Sickle-cell Disease Knowledge among In-school Adolescents in Public Secondary Schools in Nsukka Local Government Area, Enugu State, Nigeria

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Abstract

Sickle-cell disease (SCD) is a hereditary health problem affecting humans globally. The study determined the knowledge of sickle cell disease among in-school adolescents in public secondary schools in Nsukka LGA, Enugu state. Two research questions and one null hypothesis guided the study. The cross-sectional survey research design was adopted for the study. The population for the study comprised 14,947 students in all the public secondary schools in Nsukka LGA of Enugu state. The sample of 384 students was selected using multi-stage sampling procedure. A researcher-designed questionnaire titled "Sickle Cell Disease Knowledge Questionnaire" was used for data collection. Frequencies, percentages, and Chi-square (x^2) statistics were used for data analysis. The results showed that in-school adolescents possessed a high knowledge (65.7%)of sickle cell disease; in-school adolescents in SSS class possessed higher knowledge of SCD (78.8%) than JSS class level (62.5%); in-school adolescents 18years and above had higher level of knowledge of SCD (71.0%) than those within 10-13years (61.8%)and 14-17years (62.5%): male in-school adolescents had higher level of knowledge of sickle cell disease(72.8%)than females (63.0%).There was a significant difference in the level of knowledge of sickle cell disease possessed by in-school adolescents in public secondary schools in Nsukka LGA based on class of study (p = 0.012)while there was no significant difference in the level of knowledge of sickle cell disease possessed by in-school adolescents in public secondary schools in Nsukka LGA based on age (p= 0.227), and gender (p= 0.091). Based on the findings of the study, it was recommended among others that sickle cell education should be incorporated into the Health Education Curriculum and made a compulsory subject/course for all students in college and tertiary institutions. In addition, the subject should be taught by professional health educators.

Keywords: sickle cell disease, knowledge, signs and symptoms, sickle cell education, in-school adolescents.

Introduction

Sickle cell disease (SCD) is a global health issue, affecting millions of people worldwide. Globally, the number of people living with SCD increased by 41.4% (38.3-44.9), from 5.46 million in 2000 to 7.74 million in 2012 (Azalea et al., 2023). Sickle cell disease remains a leading cause of mortality, morbidity, and health disparity, and has been designated as a major global health problem and priority by the World Health Organization (WHO, 2021) and World Health Assembly (2018).Sickle cell disease affects about 100,000 people in United States; more than 90 percent are non-Hispanic Black or African American (Center for Disease Control and Prevention [CDC], 2023). Sub-Sahara Africa accommodates 75% of all patients with SCD births globally, with some affected children dying before the age of 5 years (Stephen et al., 2018). With the global occurrence of SCD, Nigeria is not an exception. Sickle cell disease is a significant public health issue in Nigeria due to its high prevalence and associated morbidity and mortality. Nigeria stands out as the most profoundly affected country by SCD worldwide, each year the nation tragically witnesses the loss of more than 100,000 newborns afflicted by this severe condition (Adeniran et al., 2020). Nearly half of the affected children die before their fifth birthday (Nnodu et al. 2021).Even those who

survive face a life expectancy that hovers around 21 years, much lower than the life expectancy of people with SCD in high income nations which is 54 years (Lubeck et al., 2019). Furthermore, in Nigeria, SCD has been recorded in several states of the federation, Enugu state inclusive. Sickle cell disease prevalence of (4.9%) was reported in Enugu State (Nnebe-Agumadu et al., 2018). The above statistics indicated that SCD is a serious health problem ravaging the world and causing great morbidity and mortality. Worse still, the general public may not have knowledge of the disease including the meaning, causes, clinical manifestations and preventive measure (screening practice).

Sickle cell disease (SCD) is an inherited red blood cell disease through parents. Sickle cell disease refers to "a group of inherited red blood cell disorders characterized by the presence of an abnormal form of hemoglobin" (WHO, 2021). Sickle cell disease is a disease caused by a mutation in the gene that produces hemoglobin, the protein in red blood cells that carries oxygen throughout the body (National Heart, Lung, & Blood Institute, 2021). Sickle cell disease is referred to as a genetically inherited blood disorder of haemoglobin that can lead to serious health complications, including infection, stroke, acute and chronic pain (Bulgin et al., 2018). The mutation leads to the production of abnormal hemoglobin, which causes red blood cells to become stiff, sticky, and sickle-shaped, instead of the normal round and flexible shape, causing blockages in small blood vessels and reducing blood flow to tissues and organs, resulting to tissue damage and organ dysfunction which can lead to a range of complications, including stroke, organ damage, and chronic pain. Therefore, there is a need to determine the knowledge of SCD among in-school adolescents Nsukka LGA, Enugu State.

Studies have been conducted on SCD knowledge among in-school adolescents in different countries. Previous studies reported a moderate to a high level of knowledge of SCD among the participants. For instance, studies conducted in Osun State Nigeria by Adeyemo et al. (2021) in Jedda City by Alturaifi et al. (2018) and in Tanzania by Mallya et al. (2018) reported moderate knowledge of (58.6%, 51.4% and 57.8%) respectively among the study participants. Other researchers' reported very high knowledge of SCD among the students, for instance, studies done Saudi Arabia by Almulhim et al. (2022), in Ghana by Brown et al. (2022),in Congo by Kambale-Kombi et al. (2020) and in Ghana by Djan and Mensah (2020) reported (80%,96.75%, 92.9%,79.9%) respectively indicating high knowledge of SCD among the respondents. However, other studies conducted in Southeast Nigeria by Ezenwosu et al. (2019) and in Uganda by Tusuubira et al. (2018) reported (7.3% and 9.8%) indicating low or inadequate knowledge of SCD among the respondents. The knowledge of SCD in different locations both in Nigeria and other countries among in-school adolescents may be associated with certain factors.

These factors include socio-demographic factors such as class of study, age, and gender. class of study, age and gender were choosen for the study because understanding of health issues such as SCD may vary based on class of study, age and gender. This is previous reseachers from different locations (Adeyemo et al., 2021, Baba & Yidana, 2021, Abiye et al. 2020) studied these factors to find out their association with knowledge of sickle cell disease.Specifically, studies done in Jordan by Al-Awamreh et al. (2021), in Enugu by Nwafor, et al. (2021)and Tamale Metropolis by Baba & Yidana, (2021) reported that individuals with higher class levels (senior students) demonstrated greater knowledge of SCD. Also, study by Alturaifi et al. (2018) indicated that class level is significantly associated with knowledge of sickle cell disease while study in Tamale Metropolis by Baba et al. (2023) reported that form (class level) is not significantly associated with knowledge of SCD among senior high school students. The findings of these studies revealed that there was a significant difference in knowledge scores across different class levels, with higher class

levels generally having better knowledge of sickle cell disease. The researchers' attributed the difference to the cumulative effect of academic exposure and the inclusion of health-related topics (including SCD) in the school curriculum as students' progress to higher class levels.

Different studies have been conducted in Nigeria to identify the association between knowledge of sickle cell disease and age. Studies found that older students and adult had significantly higher knowledge scores than younger students (Brown et al., 2022, Adeyemo et al., 2021, Afolabi et al., 2021, Ilesanmi et al., 2021).On the contrary, study by Baba, et al. (2023) indicated that age is not significantly associated with knowledge of sickle cell disease.

The study also determined the if gender is associated with knowledge of SCD among the in-school adolescents. Previous studies conducted in River State, Nigeria by Therese, et al. (2019) and in Port Harcourt, Nigeria by Abiye et al. (2020) indicated that more females than males had knowledge about sickle cell disease. Other studies done in Yola, Nigeria by Adamu, et al. (2021)and in Onitsha by Kidjo et al. (2021) reported that male students had higher knowledge of SCD in all aspects compared to female counterparts Another study by Baba, et al. (2023) reported that gender is significantly associated with knowledge of sickle cell disease. This study was conducted to ascertain if socio-demographic factors of class level, age and gender were associated with knowledge of SCD among in-school adolescents in Nsukka local government, Enugu State.

This study was conducted in Nsukka local government area, Enugu State, Nigeria. Majority of this population in Nsukka LGA are adolescents in their prime reproductive ages in different levels of secondary school education. These students may not have been exposed to knowledge about SCD in classroom studies. Identifying the knowledge of SCD would help to educate the students on the possible causes, clinical manifestations of the disease and preventive measures. When the students possess adequate knowledge, they can undergo genotype screening to know their genotype before engaging in opposite sex relationship. Also, the students could as well counsel the relations on the need for genotype counselling before marriage. Findings of the study could help the government develop programme targeting the adolescents to increase the knowledge of the disease. It may also facilitate policies for free and compulsory genotype screening for all children on entering primary school. Previous studies have been conducted on the knowledge of SCD among in-school adolescents in different locations but none of such study was conducted in the study area. Thus, there is a need to determine the level of SCD knowledge among in-school adolescents in public secondary schools in Nsukka local government area, Enugu state two research questions and one hypothesis guided the study.

Research Questions

1. What is the level of knowledge about sickle cell disease among in-school adolescents in public secondary schools in Nsukka LGA?
2. What is the level of knowledge about sickle cell disease among in-school adolescents in public secondary schools in Nsukka LGA based on class level, age and gender?

Hypothesis

There is no significant difference in the level of knowledge about sickle cell disease among in-school adolescents in public secondary schools in Nsukka LGA based on class level, age and gender ($p \leq 0.05$).

Methods

Research Design and Study Setting

A descriptive cross-sectional survey design was adopted. This study was conducted among in-school adolescents in Nsukka local government area in Enugu state, Nigeria. These in-school adolescents are known to be in the transitional stage between childhood and adulthood, typically ranging from ages 10 to 19 experiencing significant physical, psychological, and social changes, as well as heightened curiosity, experimentation, and sexual behaviors. These students may not have any knowledge of SCD including the cause, clinical manifestations and screening practice. Thus, adolescents may even engage in opposite sexual relationship ignorance of the consequences. Adolescents may even enter into marriage relationship without knowing their genotype and may start bearing children with sickle cell disease. It therefore, becomes necessary to determine the SCD knowledge of the in-school adolescents for appropriate sexual education, educational programmes and pre-marriage counselling.

Population for the Study

The population consisted of all the in-school adolescents in Nsukka Local Government Area of Enugu State with a total of 14,947 in-school adolescents during the 2022/2023 academic session (Post Primary Schools Management Board, 2022).

Sample and Sampling Techniques

The sample size for the study was three hundred and eighty-four (384) in-school adolescents. This was based Cohen, et al. (2018) guidelines that when a population is 10,000 and above at 95% confidence level (5% interval), the sample size should be 370 and above.

The multi-stage sampling procedure was used to draw out the sample size for the study. Stage one involved the use of simple random sampling technique by balloting without replacement to draw 8 (2 boys only, 2 girls only, and 4 co-educational) secondary schools out of the 32 secondary schools in Nsukka L.G.A. of Enugu State. The second stage involved the use of simple random sampling technique by balloting without replacement to draw 48 in-school adolescents from each of the 8 selected secondary schools. The third stage involved systematic random sampling to select 12 students from JSS1 and JSS2 classes, SS1 and SS2 classes. тhis gave a total of 384 in-school adolescents that were used for the study. Systematic sampling was done using the class register with the list of names of the students, and every fourth students in register was drawn for the study. JSS3 and SS3 were excluded from the study because they have completed the Junior and Senior WASC examinations and were not in the school.

Instrument for Data Collection

The instrument used for data collection was a researcher designed questionnaire titled “Sickle Cell Disease Knowledge Questionnaire (SCDKQ)”, which consisted of 13 items. Three items on demographic characteristics of the respondents while ten (10) items elicited information on of Sickle Cell Disease Knowledge with response options of ‘‘YES or NO’’.

Validity of the instrument

The face validity of the instrument 'SCDKQ' was established by three experts from the Department of Human Kinetics and Health Education, University of Nigeria, Nsukka. The experts’ constructive criticisms and corrections were incorporated to modify the instrument before the final copy was used for data collection.

Reliability of the instrument

The reliability of the instrument was established by carrying out a trial-test on in-school adolescents in Igbo-Eze south LGA of Enugu state with similar characteristics with the study population but was not included in the present study. The Spearman-Brown correlation coefficient was used to determine the internal consistency of the instrument. The reliability index 0.89was obtained which made the instrument reliable for the study.

Method of Data Collection

An introductory letter was obtained from the Head, Department of Human Kinetics and Health Education, University of Nigeria, Nsukka seeking permission and cooperation to conduct the study. The letter was presented to the principals of the respective secondary schools selected for data collection. Three hundred and eighty-four (384) copies of the questionnaire were administered to the respondents by the researcher with the help of four research assistants who were briefed on the modalities for the data collection. The completed copies of the questionnaire were collected on the spot by the researcher and research assistants to ensure a high return rate.

Method of Data Analysis

The returned copies of the instrument were screened for completeness of responses. Information obtained from the instrument were coded into Internal Business Machine Statistical Package for Social Sciences (IBM-SPSS) version 25 and analyzed to indicate the response in frequencies, percentages and probability values. The research questions were answered using frequency and percentages while the null hypothesis was tested using Chi-square (x^2) statistics at 0.05 level of significance. In assessing the knowledge of SCD, Okafor (1997) guidelines were used. By these guidelines, below 20 per cent were interpreted very low knowledge, 20-39 per cent were interpreted low knowledge, 40-59 per cent were interpreted average/moderate knowledge, 60-79 per cent were considered high knowledge and 80 per cent and above were interpreted very high knowledge

Results

Table 1.

Percentage Responses to the Level of Knowledge of Sickle Cell Disease among In-school Adolescents in Public Secondary Schools in Nsukka LGA (n=338)

S/N	Items Statement	Yes f(%)	No f(%)
1.	Have you heard of sickle cell disease before?	285(84.3)	53(15.7)
2.	Do you know your genotype?	198(58.6)	140(41.4)
3.	Can sickle cell disease be diagnosed only through blood test?	177(52.4)	161(47.6)
4.	Is sickle cell disease an inherited disease from parents?	263(77.8)	75(22.2)
5.	Do you know that genotype AS is called sickle cell carrier?	193(57.1)	145(42.9)
6.	Are individuals with sickle cell disease more susceptible to infections?	233(68.9)	105(31.1)
7.	Are you familiar with the fact that sickle cell disease can cause chronic pain and complications throughout a person's lifetime?	239(70.7)	99(29.3)
8.	Have you heard that when both parents are carriers, they can give birth to some sickle-cell children?	293(86.7)	45(13.3)
9.	Is there a cure currently available for sickle cell disease?	118(34.9)	220(65.1)

10.	Can individuals with sickle cell disease lead fulfilling and productive lives with appropriate medical care and support as well as affect a person's lifespan?	223(66.0)	115(34.0)
	Overall %	**(65.7)**	**(34.3)**

Key: Less than 20% = Very low knowledge; 20-39% = Low knowledge; 40-59% = Average/Moderate knowledge; 60-79% = High knowledge; 80% and above = Very high knowledge.

Results in table 1 above shows that there is a high level of knowledge (65.7%) of sickle cell disease among in-school adolescents in public secondary schools in Nsukka LGA. The table further showed that the students had a very high knowledge on items 1 and 8 (84.3% and 86.7%) respectively. The table still further showed that the students had a very low knowledge on item 9 (34.9%).

Table 2

Percentage Responses of the Level of Knowledge of Sickle Cell Disease among In-school Adolescents in Public Secondary Schools in Nsukka LGA based on Class level, Age and Gender (n=338)

Socio-demographic Variables		Correct responses	Incorrect responses	
Class level		**f(%)**	**f(%)**	**Total**
JSS	272	170(62.5)	102(37.5)	272(100)
SSS	66	52(78.8%)	14(21.2)	66(100)
Age(years)				
10-13	191	118(61.8)	73(38.2)	191(100)
14-17	116	82(70.7)	34(29.3)	116(100)
18 and above	31	22(71.0)	9(29.0)	31(100)
Gender				
Male	92	67(72.8)	25(27.2)	92(100)
Female	246	155(63.0)	91(37.0)	246(100)

Key: *Less than 20% = Very low knowledge; 20-39% = Low knowledge; 40-59% = Average/Moderate knowledge; 60-79% = High knowledge; 80% and above = Very high knowledge.*

Results in Table 2 above show that students in SSS classes had a higher level of knowledge (78.8%) of sickle cell disease than those in JSS class (62.5%).Also, students aged 18years and above (71.0%) possessed higher level of knowledge of sickle cell disease than their counterparts less than 18 years while males (72.8%) had a higher knowledge of sickle cell disease than females (63.0%).

Table 3

Summary of Chi-Square Statistics of No Significant Difference in the Level of Knowledge of Sickle-cell Disease Among In-school Adolescents in Public Secondary Schools in Nsukka LGA based on Class Level, age and gender (n=338)

Variable	N	Yes	No	$x^{2\text{-value}}$	Df	*p-value*	Decision
Class level		**O(E)**	**O(E)**				
JSS	272	170(178.7)	102(93,3)				
SSS	66	54(43,3)	14(22.7)	6.251	1	.012	Rejected
Age(years)							
10-13	191	118(125.4)	73(65.6)				
14-17	116	82(76.2)	34(39.8)	2.965	2	.227	Not rejected
18 and above	31	22(20.4)	9(10.6)				
Gender							
Male	92	67(60.4)	25(31.6)				
Female	246	155(161.6)	91(84.4)	2.863	1	.091	Not rejected

*The p-value is significant at 0.05 level; O(E) = Observed frequency (Expected frequency)

Table 3 shows there was a significant difference in the level of knowledge of sickle cell disease among in-school adolescents in public secondary schools in Nsukka LGA based on class of study (x^2 = 6.251, p = .012). However, there was no significant difference in the level of knowledge of sickle cell disease among in-school adolescents in public secondary schools based on age (x^2 = 2.965, p= .227) and gender (x^2 = 2.863, p= .091).

Discussion

The findings of the study in Table 1 showed that in-school adolescents in public secondary schools in Nsukka LGA had a high level of knowledge of sickle cell disease. The reason for the high knowledge might be that they may have acquired information about disease either through formal education in their classrooms or through internet access. The reason might be that Nigeria is a country with prevalent of SCD, it is common to be acquainted with people with suffering SCD in schools or communities. This is in consonance with the findings of conducted in Osun State by Adeyemo et al. (2021); and in Tanzania by Mallya et al. (2018) who reported a high level of knowledge of SCD among in-school adolescents. The similarities in findings may be linked that all the studies were conducted among in-school adolescents who are exposed to similar academic programme and internet sources for information. The finding disagrees with the study done in Saudi Arabia by Almulhim et al. (2022) in Ghana by Brown et al. (2022), in Congo by Kambale-Kombi et al. (2020) and in Ghana by Djan and Mensah (2020)which reported very high knowledge of SCD among the participants. The differences may be attributed to area of study as the reviewed studies were conducted in other countries that may have better organized health education programme than Nigeria. Also, the finding of the study is at variance with the findings of study done in Southeast Nigeria by Ezenwosu et al. (2019)and in Uganda by Tusuubira et al. (2018) who reported low and inadequate knowledge of SCD among the respondents. This might be because of students not being exposed to formal education about SCD or the exclusion of SCD in the school health education programme. Another reason may be a lack of access to information about SCD such as books, internet, or health professionals.

Results of the study in Table 2 showed that in-school adolescents in SSS class possessed higher level of knowledge of sickle cell disease than those in JSS class. This might be linked to exposure to educational contents on sickle cell disease mainly in the senior secondary classes This is in line with the findings of studies conducted in Jordan by Al-Awarmeh et al. (2021) in Enugu State by Nwafor et al. (2021),in Tamale Metropolis by Baba and Yidana (2021) that students in SSS classes had a higher knowledge of SCD than those in JSS classes. The similarities in the findings might be attributed to class of study of the respondents. In addition, finding in Table 3 shows that there is a significant difference in the level of knowledge of sickle cell disease among in-school adolescents in public secondary schools in Nsukka LGA based on class level. The finding agrees with the studies done in Jeddah City Egypt by Alturaifi et al. (2018) in Tamale Metropolis, Ghana by Baba et al. (2023) which indicated that class level is associated with SCD knowledge among the students. This might be attributed that those in senior classes have been exposed to SCD knowledge compared to those in junior classes. The finding of this study is at variance with the study of Baba and Yidana (2021) which reported that form (class level) is not significantly associated with knowledge of sickle cell disease. This might be due to the fact that SCD as a serious health issue is being taught in schools at all class levels.

The findings in Table 2 showed that the level of knowledge of sickle cell disease was higher (71.0%) among in-school adolescents aged 18 and above compared to other age groups 14-17 (70.7%) and 10-13 (61.8%). This might be that the age range (18 years and above) are more exposed and have wider opportunities to access information and experiences

either through personal experiences or peer pressure influence, through social media, web browsers, family members and friends' experiences of sickle cell disease. This corroborates with the findings of study done in Ghana by Brown et al. (2022), in Osun State by Adeyemo et al. (2021), in Ile-Ife Nigeria by Afolabi et al. (2021) which reported that older adolescents had higher knowledge scores and better knowledge of SCD compared to younger adolescents. Furthermore, findings in Table 3 showed no significant difference in the level of knowledge of sickle cell disease among in-school adolescents in public secondary schools in Nsukka LGA based on age. The reason for the findings might be that all in-school adolescents of different age groups pay much attention during classes when SCD was taught. The result of the study is in tandem with the findings of Baba et al. (2023) which reported that age is not significantly associated with knowledge of the disease. The result of this study vary with the studies by Brown et al. (2022), by Afolabi et al. (2021) which reported that age of the students was significantly associated with the knowledge of the disease. The similarities might be due to the facts that studies were conducted among students of same age grade with similar characteristics.

Finding in Table 2 showed that the males had a higher knowledge of sickle cell disease than females (63.0%).This finding might be that male students are more attentive in classes when the concept of SCD was taught than the female counterparts. This finding is in line with the studies conducted in Yola, Nigeria by Adamu et al. (2021) and in Onitsha, Nigeria by Kidjo et al. (2021) who reported that male students had a higher knowledge of SCD in all aspects than female counterparts. The similarities might be because the studies were conducted in Nigeria among secondary school students with similar characteristics. However, this finding disagreed with studies done in River State, Nigeria by Therese et al. (2019) and in Port Harcourt Nigeria by Abiye et al. (2020) which observed that females showed better knowledge of SCD than males. However, findings in table 3 showed no significant difference in the level of knowledge of sickle cell disease among in-school adolescents in public secondary schools in Nsukka LGA based on gender. This corroborates with the study of Baba et al. (2023) which reported that gender is not significantly associated with knowledge of the disease. The finding varies with the study done in Jedda city Egypt by Alturaifi et al. (2018) which indicated that gender is associated with SCD knowledge among the students. The similarity and difference in findings might be linked to the area of the study, educational qualification/class levels and SCD educational interventions in different locations.

Conclusion

The knowledge of sickle cell disease possessed by in-school adolescents in public secondary schools in Nsukka LGA was high.. The level of knowledge of SCD possessed by in-school adolescents was high among students within the SSS class levels, among students within the age range of 18 years and above, and among male gender. There was a significant difference in the level of knowledge of sickle cell disease possessed by in-school adolescents in public secondary schools in Nsukka LGA based on class level but there was no significant difference in the level of knowledge of sickle cell disease possessed by in-school adolescents in public secondary schools in Nsukka LGA based on age and gender.

Recommendations

The following recommendations were made;

1. Sickle cell education should be incorporated into Health Education Curriculum and made a compulsory subject/course for all students in college and tertiary institutions and should be taught by a professional health educator.
2. Activities such symposiums, lectures, and seminars on sickle cell disease should be organized in all schools and colleges at regular intervals.
3. Free genetic and medical screening on genotype can be organized on a regular basis for students in secondary schools and colleges.

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