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Frequency Distribution of Haemoglobin Electrophoretic Pattern in Pregnant Women Attending Antenatal Clinic in Specialist Hospital, Sokoto, Nigeria

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Abstract

About 85% of sickle cell disorders and over 70% of all affected births occur in Africa. The aim of this study was to describe the haemoglobin electrophoretic pattern among pregnant women in Sokoto. Blood samples collected from three hundred and eighty-five (385) consenting pregnant women at the Specialist Hospital, Sokoto were used for haemoglobin electrophoresis using standard haematology technique between June and October, 2015. Out of 385 pregnant women screened, 316 were of HbAA (82.1%), 18 were of HbAC (4.7%) and 51 were of HbAS (13.2%). Religion, ethnicity and age had no relationship with the distribution of haemoglobin electrophoretic pattern ($p > 0.05$). There was low prevalence of haemoglobinopathies probably due to reduced consanguineous marriage, adequate information on genetic counseling on haemoglobinopathies and pre-marital screening. There were no association between haemoglobin electrophoretic patterns with religion, ethnicity and age.

Keywords: Frequency, Haemoglobin Electrophoretic Pattern, Pregnant Women, Antenatal Clinic, Specialist Hospital, Sokoto, Nigeria.

Introduction

Haemoglobin molecule is composed of four polypeptide globin chains and each of the chains

contains a haem moiety which has an organic part (a protoporphyrin ring made up of four pyrrole rings) and a central iron ion in the ferrous state (Fe^{2+}) (Thomas and Lumb, 2012).

Haemoglobin is the oxygen carrying pigment of the red blood cells and the defects in its genes can result in the production of abnormal haemoglobin which leads to conditions known as haemoglobinopathies. These haemoglobin variants cause moderate to severe haemolytic anaemia leading to high degree of morbidity and mortality (Akhigbe *et al.*, 2009; Patel *et al.*, 2009).

One of the most severe haemoglobinopathies is the sickle cell disease, which was originally found in the tropics and subtropics but it is now common worldwide due to migration of people from tropical to the temperate zone (Ahmed *et al.*, 2010). However, it has been observed that about 85% of sickle cell disorders and over 70% of all affected births occur in Africa while over 5.2% of the world population have been reported with sickle cell trait (Modell and Darlison, 2008).

Reports from various parts of Nigeria on the distributions of haemoglobin variants have shown prevalence of 65.3-78.5% for HbAA, 14.4-25.4% for HbAS, 0.3-4.8% for HbAC, 0.8-9.4% for HbSS,



0.08% for HbSC and none for HbCC (Akodu *et al.*, 2015; Okoroiwu *et al.*, 2015; Onuoha *et al.*, 2015; Onuigwe *et al.*, 2014; Nubila *et al.*, 2013; Pennap *et al.*, 2011; Adeyemo and Soboyejo, 2006).

The main aim of this study was to describe the haemoglobin electrophoretic pattern among pregnant women in Sokoto as this could provide information on the prevalence of haemoglobinopathies in the locality. It is our hope that the knowledge will be utilized in health education campaign and during pre-marital screening to reduce the prevalence of sickle cell diseases in the community.

Materials and Methods

Study area

The study was conducted at the Specialist Hospital, Sokoto, North-Western Nigeria. Sokoto city lies between longitude 05° 11 to 13°03 East and latitude 13°00 to 13°06 North and covers an area of 60.33km² with an annual rainfall between 500mm to 1300mm. The population of Sokoto was 3.6 Million in 2006 with projected population of 4,244,399 in 2015 while the inhabitants are mainly Hausa Fulanis.

Study population

The study on the distribution of haemoglobin electrophoretic pattern among three hundred and eighty-five (385) consenting pregnant women, whose ages were between 15 and 44 years was conducted after the ethical approval was obtained from the ethical committee of the Specialist Hospital, Sokoto. Written informed consent was obtained from all the pregnant women. The study was carried out between June and October, 2015. Socio-demographic factors of every participant were obtained with the aid of structured questionnaire.

Inclusion criteria

Consenting pregnant women at the antenatal clinic of the Specialist Hospital, Sokoto were included in the study.

Exclusion criteria

All non-consenting pregnant women that attended the antenatal clinic in Sokoto Specialist Hospital were excluded from the study.

Sample collection

Two milliliters (2ml) of blood was collected by venipuncture from every pregnant woman into ethylene diamine tetra-acetic acid for haemoglobin electrophoresis using cellulose acetate electrophoresis technique as described by wild and Bain (2002). Haemolysates from blood samples of known HbAS and HbAC were used as controls.

Analysis

Data were analyzed using computer data-based software SPSS version 21 to determine the frequency distribution of haemoglobin variants. Relationship of haemoglobin electrophoretic pattern and socio-demographic factors was determined using chi-square test. A p-value less than ≤ 0.05 was considered statistically significant.

Results

Table 1 shows the distribution of haemoglobin electrophoretic pattern. Out of 385 pregnant women screened, 316 were of HbAA (82.1%), 18 were of HbAC (4.7%) and 51 were of HbAS (13.2%). Table 2 reveals the relationship between haemoglobin electrophoretic pattern and socio-demographic factors. Religion, ethnicity and age of the pregnant women showed no relationship with the distribution of haemoglobin electrophoretic pattern; $p=0.121$, $p=0.309$ and $p=0.222$, respectively.

Table 1: Distribution of haemoglobin genotypes in pregnant women

Haemoglobin Pattern (%)	Electrophoretic Frequency	Percentage
Hb AA	316	82.1
Hb AC	18	4.7
HbAS	51	13.2
Total	385	100

Table 2: Relationship between haemoglobin genotypes and socio-demographic factors.

Socio-demographic factors	Haemoglobin genotypes			p-value
	HbAA (n)	HbAC (n)	HbAS (n)	
Religion	Islam	305	17	0.121
	Christianity	11	1	
Ethnicity	Hausa/Fulani	291	17	0.309
	Igbo	4	0	
	Yoruba	14	1	
	Nupe	7	0	
Age (years)	15-24	153	5	0.222
	25-34	137	9	
	35-34	26	4	

Discussion

The percentage distributions of HbAA, HbAC and HbAS were 82%, 4.7% and 13.2 %, respectively in this study. However, the prevalence of HbAA observed in this study is contrary to the lower prevalence of 65.3- 74.6% documented in Southern Nigeria (Okoroiwu *et al.*, 2015; Onuoha *et al.*, 2015; Nubila *et al.*, 2013; Egesie *et al.*, 2008 and Adeyemo and Soboyejo, 2006). Our finding is however in agreement with a previous report in Nassarawa State (Pennap *et al.*, 2011). The higher prevalence of HbAA in this study could be associated with awareness on pre-marital screening and genetic counseling on haemoglobinopathies.

This study has further shown lower frequency of HbAS (13.2%) compared to previous findings of 21.5 – 26.0% (Okoroiwu *et al.*, 2015; Onuoha *et al.*, 2015; Nubila *et al.*, 2013; Pennap *et al.*, 2011; Egesie *et al.*, 2008 and Adeyemo and Soboyejo, 2006) while the frequency of HbAC of 4.7% in this study agrees with earlier report (Pennap *et al.*, 2011).

However, changes in the frequencies of haemoglobin variants reported at various parts of the country may be associated with the number of subjects studied, levels of awareness of pre-marital screening and genetic counseling.

The research has confirmed the findings of previous authors (Pennap *et al.*, 2011; Egesie *et al.*, 2008 and Adeyemo and Soboyejo, 2006) which revealed that haemoglobin AA had the highest frequency, followed by HbAS and HbAC.

The findings in this study further revealed that religion, ethnicity and age had no relationship with the distribution of haemoglobin electrophoretic pattern.

In conclusion, the study has shown low prevalence of haemoglobinopathies probably due to reduced consanguineous marriage, adequate information on genetic counseling on haemoglobinopathies and pre-marital screening in the community. However, there were no influences of religion, ethnicity and age on



the distribution of haemoglobin electrophoretic pattern.

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