EVALUATION OF HAEMATOLOGICAL PARAMETERS OF OBESE INDIVIDUALS BASED ON AGE GROUPS AT OMISANJANA AREA OF ADO EKITI, EKITI STATE

ABSTRACT

Obesity is a chronic disease which has spread all over the world and threatens public global health. Eighty (80) obese individuals based on age groups. The table above show no significant difference in PCV (p=0.241), WBC (p=0.445), LYM (p=0.531), GRAN (p=0.514), MID (p=0.930), LYM (p=0.984), GRAN (p=0.682), MID (p=0.343), RBC (p=0.971), HGB, MCV (p=0.389), MCH (p=0.755), MCHC (p=0.052), RDW_CV (p=0.392), RDW_SD (p=0.177), PLT (p=0.055), MPV (p=0.224), PDW (p=0.432), P_LCR (p=0.096) when compared between obese individuals and non-obese individuals based on age group respectively. Age group has no changes in the haematological parameters of obese individuals among the studied subjects.

Keywords*: haematological parameters, obese individuals, age groups*

INTRODUCTION

Obesity is a chronic disease which has spread all over the world and threatens 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 (Salma *et al.*, 2016; Obeagu *et al.*, 2018; Obeagu *et al.*, 2021; Obeagu *et al.* 2017; Obeagu *et al.*,2018). Body Mass Index (BMI) is regarded as the most popular of many anthropometric indices. Indeed, it is accredited as an internationally accepted index for assessing obesity (Ajayi *et al.*, 2017) and is a measure of weight adjusted for height, calculated as weight in kilograms divided by the square of height in meters (kg/m2). 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 (Ajayi *et al.*, 2017).

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 (Polikandrioti and Stefanou, 2009). 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 (Low *et al.,* 2009). 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 (Berghöfer *et al.,* 2008). 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 (Yanoff *et al.,* 2007).

Obesity is a chronic medical condition. It can lead to several untoward health effects, involving different organ systems (Ranjani *et al.,* 2016). Obesity is an important risk factor for hypertension (high blood pressure), coronary heart disease (responsible for heart attacks) and cerebrovascular diseases (responsible for strokes). It is strongly linked with derangements in lipid profile (such asincreased low density-lipoprotein cholesterol, increased triglycerides, increased very low density-lipoprotein cholesterol, and decreased high density-lipoprotein cholesterol) which favor atherosclerotic changes on the walls of blood vessels. Atherosclerosis constitutes the basic pathology of hypertension and coronary heart disease, and also a sizeable proportion of cerebrovascular diseases (Ranjani *et al.,* 2016). A few cases are caused primarily by genes, endocrine disorders, medications, or mental disorder. The view that obese people eat little yet gain weight due to a slow metabolism is not generally supported. On average, obese people have a greater energy expenditure than their normal counterparts due to the energy required to maintain an increased body mass (Tabasum *et al.,* 2018). The most common symptoms that indicate an adolescent is obese are large body frame, difficulty in doing daily activities, lethargy, breathlessness, disproportionate facial features, breast region adiposity - (sagging fat cells) in boys, big belly (abdomen), sometimes marked with white or purple blemishes, male external genitalia may appear disproportionately small, flabby fat in the upper arms and thighs and knock-knees (Genu valgum) is common (Tabasum *et al.,* 2018). 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 (Chambers *et al.,* 2017).

Obesity has been described as a state of low-grade inflammation (Salma *et al.,* 2016), with leukocytes playing an important role in this state. Leukocytosis is an increase in the total number of White blood cell (WBC) count with a value greater than 11,000/mm3 (11×109/L) due to any cause such as infection, inflammation, allergic reaction, malignancy, hereditary disorders, or other miscellaneous causes. (Salma *et al.,* 2016), showed that a high WBC count in obese patients is associated with insulin resistance. Another cross-sectional study also concluded that an elevated WBC count is linked to the prevalence and future development of metabolic syndrome in the young population (Fadini *et al.,* 2012). The primary findings of (Thiago *et al.,* 2014) revealed that obese adolescents presented with higher total leukocytes and subpopulation counts (neutrophils and monocytes) when compared to their normal weight peers and also noted a positive relation between adiposity and total leukocytes, monocytes, and neutrophils; indicating that there was also a negative association between cardiorespiratory fitness and total leukocytes, monocytes, and neutrophils, only for the boys, regardless of BMI and age (Thiago *et al.,* 2014). Also, Ciroma *et al.,* (2019) study observed significantly higher total leucocytes count and higher PCV only in obese males, when compared with normal weight and as well observed a positive correlation between BMI and total leucocytes count, only in males. Female participants did not show any significant changes or association between BMI and leucocytes. However, neutrophils count was weakly lower in overweight female respondents (Ciroma *et al.,* 2019). The peripheral erythrocyte and total leukocyte counts were significantly higher in the obese group than in the control group. Particularly, significant increases were noted in the monocyte count in the obese group compared with those in the control group. There was no significant difference in peripheral neutrophil, lymphocyte as well as eosinophil and basophil counts between groups (Aya *et al.,* 2015).

An estimation of fat depots are essential to better understand the effects of obesity on the health status, as fat distribution has been described as an important marker of inflammation and is directly linked to changes in cytokine concentrations and the platelet count. Additionally, platelets, red blood cells (RBCs) and haemoglobin are associated with cardiorespiratory

conditions (Zamai *et al.,* 2010), the oxidative metabolism, and cardiovascular events (Lisianny *et al.,* 2012) in obese and non-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 evaluating the haematological parameters of obese individuals at Omisanjana area of Ado Ekiti, Ekiti State**.**

The study was done to evaluate the haematological parameters of obese individuals based on age groups at Omisanjana area of Ado Ekiti, Ekiti State. Nigeria.

MATERIALS AND METHOD

Research design

The study is a hospital based cross-sectional study among obese individuals 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**.** Ado Ekiti is the state capital of the state with a population of 446, 749 individuals according to 2004 census. It is located at latitude 7^0 36' 59.99'N and longitude 5^0 12'60.00'E. They are mainly of the Ekiti sub-ethnic group of the Yoruba.

Target population

This study was conducted at Omisanjana area of Ado Ekiti, Ekiti State**.** Eighty (80) obese individuals were recruited 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.15 5.

Body mass index:BMI was measured 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

Full Blood Count (FBC): Measurement of haemoglobin, red blood, cells, white blood cells and platelets count were done by using an automated analyser; KX-2IN (Sysmex Corporation, Kobe, Japan) Haematology analyser. The cell count was cross-checked by experienced Medical Laboratory Scientist on duty.

Method of data analysis

The data were presented in tables and were presented as mean ± standard deviation and 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 *(n=50)*

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	

❖ secondary ❖ tertiary	4 (8%) 21(42%) 25(50%)

TABLE 2: Mean ± standard deviation of haematological parameters of obese patient based on age group

Parameter	18-30 years	31-65 years	T-value	P –value
PVC(%)	35.88±4.43	37.56±5.51	-1.187	0.241
WBC(10^9/L)	6.41±2.49	5.88±2.43	0.770	0.445
LYM(%)	34.16±11.40	36.28±12.23	-0.631	0.531
GRAN(%)	54.16±19.39	50.61±18.74	0.658	0.514
MID(%)	10.47±11.74	10.77±12.34	-0.088	0.930
RBC(10^9/L)	4.53±0.85	4.52±0.82	0.037	0.971
HGB(g/dl)	11.18±2.45	11.12±3.85	0.061	0.951
HCT(%)	35.74±4.51	37.58±5.50	-1.292	0.202
MCV(fL)	77.86±11.82	80.41±8.75	-0.869	0.389
MCH(Pg)	26.47±4.50	26.82±3.21	-0.314	0.755
MCHC(g/dL)	31.65±2.59	32.75±0.91	-1.994	0.052
RDW_CV(%)	16.38±4.56	15.52±2.10	0.863	0.392
RDW_SD(fL)	49.89±9.63	46.82±5.74	1.370	0.177

PLT(10^9/L)	192.64±79.45	153.62±57.09	1.967	0.055
MPV(fL)	6.32±0.59	7.20±3.51	-1.233	0.224
PDW(fL)	10.88±13.91	8.65±1.88	0.793	0.432
P_LCR(%)	4.97±4.04	6.74±3.30	-1.695	0.096

The table above show no significant difference in PCV (35.88 ± 4.43%, 37.56 ± 5.51%, p=0.241), WBC (6.41 ± 2.49×10^9/L, 5.88 ± 2.43×10^9/L, p=0.445), LYM (34.16 ± 11.40%, 36.28 ± 12.23%, p=0.531), GRAN (54.16 ± 19.39%, 50.61 ± 18.74%, p=0.514), MID (10.47 ± 11.74%, 10.77 ± 12.34%, p=0.930), RBC (4.53 ± 0.85×10^9/L, 4.52 ± 0.82×10^9/L, p=0.971), HGB (11.18 ± 2.45g/dl, 11.12 ± 3.85g/dl, p=0.951), HCT (35.74 ± 4.51%, 37.58 ± 5.50%, p=0.202), MCV (77.86 ± 11.82fL, 80.41 ± 8.75fL, p=0.389), MCH (26.47 ± 4.50Pg, 26.82 ± 3.21Pg, p=0.755), MCHC (31.65 ± 2.59g/dl, 32.75 ± 0.91g/dl, p=0.052), RDW_CV (16.38 ± 4.56%, 15.52 ± 2.10%, p=0.392), RDW_SD (49.89 ± 9.63fL, 46.82 ± 5.74fL, p=0.177), PLT (192.64 ± 79.45×10^9/L, 153.62 ± 57.09×10^9/L, p=0.055), MPV (6.32 ± 0.59fL, 7.20 ± 3.51fL, p=0.224), PDW (10.88 ± 13.91fL, 8.65 ± 1.88fL, p=0.432), P_LCR (4.97 ± 4.04%, 6.74 ± 3.30%, p=0.096) when compared between obese individuals and non-obese individuals based on age group respectively.

Discussion

The aim of the present study was to evaluate the haematological changes that occurs in obese individuals based on age groups. Twenty five percent (25%) of the population are male while Twenty five percent (25%) of the population are females, Age group 11-25 years is approximately 10%, 21-30 years is approximately 18% and 31-40 years is approximately 20%, 41-50 years is approximately 2% years of age. The table above show no significant difference in PCV, WBC, LYM, GRAN, MID, RBC, HGB, HCT, MCV, MCH, MCHC, RDW_CV, RDW_SD, PLT, MPV PDW, P_LCR when compared between obese individuals and non-obese individuals based on age group respectively.

These results were in contrast to Mei-Chu*et al.,* (2019) that suggest RBC count and haematocrit were positively associated with obesity. Also, previous literature has traced increased 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. Viscosity of the blood is an indicator of vascular risks, and increased BMI is known to increase viscosity of the blood (Salih *et al.,* 2016) and the lower value may indicate that the subject 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) (Madjid *et al.,* 2004). 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 their own adhesive properties under stress and participating also in the case of endothelial injury. However, there is no significant difference of WBC of of the subjects.

Conclusion

The study revealed no changes in the haematological parameters studied. It shows that age variations in obesity has no significant impact on the haematological parameters of the affected individuals.

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