

Knowledge, Attitude, Practice of Genotype Screening Among Undergraduate Medical Students in The University of Abuja

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ABSTRACT

Background: Sickle cell disease remains the most common life-threatening genetic disorder worldwide. Globally about 312,000 children are born each year with sickle cell disease (SCD), half of which are from Nigeria [1,2,4,5,7,8]. The prevalence of sickle cell anaemia (SS) in Nigeria is estimated to be 20 per 1000 and 25% of the population have sickle trait (AS) [2,6,9,10,11]. Medical students in Nigeria are key in the future management of sickle cell disease. Therefore, it is important to understand what training in SCD is given to medical students in Nigeria and to identify any important knowledge gaps which may improve training curricula. **Method:** A student survey was conducted at the College of Health Sciences, University of Abuja in the Federal Capital Territory of Nigeria (FCT) in the 2021/2022 academic year. At this University, all students undergo comprehensive medical tests before admission, which include genotype screening. All medical students were eligible to complete the survey and which was advertised through year group social platforms. Data were collected using a self-administered questionnaire through Google form, after the respondent indicated their consent. The questions focused on knowledge of the disease and attitude towards genotype screening, and whether the student had undergone screening and were aware of their status. **Results:** In the academic year of 2021/2022 there were a total number of 374 medical students from year one to year six of these 150 (40%) completed the survey. Survey respondents included similar numbers of males and females, with a mean age of 23.7 years and were from all years of study. All the respondents had heard about sickle cell disease and 85% stated that they had attended courses which covered Sickle cell disease topics (from 63% in 1st year of study rising to over 90% by year 3). A very high proportion knew that Sickle cell disease trait can be transmitted from both parents to offspring (95%), and 90% knew that SCD can affect anyone and can occur when both parents are carriers of the Sickle gene. Fewer students (79%) knew that SCD can be diagnosed at birth. Knowledge of common symptoms for sickle cell patients was variable, while most knew that one of the most common complaints was pain in the limbs (92%), only 23% were aware that yellow eyes is also a common symptom, and 10 students (7%) incorrectly identified skin rashes as a common symptom. A total of 93% of students had been genotype-screened for SCD, and attitudes towards genotype screening, was generally positive. Most agreed that genotype screening can help prevent SCD and

that pre-conception genotype screening is important. Of those who had been screened and knew their status, 68.6% were AA (adult haemoglobin without any haemoglobin disorder), 28.6% were AS (had the sickle cell trait) and 2.9% were SS (sickle cell anaemia). **Conclusion:** Over 90% respondents knew their sickle cell status (Hb genotype) and 2.9% had SCD (HbSS), and 29% had sickle cell trait (HbAS) consistent with the national burden in Nigeria. Reassuringly, medical students had a good knowledge of and attitude towards SCD irrespective of their year of study. Although identifying symptoms, which may be important in diagnosis, could be improved. Given that almost half of the global burden of SCD is in Nigeria, this study reflects the importance of ensuring adequate health education towards sickle cell disease among Nigerian medical students.

Keywords: Sickle Cell Disease, Genotype Screening, Medical Students, Knowledge, Attitude and Practice.

INTRODUCTION

Sickle cell disease (SCD) is a group of inherited disorders of hemoglobin (Hb) in which the sickle Hb is present in association with abnormal Hb [1]. It is the most common single gene disorder in the world. Historically, the homozygous HbSS disease, HbS β -thalassaemia (HbS β -Thal), HbS plus C, D, and E (HbSC, HbSD, and HbSE, respectively) are commonly included under the classification of SCD [12].

The geographical distribution of these Hb variants differs and often parallels certain attributes such as climatic conditions and malaria endemicity. While the HbSS and HbSC diseases are highly prevalent in areas of Sub-Saharan Africa, particularly West Africa, the HbS β -Thal, HbSD and HbSE are more common in parts of the Middle East and Asia [5,6,7,8,9,10]. The prevalence of the carrier rates for HbS ranges from 5% to 40% among populations in these endemic areas; this thus drives disease epidemiology [13].

Sickle cell disease (SCD), because of its chronic course, also has major psychological, social and economic implication on the child as well as the family [13]. In Sub Saharan African, most of the affected children do not survive childhood largely because of malaria and bacterial infection and lack of access to appropriate care.

Genotype screening and the resultant genetic counseling are increasingly recognized as integral part of the much-herald preventive medicine which more recently, have been used increasingly to inoculate prospective parents of conceiving children with preventive deformities, if any. The emergence of genotype screening has conjured the view on how to proceed in implementing premarital screening at the national level that could be acceptable to the society, as many traditional societies are shrouded with the social prescription that are akin to fatalism. Therefore, studies are needed to gauge the 'pulse' of the society towards genotype screening.

Genetic counseling and testing have been sparsely reported in Nigeria; the pioneer work by Akinyanju *et al.* in 1999 highlighted the need for a country-wide application of this program. In the above study, genetic counseling and subsequently post-natal diagnosis were offered to 124 women (51% had previously had children with sickle-cell anemia) in Lagos, Southwest Nigeria, and showed a carriage rate of 18.5% for HbSS among the fetuses; 96% of these fetuses were subsequently aborted [14]. This therefore implies that premarital SCD genetic counseling and

testing (if correctly applied in Nigeria) has the potential to reduce the frequency of births to affected children and in the longer term the prevalence of this disease.

Correct knowledge and attitude towards genotype screening for sickle cell disease is vital because preventing genetic disease through early identification and genetic counseling remains the only realistic approach to reducing the impact of the disease. This also allows for better use of available resources in resource-poor countries such as Nigeria where the prevalence of SCD is high.

Generally, genotype screening provides the individual with genetic information of potential value which could assist him in making informed decisions about future reproduction. This benefit of screening notwithstanding, submission of self for the screening test has not received widespread acceptance, particularly in developing world. Attitude is therefore the dynamic element and the motive of activity in human behavior, that is behavior is influenced by attitude [15]. It can also be defined as susceptibility to certain kinds of stimuli and readiness to respond in a given way, which are possible towards our world and parts of it which impinges upon us [16].

Superstitious belief about genotype test is a major issue adversely affecting the willingness of the public to embrace screening. Other constraints include barriers to screening arising from undersupply of preventive counseling services in clinics and hospital [17]. Essentially, genotype screening remains voluntary, though in recent times, some religious organizations and tertiary institution mandate the genotype screening as pre-requisite to marriage and medical requirements respectively [11,17].

This study is aimed at providing more information of genotype screening to the undergraduate medical students so as to make them make an informed decision on pre-conception genetic screening, thereby reducing the burden of sickle cell diseases in the country. The findings of this study will also contribute towards understanding the current SCD-related gaps in knowledge and practice among these students, which will inform improvement in their curricula, and also policy making towards genotype and newborn screening in the future.

METHODOLOGY

Study Area

The study was conducted at University of Abuja in the Federal Capital Territory of Nigeria (FCT). The FCT is located in the center of the country and is made up of six area councils among which is Gwagwalada area council where the university is located. The population of the FCT according to the 2006 National Census was 1.4 million with a projected rise to 2.2 million by 2011. Gwagwalada area council had a population of about 160,000 during that census [18].

There is a good road network and the health care system is composed of numerous primary healthcare centers, a handful of general hospitals and two tertiary hospitals which cater for residents of the FCT and its environs. The institution was established on January 1st, 1988; The University is located in Gwagwalada Area Council in the FCT. Gwagwalada is a semi-urban town located in the Gbagyi speaking region of the FCT. The residents of Gwagwalada are comprised of civil servants, university and teaching hospital staff as well as students, traders, artisans,

farmers and more. The town is surrounded by different rural settlements of farmers and cattle herdsmen. Presently, the University has ten faculties including the College of Health Sciences.

Study Design; Study Population; Sample Size Estimation

Data were collected using a self-administered questionnaire through Google form, after the respondent indicated their consent. A descriptive cross-sectional study. The study population were undergraduate medical students who had registered for the 2020/2021 academic year in the university.

The minimum sample size, n , for the study was determined using Leslie Kish formula $N = (Z\alpha)^2 pq / d^2$. Where: n = sample population, $Z\alpha$ = confidence interval (1.96), p = prevalence value⁸⁸=0.190, $q = 1-p = 1-0.19 = 0.81$, d = level of precision =0.05. 10% was added to make up non-response rate. The computed value of the minimal sample size n was 264. All undergraduate medical students who were registered for the academic year 2020/2021 during which this research was conducted in the University of Abuja were included.

DATA COLLECTION; DATA ANALYSIS

Data were collected using a self-administered questionnaire through Google form, after the respondent indicated their consent. The questions focused on knowledge of the disease and attitude towards genotype screening, and whether the student had undergone screening and were aware of their status. The questionnaire was made up of four sections. The first section got socio-demographic data of the respondents. The second section was to obtain data regarding the knowledge of sickle cell disease. The third section of the questionnaire was to obtain data regarding attitude to genotype screening while the fourth section was to ascertain the practice of genotype screening. Data was analyzed using Statistics and Data (STATA) version 17 software. Analysis seeks to find associations between socio-demographics, knowledge of sickle cell disease, attitude and practice of genotype screening.

The knowledge section about sickle cell was a structured closed question offering a multiple dichotomous choice of "yes", "no" or 'I don't know'. Questions were asked on sickle cell. This provided a maximum of 100% and a minimum of 0% on each question. The values were calculated. Respondents with scores equal to or 50% the value were considered to have a good knowledge to genotype screening while those who had scores below 50% value were considered to have poor knowledge to genotype screening. The attitude of the respondents toward sickle cell disease were assessed using the 5-point Likert scale ranging from strongly disagree, disagree, indifferent, agree to strongly agree. Strongly agree and agree were awarded positive attitude. Strongly disagree, disagree and indifferent were awarded negative attitude. Six questions were asked on attitude towards genotype screening. This provided a maximum of 100% and a minimum of 0% on each question. The 50% value were calculated. Respondents with scores equal to or above the 50% value were considered to have had positive attitude toward genotype screening while those who had scores below the 50% value were considered to have negative attitude toward genotype screening.

Practice of the respondent was assessed using a semi structured question. This was provided a maximum of 100% and a minimum of 0% on each question. The 50% score was calculated. Respondents with scores equal to or above the 50% value were considered to have good

practice toward genotype screening while those who had scores below the 50% value were considered to have had a bad practice toward genotype screening.

Ethical Consideration

Ethical approval for this research was obtained from the Ethical committee of the University of Abuja teaching Hospital, Gwagwalada-Abuja. Also, informed consent was obtained online from undergraduate medical students before administering the questionnaire via Google form. Maximum effort was made to ensure confidentiality of information by omitting names of the respondents and also assuring them that no information provided could be linked to them by anybody, including the researcher.

RESULTS

In the academic year of 2021/2022 there were a total number of 374 medical students from year one to year six of these 150 (40%) completed the survey. Survey respondents included similar numbers of males and females, with a mean age of 23.7 years and were from all years of study. All the respondents had heard about sickle cell disease and 85% stated that they had attended courses which covered Sickle cell disease topics (from 63% in 1st year of study rising to over 90% by year 3). A very high proportion knew that Sickle cell disease trait can be transmitted from both parents to offspring (95%), and 90% knew that SCD can affect anyone and can occur when both parents are carriers of the Sickle gene.

Fewer students (79%) knew that SCD can be diagnosed at birth. Knowledge of common symptoms for sickle cell patients was variable, while most knew that one of the most common complaints was pain in the limbs (92%), only 23% were aware that yellow eyes is also a common symptom, and 10 students (7%) incorrectly identified skin rashes as a common symptom. A total of 93% of students had been genotype-screened for SCD, and attitudes towards genotype screening, was generally positive.

Most agreed that genotype screening can help prevent SCD and that pre-conception genotype screening is important. Of those who had been screened and knew their status, 68.6% were AA (adult haemoglobin without any haemoglobin disorder), 28.6% were AS (had the sickle cell trait) and 2.9% were SS (sickle cell anaemia).

Table I: The mean age and standard deviation of the undergraduate medical students

Variable	N	Mean	p50	SD	Variance
Age_in_years	150	23.68	23	2.642756	6.984161

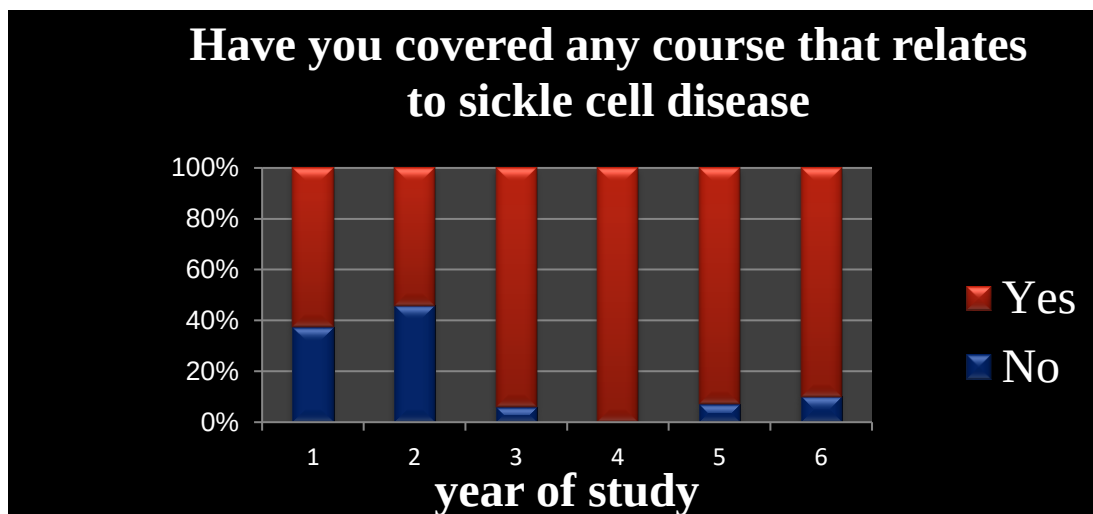
Mean age was 23.68 years with Standard Deviation of 2.64.

Table 2: Frequency of Age in years

Age_in_years	Freq.	Percent	Cum.
19	4	2.67	2.67
20	12	8.00	10.67
21	20	13.33	24.00
22	21	14.00	38.00
23	23	15.33	53.33
24	12	8.00	61.33
25	15	10.00	71.33
26	20	13.33	84.67
27	10	6.67	91.33
28	8	5.33	96.67
29	4	2.67	99.33
32	1	0.67	100.00
Total	150	100.00	

Table 3: Percentage of students who had been genotype screened

Have you had a genotype screening done	
Yes	93.33%%
No	4.67%
I don't know	2.00%

**Figure 1: Fraction of students per year of students that has covered courses on SCD**

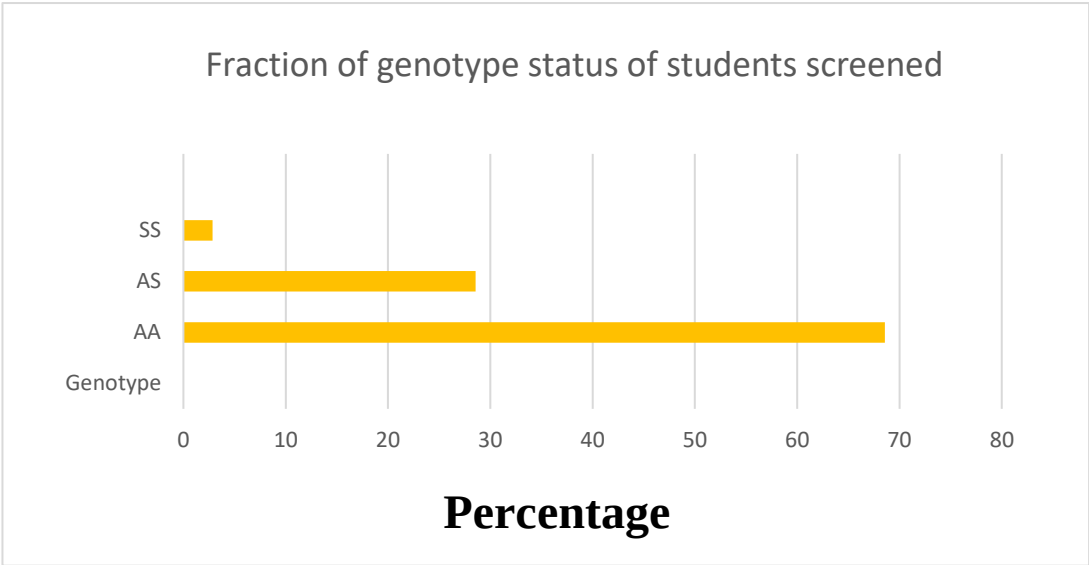


Figure 2: Fraction of Genotype Status of Students Screened

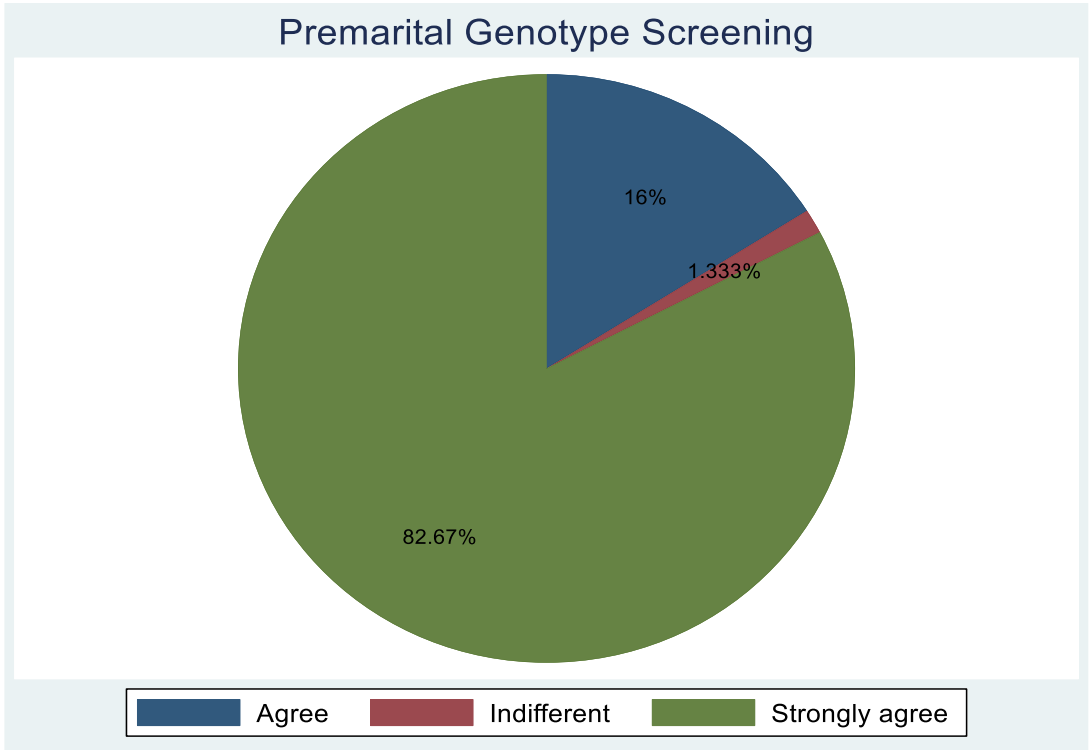


Figure 3: Importance of Prenatal Genotype Screening as shown by Respondents

DISCUSSION

The respondents were undergraduate medical students from year 1 to year 6. The results of this study show the female respondents slightly more than the males, the mean age was 23.68 years with standard deviation of 2.64. 15.33% of the respondents were 23 years old, while 14% were 22 years old, and respondents of the age 21 and 26 years old were 13%. These findings are consistent with a similar study in Abuja, where majority of the students were within the age group 21-25 years¹¹. Quite a large number of participants (94%) were single.

Knowledge on Genotype Screening

All the undergraduate medical students have heard of sickle cell disease and majority know it is genetically acquired. This outcome is similar to findings in a study by Animasahun BA, et al in Lagos state Nigeria [19].

In this study 85% of the medical students stated that they had attended courses which covered Sickle cell disease topics (from 63% in 1st year of study rising to over 90% by year 3). A very high proportion knew that Sickle cell disease trait can be transmitted from both parents to offspring (95%), and 90% knew that SCD can affect anyone and can occur when both parents are carriers of the Sickle gene. Similar studies were also reported by Olarewaju SO et al in Jos, were 97.4% of the students were aware of sickle cell disease. This is also in keeping with the study of Abubakar S et al in Kano Nigeria, were 73% of the students of Bayero University knew that SCD was inherited from both parents [20].

Fewer students (79%) knew that SCD can be diagnosed at birth. Knowledge of common symptoms for sickle cell patients was variable, while most knew that one of the most common complaints was pain in the limbs (92%), only 23% were aware that yellow eyes is also a common symptom, and 10 students (7%) incorrectly identified skin rashes as a common symptom.

Attitudes towards Genotype Screening

A total of 93% of students had been genotype-screened for SCD, compared to the findings from a study by Bazuaye et al in Benin Nigeria, were only 32% of the respondent knew their genotype. Attitudes towards genotype screening, was generally positive in this study and showed high number of screened students. This is not surprising, as the respondents are medical students and also comprehensive medical tests is a prerequisite for admission into the college [21].

98.7% of the respondents had positive attitude that pre-marital genotype screening should be conducted before marriage, this is similar to 97% of undergraduate students agreed to go for pre-marital counselling and screening in a study by Ugwu in Ebonyi Nigeria [22]. Also 42.6% of respondents identified that pre-marital genotype testing is a means of prevention of SCD, this was in the findings of a study carried out by Owolabi RS et al in Abuja Nigeria [23].

In this study 100% of the respondents had positive attitude that everyone should have a genotype screening done, this finding is similar to the results observed by Gbeneol et al with 88.9% of the respondents recommending intending couples to have a compulsory pre-marital screening [24].

Practice of Genotype Screening

93% of the students in this study had been genotype screened, which is similar to the findings among youths in Plateau state Nigeria, where 52.7% of the youths have been screened for their genotype [25]. Overall, most of the undergraduate medical students agreed that genotype screening can help prevent SCD and that pre-conception genotype screening is important. Of those who had been screened and knew their status, 68.6% were AA (adult haemoglobin without any haemoglobin disorder), 28.6% were AS (had the sickle cell trait) and 2.9% were SS (sickle cell anaemia).

CONCLUSION

Over 90% respondents knew their sickle cell status (Hb genotype) and 2.9% had SCD (HbSS), and 29% had sickle cell trait (HbAS) consistent with consistent with the national burden in Nigeria. Reassuringly, medical students had a good knowledge of and attitude towards SCD irrespective of their year of study. Although identifying symptoms, which may be important in diagnosis, could be improved. Given that almost half of the global burden of SCD is in Nigeria, this study reflects the importance of ensuring adequate health education towards sickle cell disease among Nigerian medical students.

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