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ORIGINAL RESEARCH

Assessment of the Knowledge of Nigerian Health Technologists-In-Training on Sickle Cell Disease

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Abstract

Background: Community Health Workers (CHWs) have played a key role in the holistic care of sickle cell disease (SCD) in the developed world. However, in Nigeria and other African countries which harbour the largest burden of SCD globally, the poor involvement of CHWs in the care of individuals with the disease may be related to their knowledge about the disease.
Objective: To assess the adequacy of knowledge or otherwise of CHWs-in-training (students of School of Health Technology) in SCD identification, screening and crises prevention.
Methods: This cross-sectional study involved 600 students of the College of Health Technology, Ilesa, southwest Nigeria. A pre-tested self-administered forty-point questionnaire was used to assess information on what SCD is and how it is transmitted (6 questions); major clinical presentations (8 questions); ideal timing for diagnosis (7 questions); common methods of crisis prevention (7 questions); basic counselling of individuals with the disease (6 questions); and knowledge on the relevance of record keeping, home visit, immunisation and prompt referral in SCD care (6 questions).
Results: Only 239 (39.8%) had good knowledge of SCD in the assessed domains. Knowledge on crisis prevention including roles of record keeping, home visits, immunisation and prompt referral in SCD care was particularly poor. Age group, gender and course of study were not significantly associated with the overall knowledge of the disease.
Conclusion: The overall knowledge of Health Technologists-in-training in Nigeria on SCD is poor. Focused and comprehensive modules on SCD should be incorporated into the training curriculum of students in the Colleges of Health Technology in Nigeria.

Keywords: Community Health Workers-in-training, Knowledge, Sickle Cell crises, Sickle Cell Disease.

Introduction

Data from some developed parts of the world suggest that Community Health Workers (CHW)-based interventions such as social support, regular patient-centred education and advocacy are associated with improved short- and long-term clinical outcomes in individuals

with sickle cell disease (SCD). [1,2] A few available evidences in developing countries, however, shows that the involvement of CHWs in the care of individuals with SCD is poor. [3,4] In Nigeria, a recent facility-based study that assessed SCD-related knowledge of 186 CHWs from 46 primary health care centres found that, although majority of them knew that SCD is an inheritable disease, the level of SCD care and knowledge of early SCD diagnosis and crisis prevention was abysmally low. [3] The study recommended that CHWs should be regularly trained and equipped for basic SCD management, with particular attention on early disease detection, crisis prevention, prompt referral and provision of basic genetic counselling.

Beyond regular in-service trainings for CHWs, robust and standardized curricula for training must be developed and adopted in the Schools of Health Technology and Nursing where prospective CHWs undergo formal training. In Nigeria, the curriculum for community health practitioners which was developed in 2006 focused on causes of SCD, identification of clinical features and knowledge of the disease burden on the family. [5] It is grossly deficient on the specific roles of CHWs as SCD counsellors and health educators, their involvement in SCD screening, collation as well as dissemination of results to appropriate institutions and prompt referral.[5]

In Nigeria and other African countries with a high burden of SCD, the involvement of Community Health Workers in the care of individuals with the disease is poor and scantily studied. However, CHWs have demonstrated a key role in the holistic care of SCD in the developed world. To the best of the researchers' knowledge there has been no published work on the knowledge of CHWs -in-training on SCD in many African countries.

Therefore, this study aimed to assess the adequacy or otherwise, of the knowledge of a target population of CHWs-in-training, undergoing training for primary health care (PHC) delivery in Nigeria, concerning SCD identification, disease screening, basic means of crises prevention, including the roles of counselling and immunisation. It was hypothesized in this study that, the basic knowledge of these future key performers in PHC about SCD would determine their level of preparedness for optimal SCD care, especially in settings where sophisticated means of care and specialists are limited.

Methods

Study design and location

The study was a descriptive, cross-sectional survey involving the students of the College of Health Technology, Ilesa, Osun State, southwest Nigeria. Ilesa is a semi-urban town located in the rainforest belt at latitude 7°37'N and longitude 4°40'E. [6] As at year 2020, there were about 87 accredited Schools of Health Technology in Nigeria, with four of them located in Osun State. [7] Three of these four are privately owned while the College of Health Technology, Ilesa is a public institution with a student population of about 4,000 in the 2019/2020 academic session. The school was established in 1977 with the objective of producing competent health care officers to complement efforts of other health care professionals especially at the PHC facilities.

Study population

The study participants included students offering the following courses of study: Community Health (trainee community health officers and community health extension workers), Environmental Health Technology, Food Hygiene and Nutrition, General Health Studies, Health Assistance, Health Education and

Promotion, Medical Laboratory Technology, and Pharmacy Technology.

Inclusion criterion: Students of the College of Health Technology offering the above-listed courses who gave informed consent to participate in the study.

Exclusion criterion: Students who had been in the school for less than two completed semesters before the commencement of the study.

Sampling technique

All the students offering the above-listed courses who were present on the day of the study were eligible for inclusion. However, those who consented after careful explanation of the purpose of the study were given questionnaires to complete. The initial version of the questionnaire was pre-tested on 15 medical students of Obafemi Awolowo University, Ile-Ife and modified as appropriate, thereafter.

Data Collection

The data were collected on participants' demographics (age, sex, course of study, level/class) and level of knowledge about SCD using a pre-tested self-administered questionnaire. The knowledge of SCD of each participant was assessed based on specially-designed forty-point questionnaire which evaluated six major areas on SCD (Appendix 1). These six areas included knowledge on the nature/definition of the disease, including how it is transmitted (6 questions), main clinical presentations (8 questions), ideal timing for diagnosis (7 questions), common methods of crisis prevention (7 questions), basic counselling of individuals with SCD (6 questions) and knowledge on the relevance of record keeping, home visit, immunisation and prompt referral in SCD care (6 questions). Each correct response was awarded 1 mark while wrong or outright non-response was awarded 0. The highest obtainable score was 40. Those who scored 0 -15 were adjudged to have poor knowledge, scores of 16 - 27 as fair knowledge and scores >27 as good knowledge. The questionnaires were filled in the presence of the researcher or other members of the research team to avoid the use of any external source of information such as the internet.

Data analyses

The data were entered using SPSS version 22 (SPSS Inc., Chicago, Ill., USA) into a personal computer system. The demographic characteristics and knowledge levels were summarized in frequencies and proportions while the relationship between demographic characteristics and the participants' SCD knowledge levels (high or low knowledge) was performed using with the Chi-Square test. Mean values were compared using the Analysis of Variance (ANOVA) and the Student's t-test as necessary. Statistical significance level was determined at $p<0.05$.

Ethical considerations

The study protocol was approved by the Ethics Review Committee of the Institute of Public Health, College of Health Sciences, Obafemi Awolowo University, Ile-Ife, Nigeria (protocol number: IPH/OAU/12/827). In addition, permission to conduct the study was obtained from the school management while all the study participants gave written informed consents for enrolment into the study.

Results

A total of 643 questionnaires were distributed but only 600 students successfully completed the questionnaire giving a response rate of 93.3%. The ages of the 600 participants ranged from 15 years to 47 years, with a mean (± SD) of 21.2±3.3 years. As shown in Table I, the majority of them (70.7%) were between the ages of 20 and 29 years, while only 3 (0.5%) were aged 40–49 years.

Table I: Socio-demographic characteristics of the 600 participants

Demographic variables	*Frequency*	*Percentages*
Age group		
< 20 yr	153	25.5
20 -29 yrs	424	70.7
30-39 yrs	20	3.3
40-49 yrs	3	0.5
Gender		
Male	71	11.8%
Female	529	88.2%
Course of study		
Community Health	71	11.8
Environmental Health Technology	122	20.3
Food Hygiene and Nutrition	16	2.7
General Health Studies	34	5.7
Health Assistant	316	52.7
Health Education and Promotion	9	1.5
Medical Laboratory Technology	11	1.8
Pharmacy Technician	21	3.5
Degree in view		
National Diploma	542	90.3%
Higher National Diploma	58	9.7
Reported haemoglobin genotype		
Hb AA	438	73.0%
Hb AS	109	18.2%
Hb SC	3	0.5
Hb AC	25	4.2%
Not known	25	4.2%

Overall knowledge on SCD

Only 239 (39.8%) had good knowledge across all the areas assessed: nature/type of the disease, clinical features, ideal timing for screening, methods of crisis prevention, proper ways of counselling and keeping of health records, home visits and immunisation. Three hundred and fifty (58.3%) and 11 (1.8%) participants had fair and poor overall knowledge about SCD respectively. The overall score ranged from 10 - 38 with a mean (SD) score of 26.0±4.4.

Knowledge of the participants on the six areas that were assessed.

As shown below in Table II, higher proportions of participants demonstrated good or fair knowledge on basic information about nature of the disease (70.5%), proper counselling of affected individuals/caregivers (81.0%) and proper identification of stigmata of SCD (63.6%). However, majority had poor knowledge on ideal timing for screening, methods of crisis prevention and roles of record keeping, home visits, immunisation and prompt referral in SCD care.

Table II: Knowledge of the participants on the areas assessed

Assessed areas of knowledge	*Good or Fair knowledge*	*Poor knowledge*
Nature of the disease	423 (70.5)	177 (29.5)
Presenting features	382 (63.6)	218 (36.4)
Ideal timing for diagnosis	196 (32.7)	404 (67.3)
Crisis prevention	14 (2.3)	586 (97.7)
Counselling	486 (81.0)	114 (19.0)
Record keeping, home visits, immunisation and prompt referral	142 (23.7)	458 (76.4)

Spectrum of the knowledge of SCD

Table III showed the proportion of participants with correct response to all the questions in the domains of SCD nature, clinical features and ideal timing for diagnosis. The table revealed that only 68.7% of the participants knew that the abnormality in the genotype must be passed from both parents, and not just one of the parents or siblings. Also, only 22.2% knew that big tummy due to enlarged abdominal organs is a feature of SCD in children. The proportion of the participants who knew that impairment in growth is seen in children with SCD was abysmally low (13.7%). In addition, only 29.0% knew correctly that children with SCD experience delayed, rather than early puberty. In term of ideal timing for diagnosis, only 53.0% of the participants correctly knew the value of diagnosis in the newborn period.

Table IV showed the proportion of participants with correct response to all the questions in the domains on crisis prevention, SCD counselling and roles of record keeping, home visits, immunisation and prompt referral. While high proportions knew what constitute good counselling, only 4.5% knew about the roles of malaria chemoprophylaxis. Ditto for only 20.3% that knew about the need for prompt referral to secondary or tertiary health facility.

Influence of sociodemographic characteristics on the overall knowledge of SCD

Gender

There was no statistical difference in the proportions of males and females with overall good knowledge of SCD. Only 23 (32.4%) of the 71 males and 216 (40.8%) of the 529 females demonstrated overall good knowledge of SCD ($\chi^2 = 1.859$, $p = 0.173$).

Age

The mean age of the participants with overall good knowledge of SCD was 21.2±3.8 years, while it was 21.1±2.8 years for those with fair knowledge of the disease, and 20.2± 0.9 years for those with poor knowledge. There was neither a statistical difference in the mean ages of the three groups ($F = 0.504$, $p = 0.604$), nor between those with good knowledge and others (fair/poor combined) ($t = -0.220$, $p = 0.826$).

Course of study

Thirty-three (46.5%) of the 71 offering Community Health, 37 (30.3%) of 122 in Environmental Health, 6 (37.5%) of the 16 in Food hygiene, 17 (50.0%) of the 34 in General Health Studies, 133 (42.1%) of the 316 Health Assistants, 3 (33.3%) of the 9 in the Health Education/ Promotion, 5 (45.5%) of the 11 in Medical Laboratory Technology and 5 (23.8%) of the 21 in Dental Technology had good knowledge of SCD. Across different disciplines, the differences in the proportions of participants with good knowledge of the disease and those with poor or fair knowledge, were similar statistically. For instance, the 71 offering Community Health included 33 (13.8%) of the 239 with good knowledge and 38 (10.5%) of the 361 with poor or fair knowledge, $\chi^2 = 1.484$, $p = 0.223$. Also, the 316 in the Health Assistant category included 133 (55.6%) with good knowledge and 183 (50.7%) of the 361 with poor or fair knowledge, $\chi^2 = 1.417$, $p = 0.234$. Ditto for other disciplines.

Table III: Proportion of participants with correct response to questions on the nature of disease, clinical features and ideal timing for screening

Variables on the natures of SCD	*Correct response, Freq (%)*
Definition of SCD	504 (84.0)
Causes	527 (87.8)
Mode of transmission	412 (68.7)
Death occur by 18 years	485 (80.8)
Influence of spouse haemoglobin genotype on offspring	428 (71.3)
Haemoglobin genotype do change with time	460 (76.7)
Variables on the clinical features of SCD	
Recurrent body or bone pains	500 (83.3)
Shortage of blood/ anaemia	443 (73.8)
Recurrent yellowness of the eye/ Jaundice	498 (83.0)
Small head	261 (43.5)
Big tummy (due to enlarged abdominal organs)	133 (22.2)
Long and thin arms and legs	393 (65.5)
Early puberty	174 (29.0)
Impaired/ reduced growth	82 (13.7)
Variables on the ideal timing for SCD screening	
When still in the womb (in the prenatal period)	256 (42.7)
In the first one month of life (newborn screening)	318 (53.0)
It is best done when completing secondary school	150 (25.0)
At any other time when parents are ready to screen the child	167 (27.8)
Should be done just before marriage	289 (48.2)
It is ideal for mother when she is pregnant	161 (26.8)
When any member of the family has SCD	125 (20.8)

Discussion

This study has highlighted the knowledge of health technologists-in-training on various areas of SCD, viz: nature of the disease, clinical features, the ideal time for screening, measures for crisis prevention, proper ways of counselling as well as the importance of health records keeping, home visits and immunisation. Only about 40% of the participants had good knowledge of all these factors while the rest had fair or poor knowledge. Despite the huge burden of SCD in sub-Saharan Africa, sub-optimal knowledge on the disease has also been reported by other authors in this region. [8-12] These studies [8-12] were, however, conducted among university undergraduates or fresh university graduates with disciplines not particularly related to health care. This underscores the poor level of knowledge of sickle cell diseases among the general population of tertiary institution students and fresh graduates and calls for an intensified approach towards educating Nigerian Students on SCD as it is a disorder of public health significance in Nigeria. Good knowledge of SCD is especially needed for students training to be CHWs since they occupy a vantage position in the provision of culturally acceptable health education, counselling, social support as well as facilitating access to required social and medical services, among others. [1,2,13]

Table IV: Proportion of participants with correct response to questions on the ways to prevent SCD crisis, relevance of counselling and proper record keeping, home visits, immunisation and prompt referral in SCD care

Variables on the ways to prevent crisis in SCD	*Correct response, Freq (%)*
Daily intake of plenty of water	128 (21.3)
Regular intake of fruits	206 (34.3)
Regular intake of plenty of vegetables	119 (19.8)
Daily use of drugs such as folic acid and penicillin	28 (4.7)
The child should not participate in sport or any exercise at all	47 (7.8)
Prevention of malaria including daily intake of proguanil	27 (4.5)
The use of local herbs can also reduce sickness/ problem	113 (18.8)
Variables on the focus of counselling in SCD care	
How to recognise the disease	457 (76.2)
Importance of immunization for children	450 (75.0)
Roles of good nutrition	528 (88.0)
Why patients must take water regularly	529 (88.2)
Regular clinic visits and use of drugs	525 (87.5)
Checking haemoglobin genotype before marriage	575 (95.8)
Variables on the on proper record keeping, home visits, immunisation and prompt referral	
Record keeping of children with SCD facilitate care	186 (31.0)
Home visits to patients or caregivers help in the management	227 (37.8)
Children with SCD need both routine and special vaccines for infection control	154 (25.7)
Pneumococcal vaccine is highly essential in the care of children with SCD	139 (23.2)
Children with SCD will benefit from Hemophilus influenza vaccine	105 (17.5)
Patients with SCD need prompt referral to secondary or tertiary health facility	122 (20.3)

Health education has been proven to be a valuable tool in improving the knowledge of individuals on SCD. [12,14] For example, Olatona *et al*, [12] in Lagos, Nigeria reported significant improvement (from 25% to 64.1%) in optimal knowledge on SCD among participants in their health-education intervention study. Similarly, Kotb *et al*, [14] in Saudi Arabia reported a significant improvement in the scores on knowledge on SCD after instituting a health education program on SCD for their participants. These studies highlight the importance of health education in improving knowledge on SCD and as such, it should be intensified in improving the knowledge of health technologists-in-training on SCD.

This present study highlights the importance of paying attention to specific areas of knowledge gaps when incorporating health education modules to improve knowledge on SCD among health technologists-in-training. For example, while the participants in the present study performed well in knowledge on the nature of SCD, proper counselling on the day-to-day care of individuals with SCD and the clinical features of SCD, there were obvious knowledge deficiencies in other areas. These include

knowledge on crisis prevention and the importance of proper record keeping, home visits, immunisation and prompt referral for SCD care. Therefore, in addition to providing general knowledge on SCD, specific knowledge gaps should always be sought and addressed. This is to ensure that comprehensive modules with greater benefits are incorporated into the training curriculum and passed down to health technologists-in-training. A recent study in the same locality revealed poor knowledge of CHWs on early diagnosis of SCD, crisis prevention measures and organized referral to secondary/tertiary facilities when required. [3] This deficiency in knowledge can thus be traced to the non-encompassing scope of the 2006 training curriculum for community health practitioners in Nigeria. [5] Therefore, a more robust and standardized curriculum for training, which addresses these obvious knowledge deficiencies, should be developed and adopted in the Colleges of Health Technology where prospective health technologists, including CHWs undergo formal training. This is important because of the specific roles of CHWs as SCD counsellors, health educators, and their involvement in SCD screening, collation as well as dissemination of results to appropriate institutions and prompt referral.

The present study has some limitations. The data collection instrument was independently developed by the researchers, since there were no known validated instruments for a similar study. In addition, focus group discussion, which may possibly provide further in-depth information on the level of care for individuals with SCD, was not done. Future studies should involve all the stakeholders, especially the tutors in the Colleges of Health Technology and include other Colleges in the state or the country as a whole for increased generalizability of the findings.

Conclusion

The overall knowledge of this population of health technologists-in training in Ilesa, southwest Nigeria, about crisis prevention and the importance of proper record keeping, home visits, immunisation and prompt referral for SCD care is poor. Focused and comprehensive SCD modules should be incorporated into the training curriculum of these future CHWs.

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Appendix 1a: Questions to assess the overall knowledge of Sickle Cell Disease among Health Technologists-in-Training in Ilesa, southwest Nigeria

Knowledge about the nature, including the cause, of sickle cell disease	**Options**		
What type of disease is sickle cell disease?	A major Infection	Blood problem	Disease of poverty
	Food shortage	I don't know	
What causes SCD?	Witchcraft	Gene problem	Abiku
	Ogbanje	I don't know	
To develop the disease, abnormality must be passed from	One parent only	Both parents	Brothers
	Sisters	Animals	I do not know
Death occurs by 18 years	Yes	No	I do not know
Haemoglobin genotype of one's spouse may influence whether the child will have SCD or not	Yes	No	I do not know
Haemoglobin genotype can change any time	Yes	No	I do not know
What are the common ways in which patients with SCD manifest? (8 questions)	**Yes**	**No**	**I do not know**
Recurrent body or bone pains			
Shortage of blood/ anaemia			
Recurrent yellowness of the eye/ Jaundice			
Small head			
Big tummy (due to enlarged abdominal organs)			
Long and thin arms and legs			
Early puberty			
Impaired/ reduced growth			
When is the ideal or the best time to screen for sickle cell disease? (7 questions)	**Yes**	**No**	**I do not know**
When still in the womb (in the prenatal period)			
In the first one month of life (newborn screening)			
It is best done when completing secondary school			
At any other time when parents are ready to screen the child			
Should be done just before marriage			
It is ideal for mother when she is pregnant			
When any member of the family has SCD			
Which of the following can prevent or reduce crisis (i.e. sickness) in children with SCD? (7 questions)	**Yes**	**No**	**I do not know**
Daily intake of plenty of water			
Regular intake of fruits			
Regular intake of plenty of vegetables			
Daily use of drugs such as folic acid and penicillin			
The child should not participate in sport or any exercise at all			
Prevention of malaria infection including daily intake of proguanil			
The use of local herbs			

Scoring:

Correct response = 1 mark. Wrong or outright non-response = 0. Highest obtainable score = 40.

Scores of 0 - 15 = Poor knowledge; 16 - 27 = Fair knowledge; >27 = Good knowledge.

Appendix 1b: Questions to assess the overall knowledge of Sickle Cell Disease among Health Technologists-in-Training in Ilesa, southwest Nigeria

Knowledge about the nature, including the cause, of sickle cell disease	**Options**		
When counselling on SCD, you should focus on the following (6 questions)	**Yes**	**No**	**I do not know**
How to recognise the disease			
Importance of immunization for children			
Roles of good nutrition			
Why patients must take water regularly			
Regular clinic visits and use of drugs			
Checking haemoglobin genotype before marriage			
Individuals with SCD will benefit from the following during care (Questions on record keeping, home visits, immunisation and prompt referral – 6 questions)	**Yes**	**No**	**I do not know**
Record keeping of children with SCD facilitate care			
Home visits to patients or caregivers help in the management			
Children with SCD need both routine and special vaccines for infection control			
Pneumococcal vaccine is highly essential in the care of children with SCD			
Children with SCD will benefit from Hemophilus influenza vaccine			
Patients with SCD need prompt referral to secondary or tertiary health facility			

Scoring:
Correct response = 1 mark. Wrong or outright non-response = 0. Highest obtainable score = 40.
Scores of 0 - 15 = Poor knowledge; 16 - 27 = Fair knowledge; >27 = Good knowledge.