<b>Pupils</b>					
<100% seated	52 (28.9)	7 (3.9)	59 (16.4)	41.050	0.001
100% seated	128 (71.1)	173 (96.1)	301 (83.6)		
<b>Teachers</b>					
No seats available	0 (0.0)	1 (0.6)	1 (0.3)	9.924	0.007
<100% seated	21 (11.7)	6 (3.3)	27 (7.5)		
100% seated	159 (88.3)	173 (96.1)	332 (92.2)		
<b>Safety measures</b>					
<b>School fence</b>					
Yes	63 (35.0)	148 (82.2)	211 (58.6)	82.732	0.001
No	117 (65.0)	32 (17.8)	149 (41.4)		
<b>Fire extinguisher</b>					
Yes	2 (1.1)	31 (17.2)	33 (9.1)	28.057	0.001
No	178 (98.9)	149 (82.8)	327 (90.9)		
<b>Fire alarm</b>					
Yes	1 (0.6)	3 (1.7)	4 (1.1)	1.011	0.315
No	179 (99.4)	177 (98.3)	356 (98.9)		
<b>Safety patrol team</b>					
Yes	11 (6.1)	21 (11.7)	32 (8.8)	3.430	0.064
No	169 (93.9)	159 (88.3)	328 (91.2)		
<b>Nuisance &amp; hazards</b>					
<b>Noise pollution</b>					
Presence in any form	62 (35.0)	73 (35.3)	135 (37.5)	0.002	0.961
Absence	118 (65.0)	107 (64.7)	225 (62.5)		
<b>Flooding/open drainages</b>					
Presence in any form	85 (47.2)	56 (31.1)	141 (39.1)	9.805	0.002
Absence	95 (52.8)	124 (68.9)	219 (60.9)		

**Table 4:** Practice of healthful school environment in public and private schools.

Practice	Public schools n=180 (%)	Private schools n=180 (%)	Total N = 360 (%)	Test statistic value ( $\chi^2$ )	P-value
<b>Building</b>					
Dilapidated	2 (1.1)	2 (1.1)	4 (1.1)	48.995	0.001
Old walls, leaking roofs	49 (27.2)	14 (7.8)	63 (17.5)		
Strong walls with minor cracks	58 (32.2)	29 (16.1)	87 (24.2)		
Strong walls & roof	71 (39.5)	135 (75.0)	206 (57.2)		
<b>Fire protection</b>					
All prefab buildings	29 (16.1)	13 (7.2)	42 (11.7)	9.755	0.008
Some prefab buildings	92 (51.1)	86(48.3)	178(49.4)		
All buildings with fire resistant materials	59 (32.8)	81(44.5)	140 (38.9)		
<b>Floor</b>					
Sandy	5(2.8)	0 (0)	5 (1.4)	31.595	0.001
Worn off, broken & dusty	57 (31.7)	19 (10.6)	76 (21.1)		
Flat, glossy	22 (12.2)	38 (21.1)	60 (16.7)		
Flat, non-glossy	96 (53.3)	123 (68.3)	219 (60.8)		
<b>Ventilation i</b>					
Not adequate	27(15.0)	38 (21.1)	65 (18.1)	2.272	0.132
adequate	153 (85.0)	142 (78.9)	295 (81.9)		
<b>Ventilation ii</b>					
Not controllable	54 (30.0)	41 (22.8)	95 (26.4)	2.417	0.120
Controllable	126 (70.0)	139 (77.2)	265 (73.6)		
<b>Lighting</b>					
Poor	52(28.9)	43(23.9)	95 (26.4)	11.252	0.010
Supplementary light	0(0)	3(1.7)	3(0.8)		
Good	127 (70.5)	124(68.9)	251 (69.7)		
Good plus supplementary light	1 (0.6)	10(5.5)	11 (3.1)		
<b>Insulation</b>					
No ceiling	19 (10.6)	14(7.8)	33 (9.2)	23.592	0.001
Partially ceiled	74 (41.1)	35(19.4)	109 (30.3)		
Properly ceiled	87 (48.3)	131(72.8)	218 (60.5)		

administrators, as well as for rest, relaxation and recreation [16].

In this study 78% of the total number of Schools studied had some form of water supply even though about 52% of this was from bore holes/ mono pumps. This is high compared to the 46% reported by the Federal Ministries of Health and Education in their assessment of availability of water supply in schools [17]. This figure however represents a national average as primary, secondary and universities were involved in the study. It is also higher than the figures in another related study in Rivers State where 35% of the schools had water supply [18]. It is also better than the 17.3 %, 2.6% and 0% reported in Edo State [14], Imo State [19] and Zaria in Kaduna State [20], respectively. It should be noted that the Zaria study involved only one school, however majority of schools in the developed countries have adequate water supply [4,5].

In this study, sources of water were found within and less than 200 meters outside the school in 66% of the schools studied. This was acceptable as the Universal Basic Education (UBE) strategic plan had stipulated that clean water supply should be within 500 meters of the school [21]. The Rivers [18] study reported that 40% of the schools had their water supply within 200 meters of the school premises while most of the schools in the Imo study lacked water within 500 meters from the schools [19]. Poor water supply means that activities that involve its use such as hand washing, cleaning, flushing of toilets and even drinking would suffer and indirectly create unhygienic environment for the pupils. They will also become exposed to accidents and unnecessary hazards in their attempts to obtain clean water outside the school premises.

81% of the Schools in this study practiced either open dumping or burning as their method of waste disposal with the Public Schools more than the Private Schools. This was similar to a study in Ikenne Ogun State where the Public Schools practiced open dumping of refuse as against the Private School that did not [22]. All the schools in the Rivers study (100%) practiced open dumping and burning [18]. The results were also similar in the studies in Edo [14], Imo [19] and Zaria [20]. Open dumping provides excellent breeding sites for flies, rodents and reptiles. Huge piles of waste will constitute an environmental nuisance. They also serve as breeding grounds for mosquitoes when they contain broken bottles, plastic, cans etc. Children will also suffer from cuts and bruises when they play around the piles of rubbish and hence must be discouraged.

Only 39% of schools studied have functional toilets. This is made up of 23% Public Schools and 77% Private Schools. These findings are better than that done in Rivers State where 25% of the schools studied had functional toilets [18]. There were no toilet facilities for children's convenience at all in the study done in Imo State [19]. Similar study in Edo State showed that 40% of the schools studied have functional toilets and was distributed as 13% Public Schools and 87% Private Schools [14]. Similar findings were reported from the study at Obio-Akpor Local Government Area [23] and in Ikenne [22]. They showed absent functional toilets in Public Schools. Absence of toilet facilities suggests increase in unsanitary methods of sewage

disposal with contamination of the hands and environment with faecal matter leading to more cases of diarrhoeal diseases, helminthiasis and possible disease epidemics from water contamination. Studies on school toilets in the UK [24] have corroborated this. It has also been reported that unsanitary toilets lead to an increase in urinary tract infection in children as they tend to hold back from voiding urine as at when due [25].

Gender differentiated toilets were available in 41% of the schools and 59% in the Private Schools. In a study assessing toilet facilities in secondary schools in Jos North LGA, 54% of the schools had gender differentiated toilets [26]. Studies in Kenya [27] and Ethiopia [28] have reported that toilet differentiation can lead to more school attendance by girls especially if they are clean, safe, secure and private. Soap for hand wash was available in 29% of schools as at the time of study and 78% of the schools were Private Schools. This was similar to the study in Edo state where soap was present in 33% of the schools studied and 88% of them were Private Schools [14]. Others studies reported absence of hand washing soaps in the schools [18-22]. The study is a sharp contrast to that in the Schools in the Bloomberg Health District of London where 75-78% had soap and water for hand washing [24]. Hand washing has been described as the single most effective way to prevent the spread of infections [29]. WHO had recommended a ratio of 1toilet to a maximum of 30 pupils [30]. In this study, only 14% of the schools met this WHO requirement and 84% of them were Private Schools. While this finding is very poor, others studies were much worse off and reported abysmal ratios [22-24]. An insufficient toilet/pupil ratio contributes to overuse, filthy conditions and a consequent return to open defecation around schools, or absenteeism in order to use a home toilet [31].

Schools with strong walls and roof were 56% of the total schools in this study. Out of this, 65% were Private Schools. Less than 1% of the schools were completely dilapidated. This is contrast to the schools studied in Rivers where 25% were dilapidated but 50% had strong walls and roofs. One school in the Rivers study had no building at all and the students sat under a shade [18]. It is important to note that the environment in which learning takes place is an important factor in the learning process [32]. Ventilation was adequate in 81% of the schools and controllable in 71%. This is similar to another study that reported adequate ventilation in 85% of schools but differed by reporting controllable ventilation in 35% of the schools studied<sup>110</sup>. Others reported inadequate and uncontrollable ventilation [18-19]. Seventy-two percent of the Schools had good lighting while 61% had intact ceiling. The Rivers study reported 85% with good lighting and 60% of the schools there with intact ceiling. These studies are in contrast to the one that reported an abysmal 2.2% of schools with good lightning and poor ceiling of its buildings [19]. Very little teaching and learning would be on going in these schools.

Pupils were completely seated in 83% of schools studied. The Private Schools accounted for 57% of this number. This study found pupils sitting on the floor in 27% of the schools in the study population. This is in contrast to the study in Bonny in

which pupils were completely seated in 55% of the schools and on the floor in 45% of the schools [18]. The results are poorer from the study in Obio-Akpor where pupils were completely seated in 11% of the schools and were on the floor in 89% of the schools in the Local Government [23]. Sitting comfort has been identified as one of the factors that affect learning [33]. Children in these schools would find learning difficult and uninteresting. Teachers too would be very frustrated and would do very little effective teaching.

Complete school fence was present in 59% of the schools in this study. Of this number, 70% were Private Schools. This is in contrast to the schools in the Rivers [18], study that reported 10% of the schools as completely fenced and the study in Imo [19] in which none of the schools were fenced. Again 9% of the schools in this study had a safety patrol team and 66% of this were Private Schools. This is in contrast to the studies in Rivers [18] and Imo [19], where patrol teams were totally absent in all the schools. Primary school fencing and gates serve two principal purposes, namely preventing the unauthorized departure of children and keeping out people seen as a threat to young children [34]. For these reasons primary schools in the UK tend to implement even tighter security than other types of schools particularly in relation to personnel access [34]. All Schools in the State must be properly fenced to provide some degree of security to staff and children while they are within the school premises. This should be a requirement for school registration. Government should provide schools with necessary funding to ensure that all staff and pupils are seated and that basic amenities such as clean water, gender differentiated toilets with hand washing facilities are available in all public schools.

The study shows that the environmental health situation in Nigerian school care is poor. There is the need for patrol teams to inspect and monitor the activities of the schools in the state in Nigeria and other developing countries. Security has become a major issue in school health care in Nigeria right now and schools have to be more conscious of this. Still fresh in our memory is the abducted Chibok girls. Fencing and patrol teams are no longer options but necessities. They would at least serve as a line of defence. School security in the UK now revolve around the Head Teacher as the Chief Officer but supported by the Staff, pupils and the community under the 'Schoolwatch' schemes [35].

## Authors' Contributions

KOT participated in the study design and conducted data collection. OEA conceived the study theme, participated in the study design, supervised data collection and prepared the final manuscript. KOT was involved in Data collection and analysis. ALL authors read and approved the final manuscript.

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