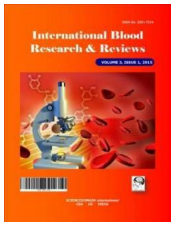

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Sickle Cell Carrier Frequency and the Need for Genetic/ Pre-marital Counseling among Students of a Nigerian University

Ugwu Ngozi Immaculata[1*] and Udeh Jude Nnanna[2]

[1]Department of Pathology, Haematology and Immunology Unit, Faculty of Medicine, Ebonyi State University, P.M.B. 53, Abakaliki, Nigeria.
[2]Medical Center, Ebonyi State University, Abakaliki, Nigeria.

Authors' contributions

This work was carried out in collaboration between both authors. Author UNI designed the study, wrote the protocol, manage the literature searches and wrote the first graft of the manuscript. Author UJN collected data, analysed data and also contributed to the final draft of the manuscript. Both authors read and approved the final manuscript.

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ABSTRACT

Aims: To determine the sickle cell carrier frequency among undergraduate students of a Nigerian University with a view to evaluate the need to institute genetic and premarital counseling program.
Methodology: This was a retrospective study and record of haemoglobin electrophoresis results of students screened between May 2010 and April 2011 was obtained from Ebonyi State University Medical Center. Data was analyzed using Epi info software, version 3.5.4.
Results: Three thousand, two hundred and eighty three results were obtained comprising 1749 (53.3%) males. The age of the students ranged from 16 – 47 years with mean age of 22 ±5 years. Among the population studied, haemoglobin AA was 74.47%, AS 25.19%, SS 0.18%, AC 0.06%, SC 0.10%.
Conclusion: Sickle cell carrier frequency was found to be high among the study population. There is need to institute genetic and pre-marital counseling program among the students in order to help

**Corresponding author: E-mail: ngoziugwu5@gmail.com;*

them take informed decision concerning their marriage so as to prevent procreation of children affected with sickle cell disease.

Keywords: Sickle cell carrier; genetic counseling; university; students; Nigeria.

1. INTRODUCTION

Sickle cell disease is a major public health problem and the commonest genetic disorder worldwide [1]. It is a blood disorder that affects the hemoglobin within the red blood cells and occurs when a person inherits two abnormal copies of the beta globin gene, one from each parent [2]. A person with a single copy is said to have sickle cell trait (sickle cell carrier) and usually does not experience symptoms, but can pass the gene on to their offspring. Sickle gene occur as a result of substitution of a single amino acid, valine for glutamic acid in the sixth codon of beta globin gene on chromosome 11. Under hypoxic condition, this abnormality causes haemoglobin to become insoluble, crystallize and form tactoid which distort the normal shape of red blood cell from biconcave to sickle shape, hence the name.

Sickle cell disease is a global problem but is more common in the ethnic population from Africa, the Mediterrenean basin and South east Asia [3]. About 7% of the world population are carriers of sickle gene, with 60% of the total being in Africa, and 300,000 – 400,000 affected children born annually with haemoglobinopathies. According to World Health Organisation report, Nigeria has the highest burden of sickle cell disease in the world with a prevalence of 2%, about 2 – 3 million homozygous cases (Hb SS), up to 40 million sickle cell trait and about 150,000 children born annually with sickle cell disease [4]. Despite the sickle cell disease burden, Nigeria has inadequate national health policies and plans, scarce facilities, diagnostic tools, treatment services and trained personnel.

In Ebonyi State and some other parts of Nigeria, control programmes do not exist despite high prevalence of hemoglobin S as reported in some parts of Nigeria [5,6]. Screening for sickle cell disease is not a common practice, and diagnosis is usually made when a severe complication occurs. In places where screening programmes exist, they are not usually accompanied by genetic counseling, so people do not understand the implication of their result or the appropriate action to take with respect to their result. There is therefore a need for urgent interventions to address this public health problem. Control and prevention of sickle cell disease partly entails setting up screening and genetic counseling programme. Interventions relating to primary prevention in form of genetic and premarital counseling and general public knowledge will help to reduce the incidence of the disease.

Sickle cell disease prevalence depends on sickle cell trait. Where the prevalence of sickle cell trait exceeds 20%, sickle cell disease is estimated to be at least 2% [7]. Studies conducted in other parts of Nigeria have reported high prevalence of sickle cell trait. [8-10] but studies have not been conducted in Ebonyi State to ascertain the sickle cell carrier frequency. Targeting the youth who are not yet married, as most of the undergraduate students, and instituting screening and counseling programme will help them to take informed decision about their marriage so as to prevent procreation of children affected with sickle cell disease. The objective of this study was therefore to determine the sickle cell carrier frequency among the students of Ebonyi State University with a view to evaluate the need to institute genetic and premarital counseling program.

2. MATERIALS AND METHODS

This is a retrospective study and data was obtained from Ebonyi State University Medical Centre. Record of hemoglobin electrophoretic screening result conducted among the students of Ebonyi State University between May 2010 and April 2011 was collected.

Data was entered into a computer using Epi info software version 3.5.4, which was also used for analysis. Descriptive statistics was used to compute percentages and averages. Results were presented in tables and expressed as percentages/proportions, means and standard deviation.

2.1 Ethical Issues

This study was approved by the Research and Ethics Committee of the institution.

3. RESULTS

Three thousand, two hundred and eighty three results were obtained, made up of 1749 (53.3%) males and 1534 (46.7%) females (Table 1). The age of the students ranged between 16 – 47 years with mean age of 22 ±5 years.

Table 1. Sex distribution of the students

Sex	Frequency	Percentage
Male	1749	53.3
Female	1534	46.7
Total	**3283**	**100**

The distribution of the various haemoglobin electrophoresis obtained in this study showed that Hb AA has the highest frequency, followed by Hb AS, Hb SS, Hb SC and Hb AC in that order as shown in Table 2. Among the population studied, sickle cell trait was found to be high (25.2%).

4. DISCUSSION

In this study, Hb AA recorded the highest frequency distribution. This agrees with findings of previous studies. [5,6] and could be attributed to increasing awareness of the sickle cell disease among the general population by both governmental and non-governmental organizations as well as health education on preventive measures.

The frequency of sickle cell trait, Hb AS, was found to be high (25.2%). This finding is in agreement with previous studies, [10,11] and is in keeping with the reports that the distribution of sickle cell trait is 20 – 30% in Nigeria [4]. It has been documented that the prevalence of sickle cell disease depends on the prevalence of sickle cell trait and in areas where the prevalence of sickle cell trait exceed 20%, sickle cell disease is estimated to be at least 2% [7]. The finding of 25.2% sickle cell carrier frequency in this study suggests that a high proportion of our population will be affected with sickle cell disease and so the need for urgent intervention in terms of instituting screening and genetic and premarital counseling program to prevent and control sickle cell disease.

This study also found a low frequency of sickle cell disease. This is similar to the findings of previous studies, [8,12] and may be attributed to the fact that this study was done among University students, who were likely to be healthy, with normal haemoglobin, Hb AA, in order to be able to withstand the usual academic stress, as opposed to their counterparts with sickle cell disease, who hardly survive before they could gain admission into the University or other higher institutions of learning.

This study also found that similar proportions of both male and female students were sickle cell carriers. This could be attributed to the fact that haemoglobinopathies are not sex-linked. This finding is compatible with the report of previous study by Pennap et al, who suggested that gender had no effect on the incidence of haemoglobin variants [13].

Table 2. Frequency distribution of haemoglobin genotype among the students

Haemoglobin genotype	Frequency	Percentage (95% confidence interval)
AA	2445	74.47 (72.98 – 75.97)
AC	2	0.06 (0.0 – 0.14)
AS	827	25.19 (23.71 – 26.68)
SC	3	0.10 (0.0 – 0.19)
SS	6	0.18 (0.03 – 0.32)
Total	**3283**	**100**

Table 3. Distribution of haemoglobin genotype according to sex

Haemoglobin genotype	Females		Males	
	Frequency	Percentage	Frequency	Percentage
AA	1161	75.7	1284	73.4
AC	2	0.1	0	0
AS	365	23.8	462	26.4
SC	1	0.1	2	0.1
SS	5	0.3	1	0.1
Total	**1534**	**100**	**1749**	**100**

5. CONCLUSION

Sickle cell carrier frequency was found to be high among the study population. There is need to institute genetic and premarital counseling program among the students in order to help them take informed decision concerning their marriage so as to prevent procreation of children affected with sickle cell disease.

CONSENT

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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