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Plasma Lipid Profile in Sickle Cell Disease Patients in Owerri, Nigeria

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Abstract: This study was done to determine the plasma lipid profile in sickle cell anaemia patients. Sixty eight sickle cell anemia (HbSS) patients aged 15-35 years were used for the study. A total of seventy healthy volunteers with HbAA genotype aged 15-35 years were used as control. The plasma cholesterol (119.7±18.4 mg/dl) in sickle cell anemia were significantly decreased ($p<0.05$) when compared with the control (171.4±21.2 mg/dl). Also the plasma high density lipoprotein cholesterol (HDL-C) and low density lipoprotein cholesterol in sickle cell anaemia (40.3±10.5 mg/dl and 51.3±2.1 mg/dl) were significantly decreased ($p<0.05$) when compared with the control (67.9±14.4 mg/dl and 81.7±2.7 mg/dl). There is no significant variation in the mean level of triglyceride in sickle cell disease when compared with the control. This result shows that sickle cell disease patients are not prone to coronary heart disease.

Key words: Lipid profile, sickle cell disease, anaemia

INTRODUCTION

Sickle Cell Disease (SCD) is a genetic disorder caused by the substitution of valine for glutamic acid at the sixth position of the amino acid β -chain of the haem molecule (Hoffbrand *et al.*, 1999; Switzer *et al.*, 2006) and characterized by the possession of sickle haemoglobin (Uwakwe *et al.*, 2002).

Sickle cell disease is a significant cause of morbidity and mortality among black individuals and descendants of negroid race (Dunlop and Benneth, 2006). Life expectancy is shortened with studies reporting an average life expectancy of 42 and 48 years for male and female respectively (Giro, 2005).

In Nigeria, sickle cell disease has resulted in adverse economic and social situations leading to breakage of marriages among parents whose children are sufferers. However, the disease is yet to be viewed as a major public health problem; as many babies are born each year with sickle cell disease are more prone to death in the presence of opportunistic infections, diarrhoea, measles and malnutrition (Ugonabo *et al.*, 2007).

In the other hand, lipid profile is a group of tests that are often ordered together to determine risk of coronary heart disease (Ugonabo *et al.*, 2007). It is a good indicator of whether someone will have a heart attack or stroke caused by blockage of blood vessels or hardening of arteries (atherosclerosis).

In the light of the above, plasma lipid profile is evaluated in sickle cell disease patients with the view to providing information whether it could be contributory to the congestion heart failure in patients with sickle cell disease. Also since lipid monitoring is an important

guide to coronary heart disease and the knowledge of the lipid profile status could offer a strategy or better management in sickle cell disease.

MATERIALS AND METHODS

Subjects: Sixty-eight sickle cell disease patients aged 15-35 years attending sickle cell clinic at General Hospital Owerri and they were on steady state. Seventy healthy volunteers between the ages of 15-35 years were randomly selected from students and hospital staff with normal adult Haemoglobin (HbAA) following informed consent. The genotype was confirmed by haemoglobin electrophoresis (Cheesbrough, 2000).

Blood sample collection: In all subjects, 5 ml of fasting venous blood was collected into EDTA bottles. The plasma was separated by centrifuging the whole blood in a Wisterfuge (model 684) centrifuge at 2500 g for 5 min.

Estimation of lipid profile: The plasma lipid profile (cholesterol, triglyceride and HDL-C) was measured by the calorimetric method using Biosystem kits; cholesterol (COD 11505), Triglyceride (COD 11528) and HDL-C (COD 11523) while LDL-cholesterol was determined by using the Freidwald formular (Tietz, 1976).

Statistical analysis: The results were expressed as mean±standard deviation and student t-test was used to calculate the level of significance.

Table 1: The level of plasma lipid profile in sickle cell disease

Parameter	Control	Sickle cell disease	Level of Sig.
Cholesterol (mg/dl)	171.4±21.2	119.7±18.4	p<0.05
Triglyceride (mg/dl)	117.2±26.5	114.9±29.1	p>0.05
HDL-cholesterol (mg/dl)	67.9±14.4	40.3±10.5	p<0.05
LDL-cholesterol (mg/dl)	81.7±2.7	51.3±2.1	p<0.05

Sig. = Significance

RESULTS

Table 1 showed the level of lipid profile in sickle cell disease control. The serum total cholesterol and HDL-cholesterol were significantly decreased when compared with control (p<0.05). Serum triglyceride was not statistically different when compared with control. While LDL-cholesterol was significantly decreased when compared with control (p<0.05).

DISCUSSION

Sickle cell disease is disease of red blood cell that is passed from a parent to a child. It could be from parents to children. Individuals with sickle cell disease have red blood cells with haemoglobin which is different from normal haemoglobin (Luzzato, 1981). When a red blood cell containing sickle haemoglobin gives up its oxygen to the tissues it changes from its usual doughnut shape to sickle shape and becomes stiff rather than soft and flexible like normal red blood cells. The abnormal viscoelastic properties of oxygenated sickle cell erythrocytes and formation of irreversibly sickled erythrocytes are related to abnormal properties of their membrane which affect the plasma lipid profile.

In this study, it was observed that plasma cholesterol in sickle cell disease was significantly decreased when compared with the control. This is consistent with the work of Ugonabo *et al.* (2007) in which plasma cholesterol was lower in sickle cell anaemia. Hashmi and Nishat (1982) have earlier observed a low cholesterol in sickle cell anaemia. The decrease in plasma cholesterol could be that the "sickled cell" gets stuck in the tiny blood vessels blocking the flow of blood and causing pain. This condition probably could reduce the circulating cholesterol and hence low cholesterol level.

Also it was observed that there was no significant difference in triglyceride of sickle cell disease subjects when compared with the control. This is in line with the work of Ngonabo *et al.* (2007). Triglyceride is mainly used in diagnosis and treatment of patients with diabetes, nephrosis, liver obstruction and other disease involving lipid metabolism.

Similarly, the plasma high density lipoprotein cholesterol was depleted in sickle cell disease when compared with the control. The low HDL-C level seen in sickle cell patients would be expected to predispose them to increase risk of coronary heart disease. This is in line with the work Saha and Samuel (1982). HDL cholesterol

is inversely related to the risk of developing coronary artery disease. The higher the HDL-C the less chance of developing coronary heart disease.

From this study, it was observed that the plasma LDL-cholesterol was significantly decreased when compared with the control. This is also consistent with the previous work of Saha and Samuel (1982). The low level of LDL-cholesterol is highly desirable to the body. The low plasma lipid profile observed in this study could probably be due to the fact that sickle cells get stuck in the blood vessels and cannot re-circulate through the body so that the number of circulating blood cells reduces and individual becomes anaemic and hence low plasma lipid profile.

Conclusion: It could be noted from the result that sickle cell disease patients may not be prone to coronary heart disease. Also, it could be inferred that plasma cholesterol is not a contributory factor to congestive heart failure.

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