https://doi.org/10.46344/JBINO.2023.v12i02.07

ASSESEMENT OF THE ANTHROPOMETRIC DETERMINANTS OF CHILDREN LIVING WITH SICKLE CELL DISEASE AT MURTALA MUHAMMAD SPECIALIST HOSPITAL, KANO STATE

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ABSTRACT

Sickle cell disease is a chronic haemolytic disorder that is marked by tendency of hemoglobin molecules within red blood cell to polymerise and deform the red cell into a sickle (or crescent) shape resulting in characteristic vaso-occlusive events and accelerated heamolysis leading to sickle cell anemia. The aim of this study is to assess the anthropometric determinants of children living with sickle cell disease at Murtala Muhammad Specialist Hospital, Kano State. Anthropometric variables such as Height, Weight, Head circumference, mid upper arm circumference, thigh circumference were measured. Data was analyzed using statistical package for social sciences (SPSS), version 22. $P<0.05$ was set as level of significant. The findings of this study indicate that there is no relationship between anthropometric variables, BMI%, and sickle cell disease. It was observed that there was no significant relationship between Number of crises per year and BMI, and place of residence. There was no significant relationship between Number of crises per year and sex, no significance difference in the anthropometric parameters between, sickle cell patients and normal participants are found.

Keywords: *anthropometric determinants, children, sickle cell disease*

Introduction

Sickle cell disease(SCD) is one of the most common genetic diseases worldwide and its highest prevalence occurs in Middle East, Mediterranean regions, Southeast Asia and sub-Saharan Africa especially Nigeria [1-7].

SCD is a chronic hemolytic disorder that is marked by tendency of hemoglobin molecules within red cells to polymerise and deform the red cell into a sickle (or crescent) shape resulting in characteristic vaso-oclusive events and accelerated hemolysis. It is inherited in an autosomal recessive fashion either in the homozygous state or double heterozygous state. When inherited in the homozygous state it is termed sickle cell anemia (SDA).Other known SCD genotypes

includes hemoglobin SC disease, sickle beta plus thalassemia, and sickle beta zero thalassemia (which has similar severity with sickle cell anemia), hemoglobin SD Punjab disease, hemoglobin SO Arab disease, and others [1, 8-12].

Sickle cell anemia (SCA), a common inherited hematological disorder in Nigeria, presents with chronic hemolytic anemia, musculoskeletal anomalies, recurrent infections and growth problems [13-16].

Poor growth and nutrition are common in children with sickle cell anemia (SCA), there exists an evidence of nutritional status in children with sickle cell disease in relation to anthropometric status, disease severity and body composition [17].

For instance energy supply has been known to cause a constant perturbation in children with sickle cell anemia with its attendant effect on Body Mass Index (BMI). These disturbances could be due to increase demand from high metabolic rates, reduced absorption and increased degradation [18].

In sickle cell anemia, hypoxaemia and tissue hypoperfusion are the key notes. This as a result can cause impairment of tissue which then affects almost all systems of the human body causing retardation of growth and development. This is reflected in impairment in various anthropometric measurements e.g. Height, Weight, Body fat, skeletal maturation, delayed puberty [19].

BMI is concerned with the measurement of the variation of the physical dimensions and the gross composition of the human body at different age levels [20].

It is one of the important parameters for assessment of growth and development and nutritional status of the children [20].

Materials and methods

Study area

This study was carried out in Kano, at Murtala Muhammad specialist Hospital.

Study population

These were patients with hemoglobin genotype HbSS attending pediatric unit of Multala Muhammad Specialist Hospital, Kano, who fulfilled the criteria for inclusion into the study.

Inclusion criteria

1. Patients attending pediatric unit of Multala Muhammad Specialist Hospital and healthy children aged between 3-13 years of either sex

2. Patients willing and signing the written consent form participate in the study. In case of minor consent was obtained from parent/guardian of the patients.

Exclusion criteria

1. Subjects below 3 years and above 13 years

2. Patients that does not sign the written consent form.

3. Patient of sickle cell disease with other genetic or chromosomal anomaly

Ethical consideration

An introductory letter was obtained from the head of department, department of human anatomy, Yusuf Maitama Sule University Kano.

Ethical clearance was obtained from the hospital management board/ethics committee.

Study design

A cross sectional study of anthropometric measurements was conducted over a period of 3 months.

Sample size determination

The population size was determined using the formula;

$n=Z^2pq/d^2$ [21]

n= Desired sample size

Z=Standard Normal Deviation at (1.96, confident level=95)

P=Proportion (0.08)

Q=1-P = 1-0.07=0.92

d=Degree of precision= 0.040

$n=(1.96)^2(0.08)(0.92)/(0.040)^2 = 177$

n= 177

Techniques for measuring height

The body height of the subjects was measured with meter rule, subject was asked to stand erect without shoes with heels together, and recorded in centimeters.

Techniques for measuring weight

The body weight of the subjects was measured with weighing scale, the subjects was asked to remove their shoes and heavy clothes and recorded in kilograms.

Techniques for measuring head circumference

The head circumference of the subject was measured using tape rule, it was placed on the head slightly above the eyebrows and the ears, with occipital bone and glabella as the landmark for accurate measurements and recorded in centimeters.

Techniques for measuring mid upper arm circumference

The mid upper arm circumference was measured with tape rule the tape was placed on the upper arm of the subject and recorded in centimeters

Techniques for measuring thigh circumference

The thigh circumference was measured with tape rule and the measurement was recorded in centimeter

Statistical analysis

Data collected was analyzed using SPSS version 22.Mean and standard deviation was calculated for all the quantitative parameters using ANOVA, Chi square test were used to analyse the association between SCD and other variables and p-value less than 0.01 to be significantly different.

Result

Variables	Minimum	Maximum	Mean±std
weight kg	8.50	39.00	21.204±7.91
Height m	0.70	1.47	1.1479±0.19
MAC-R	10.50	19.80	15.468±2.36
MAC-L	10.50	19.90	15.598±2.36
TC-R	22.00	44.00	29.18±5.12
TC-L	22.00	44.00	29.32±5.14
HC	42.00	53.00	49.45±2.85
BMI	9.88	20.30	15.60±2.11

Table 1: Descriptive statistics of the anthropometric parameters of the study population

It was observe that the average weight (kg) have the mean value of 21.204±7.91, Height (m) 1.1479±0.19, MAC-R 15.468±2.36, MAC-L was 15.598±2.36, TC-R 29.18±5.12, TC-L 29.32±5.14, HC was 49.45±2.85 and BMI 15.60±2.11

MAC-R/L = Mid upper arm circumference Right/left
TC-R/L = Thigh circumference Right/Left
HC = Head circumference
BMI = Body Mass Index

Variables	Sex	N	Mean±std	t-value	p-value
weight kg	Male	64	21.73±8.08	0.74	0.46
	Female	69	20.71±7.77		
Height cm	Male	64	116.21±18.87	0.85	0.40
	Female	69	113.46±18.46		
Height m	Male	64	1.162±0.18	0.85	0.40
	Female	69	1.135±0.18		
MAC-R	Male	64	15.66±2.33	0.88	0.38
	Female	69	15.29±2.38		
MAC-L	Male	64	15.80±2.39	0.97	0.34
	Female	69	15.41±2.32		
TC-R	Male	64	29.02±4.90	-0.34	0.74
	Female	69	29.33±5.34		
TC-L	Male	64	29.15±4.94	-0.35	0.73
	Female	69	29.47±5.35		
HC	Male	64	49.42±2.93	-0.10	0.92

Table 2: Sexual Dimorphism for anthropometric parameters for sickles cells patients

This table shows the sexual dimorphism for anthropometric parameters for sickle cell patient having the p-value >0.05 which shows there is no differences.

	Female	69	49.47±2.78		
BMI	Male	64	15.61±2.19	0.05	0.96
	Female	69	15.59±2.05		

			BMI		X2	p-value
			underweight	normal		
NCPY	1	Count	49	7		
		Expected Count	50.1	5.9	0.368	0.578
	2	Count	69	7		
		Expected Count	67.9	8.1		

MAC-R/L = Mid upper arm circumference Right/left
TC-R/L = Thigh circumference Right/Left
HC = Head circumference
BMI = Body Mass Index

Table 4.3: Relationship between Number of crises per year and BMI

NCPY = Number of crises per year

			Sex		X2	p-value
			Male	Female		
NCPY	1	Count	29	28	0.304	0.603
		Expected Count	27.4	29.6		
	2	Count	35	41		
		Expected Count	36.6	39.4		

Table 4: Relationship between Number of crises per year and Sex

Shows Relationship between Number of crises per year and sex. It was observed that there was no significant relationship between Number of crises per year and sex (p=0.603) (X2 =0.304).

NCPY = Number of crises per year

			Locality			
			urban	rural	X2	p-value
NCPY	1	Count	40	17	1.814	0.22
		Expected Count	43.3	13.7		
	2	Count	61	15		
		Expected Count	57.7	18.3		

Table 5: Relationship between Number of crises per year and place of residence

NCPY = Number of crises per year

Table 6: Anthropometric difference between sickle cell patients and normal

Variables	S/N	N	Mean±std	t-value	p-value
weight kg	S	133	21.204±7.91	-0.444	0.658
	N	44	21.814±7.87		
Height m	S	133	1.1479±0.19	-0.283	0.777
	N	44	1.1569±0.17		
MAC-R	S	133	15.468±2.36	-0.604	0.547
	N	44	15.711±2.17		
MAC-L	S	133	15.598±2.36	-0.724	0.47
	N	44	15.891±2.22		
TC-R	S	133	29.18±5.12	-0.852	0.396
	N	44	29.93±4.88		
TC-L	S	133	29.32±5.14	-0.856	0.393
	N	44	30.07±4.93		
HC	S	133	49.45±2.85	-0.518	0.605
	N	44	49.7±2.41		
BMI	S	133	15.60±2.11	-0.452	0.652
	N	44	15.76±1.72		

MAC-R/L = Mid upper arm circumference Right/left
TC-R/L = Thigh circumference Right/Left
HC = Head circumference
BMI = Body Mass Index

Discussion

Despite the reality that most of the SCD patients globally live in sub-saharan Africa [22].

This study was carried out to assess the anthropometric determinants of sickle cell disease at Murtala Muhammad Specialist Hospital, Kano state.

The present study shows that there is no relationship between sickle cell disease and some of the anthropometric variables. This is in lines with previous findings in Nigeria (Odetunde *et al.*, 2016) on Body Mass Index and other anthropometric variables in children with sickle cell anemia.

The present study also established the association between sickle cell crisis and socioeconomic features. It is in accordance with the study by [23]. And also in similar to Jesus *et al. [24]* of socioeconomic and nutritional characteristics of children and adolescents with sickle cell anemia.

Also in line with Thales *et al.* [25] in socioeconomic and demographic characteristics of sickle cell disease patients from low income region of northeast Brazil.

The present study shows there is no significant difference between BMI% and sickle cell crisis. Which is against of finding of [26] on weight status of children with sickle cell disease.

Conclusion

The present study is an attempt to assess the anthropometric determinants of sickle cell disease at Murtala Muhammad Specialist Hospital, Kano state. No significant difference was found in the anthropometric parameters of different sex group. Also found that there is no significant difference between BMI % percentile and sickle cell disease. It was observed that there was no significant relationship between Number of crises per year and BMI. It was also observed that there was no significant relationship between Number of crises per year and sex. It was observed that there was no significant relationship between Number of crises per year and place of residence. It was also observe that there was no significance difference in all the anthropometric parameters between, sickle cell patients and normal participants.

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