A COMPARISON OF HAEMATOLOGICAL PARAMETERS OF OBESE INDIVIDUAL AND NON-OBESE AT OMISANJANA AREA OF ADO EKITI, EKITI STATE, NIGERIA

ABSTRACT

Background: The global prevalence of obesity has been on the increase over the years constituting a major public health crisis.

Aim: The study was done to evaluate the haematological parameters of obese and non obese individuals at Omisanjana area of Ado Ekiti, Ekiti State. Nigeria.

Materials and methods: The study is a hospital based cross-sectional study among obese individual and non-obese individuals. This study was carried out at Omisanjana area of Ado Ekiti, Ekiti State**.** Fifty (50) obese individuals and fifty (50) apparently non-obese individuals were recruited as controls and enrolled in this study.

Results: The results showed significant difference of MXD (p=0.017), haemoglobin (p=0.000), MCV (p=0.006), MCH (p=0.006), MCHC (p=0.008) and no significant difference in PCV (p=0.064), WBC (p=0.896), LYM (p=0.069), GRAN (p=0.488), RBC (p=0.820), HCT (p=0.061), PLT (p=0.819), when compared between obese individuals and non-obese individuals respectively.

Conclusion: Subjects with obesity had lower mean haematological parameters such as haemoglobin mean cell volume, mean cell haemoglobin, mean cell haemoglobin concentration, neutrophils values compared to non-obese subjects. While a great majority of the parameters were of normal range for the subjects some were decreased e.g. total WBC count, Platelet and PCV.

Keywords*: changes, BMI, haematological parameters, obese individual, Omisanjana Area*

INTRODUCTION

Obesity is a recurring illness which has reached all over the world and endangers public global health. Obesity is defined as body mass index (BMI) of 30kg/m^2, while a value greater than 40kg/$m^2$is considered extreme or morbid obesity [1]. Body Mass Index (BMI) is referred as the trendiest of many anthropometric indices. Indeed, it is accredited as an internationally accepted index for evaluating obesity [2] and is a degree of weight adjusted for height, calculated as weight in kilograms divided by the square of height in meters (kg/m^2). Overweight and obesity are defined as abnormal or excessive fat accumulation in the body that may impair health, so Body Mass Index (BMI) of >25 kg/m^2 and ≥30 kg/m^2 are considered to be overweight and obese respectively in adults irrespective of gender and age [2]. The phenomenon of obesity has drawn the attention of the scientific community, organizations and governments worldwide because it affects people's lives negatively and imposes excessive financial implications in every health system [3]. It is known that the obesity distribution is very huge worldwide. According to the World Health Organization's report in 2005, there were about 400 million obese adults worldwide and 1.6 billion overweight [4]. More than 1.1 billion adults are overweight, of which 312 million are obese. According to estimates of the International Obesity Task Force, 1,7 billion people are exposed to health risks related to body weight, while the increase in Body Mass Index (BMI) is responsible for more than 2.5 million deaths annually, which is expected to double by 2030 [5]. However, Dietary patterns such as a high consumption of nutrient-dense foods such as cereals, fruits, vegetables and low-fat meat and dairy products have been related to a number of favorable health outcomes in adults including a decreased prevalence of obesity [6].

Obesity is a chronic medical condition. It can lead to several untoward health effects, involving different organ systems [7]. Obesity is an important risk factor for hypertension, coronary heart disease and cerebrovascular diseases. The symptoms of obesity may resemble other medical problems or conditions. Psychological disturbances are also very common as well as stress, social pressure and doing developmental chores. Obesity is considered to be the root cause of many lifestyle diseases [8].

Obesity has been described as a state of low-grade inflammation [1], with leukocytes playing an important role in this state. Salma *et al.* [1] showed that a high WBC count in obese patients is associated with insulin resistance. Platelets, red blood cells (RBCs) and haemoglobin are associated with cardio respiratory conditions [9] in obese individuals. However, limited studies

have been conducted to describe any possible associations between body fat and haematological variables and so this topic is aimed at filling such gap by comparing the haematological parameters of obese and non-obese individuals at Omisanjana area of Ado Ekiti, Ekiti State.

MATERIALS AND METHOD

Research design

The study is a hospital based cross-sectional study among obese and non-obese individuals. The subjects were selected using a well-structured questionnaire who were age and sex matched.

Study area

This study was carried out at Omisanjana area of Ado Ekiti, Ekiti State.

Target population

Fifty (50) obese individuals and fifty (50) apparently non-obese individuals were recruited as controls and enrolled in this study.

Blood collection

Five (5ml) of venous blood was collected from each participant into an Ethylenediaminetetraacetic acid (EDTA) bottle which was then used for the determination of FBC.

Body weight: Body weight was measured while the subject minimally clothed and without shoes, standing steady on a weighing scale and it was recorded to the nearest 0.1kg.

Height: Height was measured to the nearest 0.1 cm while the subject was standing barefoot in erect position with a wall-mounted stadiometer.

Body mass index: BMI was calculated by weight in kilograms divided by square of height in meters (kg/m2). (BMI in the range of 18.50 to 24.99 kg/m2 is considered to be normal

Method of test

This was carried out using an automated analyser; KX-2IN (Sysmex Corporation, Kobe, Japan) Haematology analyser.

Data analysis

The data were analyzed using statistical packages for social sciences (SPSS, Version 20.0) and level of significance set at as $p \leq 0.05$.

Informed consent

Informed consent was obtained from the subjects who participated in the study, the purpose of the study was explained to all participants. Participation in the study was entirely voluntary. Anonymity and confidentiality was ensured and maintained.

RESULTS

Table 1: Background Characteristics of obese individuals

Demographic profile	Frequency (Percentages)
Gender	
Male	50(50%)
Female	50(50%)
Age in Years	
18-30	50(50%)
31-65	50(50%)
Education Qualification	
Primary	4 (8%)
Secondary	21(42%)

Tertiary	25(50%)

Table 2: Mean values of haematological parameters of obese and non-obese subjects

Parameter	Obese	Non-obese	t-value	P -value
PCV (%)	36.72±5.02	38.42±3.99	1.872	0.064
WBC(10^9/L)	6.14±2.45	6.08±2.42	-0.131	0.896
LYM#(10^9/L)	2.03±0.83	2.33±0.83	1.837	0.069
GRAN#(10^9/L)	3.94±3.85	3.52±1.87	-0.695	0.488
MXD#(10^9/L)	0.83±1.20	0.41±0.02	-2.431	0.017*
RBC(10^9/L)	4.52±0.83	4.55±0.58	0.228	0.820
HGB(g/dl)	11.15±3.19	12.99±1.55	3.670	0.000*
HCT(%)	36.66±5.06	38.40±4.02	1.899	0.061
MCV(fl)	79.13±10.37	84.82±7.02	3.210	0.002*
MCH(Pg)	26.65±3.87	28.60±2.97	2.827	0.006*
MCHC(g/dl)	32.20±2.00	33.39±2.33	2.727	0.008*

PLT(10^9/L)	173.53±71.46	176.74±67.46	0.230	0.819

The results showed significant difference of MXD (0.83 ± 1.20×10^9/L, 0.41 ± 0.02×10^9/L, p=0.017), HGB (11.15 ± 3.19g/dl, 12.99 ± 1.55g/dl, p=0.000), MCV (79.13 ± 10.37fL, 84.82 ± 7.02fL, p=0.006), MCH (26.65 ± 3.87Pg, 28.60 ± 2.97Pg, p=0.006), MCHC (32.20 ± 2.00g/dl, 33.39 ± 2.33g/dl, p=0.008) and no significant difference in PCV (36.72 ± 5.02%, 38.42 ± 3.99%, p=0.064), WBC (6.14 ± 2.45×10^9/L, 6.08 ± 2.42×10^9/L, p=0.896), LYM (2.03 ± 0.83×10^9/L, 2.33 ± 0.83×10^9/L, p=0.069), GRAN (3.94 ± 3.85×10^9/L, 3.52 ± 1.87×10^9/L, p=0.488), RBC (4.52 ± 0.83×10^9/L, 4.55 ± 0.58×10^9/L, p=0.820), HCT (36.66 ± 5.06%, 38.40 ± 4.02%, p=0.061), PLT (173.53 ± 71.46×10^9/L, 176.74 ± 67.46×10^9/L, p=0.819), when compared between obese individuals and non-obese individuals respectively.

DISCUSSION

Results obtained show reduction in haemoglobin, Mean Cell volume (MCV), Mean Cell haemoglobin (MCH) and Mean Cell haemoglobin concentration (MCHC). These were in contrast to Mei-Chu *et al.* [10] that suggested that red blood cell (RBC) count and haematocrit were positively associated with obesity. This shows anaemia in obese individuals and may lead to microcytic hypochromic anaemia. This situation could lead to cardiovascular disease. Also, previous literature has traced increased packed cell volume (PCV) in obesity to be one of the risk factors for cardiovascular and other diseases. Furthermore, PCV is the most important indicator to determine viscosity of the blood although; there was no change in PCV of the subjects in this study. Viscosity of the blood is an indicator of vascular risks, and increased body mass index (BMI) is known to increase viscosity of the blood [11] and the lower value may indicate that the subjects of the study are not at risk of cardiovascular disease.

Leukocytosis has often been linked with atherosclerotic disease and has also been accepted as a risk factor for cardiovascular disease (CVD) [12]. Haematological parameters have established as indicators for health and disease [13, 14]. The association between leukocyte count and risk of atherosclerotic disease is plausible because leukocytes present a major contribution to the rheologic properties of blood. This is achieved by altering the adhesive properties under stress and participating also in the case of endothelial injury. However, there is no significant different of WBC of obese individual with non- obese individual while other parameters are significantly differently different. Obesity per se is not independently associated with altered RBC, Hb and Ht, and the association between BMI and hematological parameters is mediated by their associations with abdominal fat and insulin resistance markers [15].

CONCLUSION

Subjects with obesity had lower mean haematological parameters such as haemoglobin mean cell volume, mean cell haemoglobin, mean cell haemoglobin concentration, neutrophils values compared to non-obese subjects. While a great majority of the parameters were of normal range for the subjects some were decreased e.g. total WBC count, Platelet and PCV.

Knowledge of the relationship between BMI and hematological indices of apparently healthy individuals within any population is therefore crucial for healthcare planning, as a justification for appropriate early prognosis and important counseling policy strategically important for reducing the incidence of obesity in the country. Obese individual should be aware of the risk of them developing cardiovascular disease due to the viscosity of their blood and as such haematological parameters such as full blood count would be a great diagnostic pointer to such disease condition. Thus, it becomes pertinent for the obese individual to assess their haematological parameters at nearby laboratory on monthly bases as a routine checkup to curb the risk of developing artherelerosclerosis which may aggravate as a result of obesity.

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