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Anthropometric Indicators of Nutritional Status of Children Attending Hospitals in Sokoto Metropolis

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ABSTRACT

Malnutrition is described to be the evidence of bad nutritional status, which in turn dictates the health of the individual as well as that of a community. Food provides the energy and nutrients that infants need to be healthy. Anthropometric variables have been used to assess nutritional status of individuals, infants and children inclusive. This study aimed at determining the anthropometric indicators of nutritional status of children attending hospitals in Sokoto Metropolis. Usman Danfodio University Teaching Hospital (UDUTH) being a Tertiary hospital, Specialist Hospital Sokoto as a Secondary hospital and Kware Primary Health care a Primary hospital were used for the study. A total of 506 subjects were recruited for this study. The anthropometric parameters (length, weight, Body mass index, head, chest and abdominal circumferences) were obtained using infantometer, stadiometer, weighing balance and tailoring tape. Data was reported as Mean ± Standard deviation of frequencies and percentages. One-way analysis of Variance (ANOVA) was used to determine differences in means of the various groupings. A Chi-square test was used to test association between qualitative variables. $p<0.05$ was deemed statistically significant and SPSS version 22 (IBM, Corp., New York) was used for all data analysis. Result showed children with malnutrition having lesser anthropometric parameters and the differences were statistically significant at $p<0.05$. The result also revealed 5.3% of the children to be wasting, while (94.7%) were not wasting based on the MUAC adjusted z-scores. Parents' educational status, occupational status, Socio-economic and demographic pattern largely affects Children' Nutritional status. The study concluded that, anthropometric indicators such as height, weight and body circumferences can be used to assess nutritional status of infants and children. Therefore, nutritional status is largely influenced by parents' socio economic and demographic patterns, season of birth, mothers' age and health status.

Keywords: Sokoto Metropolis, Malnutrition, Infants, Children, Anthropometric indicators.

INTRODUCTION

Malnutrition is described to be the evidence of bad nutritional status, which in turn dictates the health of the individual as well as that of a community. Normal growth and development of the child depends on the nutrition of mother, because the dietary intake of the infant is an inherited factor from the mother[1,2]. Under nutrition and over nutrition are both referred to as malnutrition, which are known as double burden of malnutrition, whose impacts may persist throughout life when it occurs during the early stage of life[3]. Anthropometric variables if successfully evaluated are reliable indices of the nutritional status of a giving population. Body mass index has been found to be a better index of identifying the nutritional status of infants and children[4]. Food provides the energy and nutrients that infants need to be healthy. An infant diet lacking essential calories, minerals, fluid and vitamins could be considered 'bad' nutrition[5]. Very high positive relationship between mother's knowledge of nutrition of infants and acute malnutrition has been observed in a study conducted by[6]. Some factors have been identified to affect the socioeconomic status of a family which in turn affect the nutrition of their children[7,8]. Assessment of growth for age based on anthropometric measurements is an important and reliable method in the monitoring of health in an individual child. Height and weight measurements are also the most frequently used indices to evaluate the nutritional state of the community. The most affected segment of the population by acute malnutrition is infant and young children (0-5yrs)[6]. The United Nations Children Fund[9] reported that, malnutrition, specifically stunting affected an estimated 22.2 percent of 150.8 million children under 5 globally in 2017. The period from birth to age 24 months is considered the "critical window" for the advancement of good growth, health, and behavioral and cognitive development[10]. Stunting varies globally among children under 5 years and is still a severe public health problem[11,12]. According to NDHS[13], Thirty-seven percent of children in Nigeria are stunted (below -2 SD), and 19% are severely stunted (below -3 SD). Several factors have been observed to be predictors of malnutrition, these include child feeding, women's nutrition, parents educational status, child's sex, maternal age, maternal education, parents occupational status and household sanitation[14,15,16]. A study in Cambodia found that child's age, perceived birth size, family wealth status, and region of residence were significantly associated with stunting[17]. In 2013 a study was conducted by Bhutta *et al.*[18] found childhood malnutrition to a major public health problem in low-income countries, in which approximately 30% of the total childhood mortality is related to stunting or underweight[18,19]. According to WHO[20], about 178 million children under five years worldwide are too short for their age group; while 115 million are underweight. An infant diet lacking essential calories, minerals, fluid and vitamins could be considered as inadequate nutrition[5]. Victoria *et al.* [21] reported that an estimated 60 million under five children were found to be stunted out of which 11 million were Nigerian children. In Nigeria, the pattern and severity of childhood malnutrition has steadily increased from 11% in 2003 to 18% in 2013 for wasting, 24% in 2003 to 29% in 2013 for underweight, although there was a decline from 42% in 2003 to 37% in 2013 for children who were stunted [22]. Sufiyan *et al.* [23], found that children of uneducated mothers are at risk of stunting. In another study, Ali *et al.* [24] found out that stunting was 40.8% among children of illiterate mothers, underweight was 57.9% among children of mothers who had attained at least primary education and wasting was 33.3% among children of mothers who had tertiary education. Some scholars assessed nutritional status using body mass index and mid arm circumference [25], some of these scholars also observed that body mass index is the used indicator of nutritional status, as

well as the mid upper arm circumference being the cheapest indicator [26,27].

MATERIALS AND METHODS

The study sample for this study consists of children aged of 6-24 months whose mothers were interviewed and their anthropometric information were collected. The Sample size was 505 each for mothers and children. The total Sample had a distribution of male (54.65%) and female (45.35%). The data was collected from the three Hospitals all in Sokoto: Usman Danfodio University Teaching Hospital (UDUTH), Specialist Hospital and Kware Primary health care. Ethical approvals were obtained from ethical committees of each of the three selected Hospitals.

Data pertaining age, sex, season of birth, ethnicity, parents' level of education and socio-demographic patterns and number of parity were provided by the informants by filling the questionnaire.

Sokoto is a City located in the northwest of Nigeria, near the confluence of Sokoto River and the Rima River. As of 2006 it has a population of 427,760. Sokoto State is predominantly a Fulani and Hausa State. These two large ethnic groups after ages became one through marriage. The City is dominated by Hausa subgroups known as Gobirawa, Zamfarawa, Kabawa. Adarawa and the Arawa and the two main Fulani groups as Fulanin Gida and Fulanin Daji.

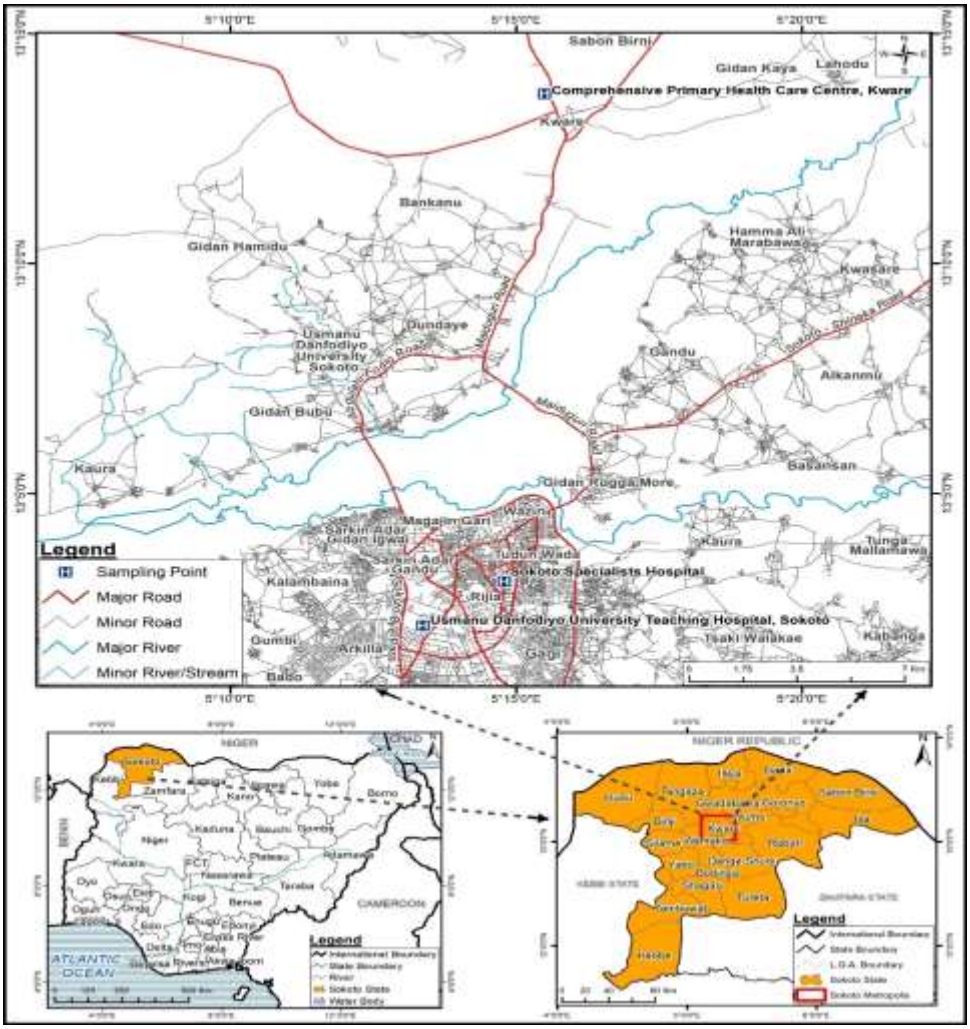

Figure 1: Map of Sokoto Metropolis and Environs showing Sampling Points. Source: Map Gallery, Geography Department, ABU Zaria, 2019

Anthropometrics variables including subject`s height, weight, chest, abdominal and head circumferences were taken. Others are the mid arm circumference (MAC), and Children height using infantometer were also taken. Mothers' height and weight were obtained using a stadiometer and weighing balance respectively. Weight and length of Children were measured according to Gibson [28]. Weight of the children was measured to the nearest 0.1kg with an electronic Seca infantometer scale (Seca GmbH and co.KG, Hamburger Germany). Measurements were carried out according to standard Techniques. The body circumferences such as head, chest and abdominal circumferences were measured using a non-stretchable Tape line in centimeters.

Data was reported as Mean ± Standard deviation of frequencies and percentages. One-way analysis of Variance (ANOVA) was used to determine differences in means of the various groupings. A Chi-square test was used to test association between qualitative variables. $p<0.05$ was deemed statistically significant and SPSS version 22 (IBM, Corp., New York) was used for all data analysis.

Ethical approval for the study was obtained from the University Committee on Research Ethics, Ahmadu Bello University, Zaria, authorities of the schools where the study was carried out. The aim and objectives of the study were well explained to the participants and consent form was issued out. Only those who filled the consent form were involved in this study.

RESULTS

Table 1 present the anthropometric parameters of the children in the studied population showing how these affects the nutritional status, in which there was decrease in the anthropometric variables as the nutritional decreases and these differences were statistically significant at $p\leq0.001$. This result indicates that malnutrition causes decrease in anthropometric variables, most especially weight, height and mid upper arm.

Table 1: Comparison of Measured Anthropometric Parameters with Children Nutritional Status

	Normal	Acute Malnutrition	Severe malnutrition	F	P
Weight (kg)	7.89±1.32	6.94±0.93	5.29±1.43	139.85	<0.001
Length (cm)	66.96±7.14[a]	65.13±6.61[a]	58.30±8.53	39.30	<0.001
Abd Cir. (cm)	44.15±3.65	41.43±2.64	38.33±3.80	100.14	<0.001
Head Cir. (cm)	44.79±2.58	43.92±4.22	41.49±3.59	91.56	<0.001
Chest Cir. (cm)	45.39±3.41	43.14±3.09	39.79±3.61	34.09	<0.001
MUAC (cm)	13.57±0.82	12.01±0.28	10.26±0.86	796.94	<0.001

Abd Cir; Abdominal Circumference, Head Cir; Head circumference, Chest Cir; Chest Circumference, MUAC; Mid arm circumference

Table 2 present the anthropometric parameters of the children in the studied population showing how these are affected by the health facilities or place of birth of the children, in which the weight, height and body circumferences were observed to be increasing with improve health facilities. The differences were not statistically significant for chest and mid upper arm circumferences but, were statistically significant at $p \leq 0.001$ for weight, height, abdominal circumference and head circumference. The differences were observed more between secondary and tertiary health care, in which those children born in a secondary health facility were seen to have higher anthropometric values.

Table 2: Comparison of measured anthropometric parameters with health facility

	Primary Health care	Secondary Health Care	Tertiary Health Care	F	*P value*
Weight (kg)	6.03±1.04	7.79±1.30	7.32±1.74	50.52	<0.001
Height (cm)	60.33±7.24	67.83±6.60	64.4±8.32	33.13	<0.001
Abd Cir (cm)	41.15±3.92	43.35±3.37[a]	42.79±4.77[a]	8.79	<0.001
Head Cir (cm)	42.10±3.69	44.79±3.07[a]	44.23±3.08[a]	19.55	<0.001
Chest Cir (cm)	43.05±3.02	44.33±2.45[a]	44.40±3.92[a]	3.98	0.020
MUAC (cm)	12.60±1.53[abc]	13.01±1.20[b]	12.61±1.59[c]	4.73	0.010

Rows sharing the same superscript are significantly different from each other

Abd Cir; Abdominal Circumference, Head Cir; Head circumference, Chest Cir; Chest Circumference, MUAC; Mid arm circumference

Table 3 present the anthropometric parameters of the children in the studied population showing the effect of tribe of the subject. Differences was observed across the tribes but, the differences were not statistically significant except for abdominal circumference which showed was statistically significant at $p \leq 0.001$.

Table 3: Comparison of measured anthropometric parameters with tribe of the subject

	Hausa	Fulani	Others	F	P
Weight (kg)	7.43±1.49[a]	6.65±1.92[b]	7.40±1.56[abc]	5.32	0.006
Height (cm)	65.52±7.41	63.78±10.29	65.98±7.79	1.10	0.335
Abd Cir (cm)	42.96±3.97[a]	41.00±4.19[a]	43.52±4.41	6.98	0.001
Head Cir (cm)	44.22±3.46	43.39±2.37	44.46±2.87	1.88	0.154
Chest Cir (cm)	44.33±3.89[a]	42.86±3.51[b]	44.26±4.37[abc]	3.64	0.027
MUAC (cm)	12.88±1.38[a]	12.42±1.61[b]	12.59±1.46[abc]	3.29	0.038

Rows sharing the same superscript are significantly different from each other

Abd Cir; Abdominal Circumference, Head Cir; Head circumference, Chest Cir; Chest Circumference, MUAC; Mid arm circumference

Table 4 present the effect of season of birth on the anthropometric parameters of the children in the studied subjects. Differences were observed across but, the differences were not statistically significant except for chest and mid upper arm circumferences which, was statistically significant at $p \leq 0.001$.

Table 4: Comparison of measured anthropometric parameters with season of birth

	Cold	Hot	Wet	F	P
Weight (kg)	7.19±1.87	7.40±1.37	7.43±1.40	1.195	0.304
Height (cm)	65.42±9.05	65.16±6.93	65.60±7.40	0.130	0.878
Abd Cir (cm)	42.82±4.93	42.78±3.47	42.77±3.71	0.010	0.990
Head Cir (cm)	43.77±3.11	44.45±3.82	44.2±2.59	1.964	0.141
Chest Cir (cm)	43.25±4.42[a]	44.89±3.17[b]	44.24±4.02[abc]	8.152	<0.001
MUAC (cm)	12.47±1.69	13.05±1.20[a]	12.86±1.25[a]	8.264	<0.001

Rows sharing the same superscript are not significantly different from each other

Abd Cir; Abdominal Circumference, Head Cir; Head circumference, Chest Cir; Chest Circumference, MUAC; Mid arm circumference,

Table 5 present the effect of fathers' occupational status on the anthropometric parameters of the children in the studied subjects. Differences were observed across; the differences were statistically significant at p≤0.001 except for chest circumference.

Table 5: Comparison of measured anthropometric parameters with father's occupation

	Civil Servant	Business	Farmer	F	*P* value
Weight (kg)	7.88±1.30	7.20±1.63	6.51±1.37	20.64	<0.001
Height (cm)	67.96±6.17	64.71±8.32	61.65±6.92	18.42	<0.001
Abd Cir (cm)	44.28±4.36	42.25±3.87[a]	41.69±4.09[a]	14.93	<0.001
H Cir (cm)	45.00±2.41	43.89±3.59[a]	43.21±3.31[a]	7.98	<0.001
C Cir (cm)	45.07±4.45	43.84±3.62[a]	43.35±3.65[a]	6.12	0.002
MUAC (cm)	13.33±1.30	12.59±1.45[a]	12.51±1.18[a]	15.26	<0.001

Rows sharing the same superscript are not significantly different from each other

Abd Cir; Abdominal Circumference, H Cir; Head circumference, C Cir; Chest Circumference, MUAC; Mid arm circumference

Table 6 present the effect of mothers' occupational status on the anthropometric parameters of the children in the studied subjects. Differences were observed across; but the differences were only statistically significant at p≤0.001 for mid upper arm circumference. However, the differences were statistically significant at p≤0.005 for weight.

Table 6: Comparison of measured anthropometric parameters with mother's occupation

	Civil Servant	Business	House Wife	F	P
Weight (kg)	8.10±1.10	7.42±1.55[a]	7.1815±1.60[a]	5.37	0.005
Height (cm)	68.45±5.53[a]	65.82±8.37[abc]	64.67±7.56[b]	4.83	0.009
Abd Cir (cm)	43.84±3.76	43.10±4.19	42.44±4.02	2.65	0.071
Head Cir (cm)	45.77±1.96	44.16±4.06[a]	43.95±2.71[a]	4.28	0.014
Chest Cir (cm)	46.03±2.58	44.34±3.68[a]	43.79±4.15[a]	5.01	0.007
MUAC (cm)	13.59±0.86	12.89±1.41[a]	12.64±1.45[a]	9.90	<0.001

Rows sharing the same superscript are not significantly different from each other

Abd Cir; Abdominal Circumference, Head Cir; Head circumference, Chest Cir; Chest Circumference, MUAC; Mid arm circumference, PCV; Pack cell volume

Table 7 present the effect of fathers' educational status on the anthropometric parameters of the children in the studied subjects. Differences were observed across; the differences were all statistically significant at $p \leq 0.001$.

Table 7: Comparison of measured anthropometric parameters with fathers' formal education

	None	Primary	Secondary	Tertiary	F	*P Val*
Weight (kg)	7.14 ± 1.49^{a}	6.30 ± 1.19^{b}	6.86 ± 1.58^{ab}	7.97 ± 1.39	23.6545	<0.001
Height (cm)	64.93 ± 7.82^{abc}	61.85 ± 5.99^{ad}	64.40 ± 8.22^{bd}	66.84 ± 7.45^{c}	5.33881	<0.001
Abd Cir (cm)	42.24 ± 3.16^{ab}	40.77 ± 4.97^{a}	41.96 ± 3.84^{b}	44.02 ± 4.23	12.2087	<0.001
Head Cir (cm)	43.77 ± 2.55^{ab}	42.27 ± 5.81^{a}	43.75 ± 2.76^{b}	44.90 ± 3.46	7.95973	<0.001
Chest Cir (cm)	43.61 ± 3.21^{a}	42.96 ± 3.38	43.48 ± 3.85^{a}	45.14 ± 4.13	7.82253	<0.001
MUAC (cm)	12.79 ± 1.41^{a}	11.52 ± 1.55^{b}	12.33 ± 1.44^{ab}	13.37 ± 1.12	24.8194	<0.001

Rows sharing the same superscript are not significantly different from each other

Abd Cir; Abdominal Circumference, Head Cir; Head circumference, Chest Cir; Chest Circumference, MUAC; Mid arm circumference

Table 8 present the effect of mothers' educational status on the anthropometric parameters of the children in the studied subjects. Differences were observed across; the differences were all statistically significant at $p \leq 0.001$.

Table 8: Comparison of measured anthropometric parameters with mothers' formal education

	None	Primary	Secondary	Tertiary	F	*P val*
Weight (kg)	7.25 ± 1.43^{a}	6.64 ± 1.52	7.41 ± 1.71^{a}	8.37 ± 1.13	16.479	<0.001
Height (cm)	64.91 ± 6.98^{ab}	62.93 ± 8.97^{ac}	65.97 ± 8.72^{bc}	68.63 ± 4.86	7.52841	<0.001
Abd Cir (cm)	42.67 ± 3.31^{ab}	41.55 ± 3.85^{ac}	42.69 ± 4.36^{bc}	45.08 ± 5.06	8.52121	<0.001
Head Cir (cm)	43.95 ± 2.54^{a}	42.96 ± 3.78	44.53 ± 3.91^{ab}	45.48 ± 2.56^{b}	8.286	<0.001
Chest Cir (cm)	44.07 ± 3.27^{a}	43.08 ± 3.66^{b}	44.07 ± 3.84^{ab}	46.05 ± 5.51	7.343	<0.001
MUAC (cm)	12.74 ± 1.18^{ab}	12.27 ± 1.82^{ac}	12.82 ± 1.02^{bc}	13.61 ± 1.42	11.0158	<0.001

Rows sharing the same superscript are not significantly different from each other

Abd Cir; Abdominal Circumference, Head Cir; Head circumference, Chest Cir; Chest Circumference, MUAC; Mid arm circumference

From the result of table 9 it was observed that all the anthropometric parameters have strong positive correlation with each other. However, a strong negative correlation was seen between abdominal circumference with mid arm circumference. These differences were statistically significant at $p \leq 0.005$

Table 9: Correlation matrix of Anthropometric parameters of study population

	1	2	5	6	7	8	9
1. C Wt (kg)	-	0.726**	0.702**	0.537**	0.655**	0.629**	0.533**
2. C lth (cm)		-	0.521**	0.572**	0.550**	0.435**	0.641**
5. A Cir (cm)			-	0.503**	-0.666**	0.618**	0.368**
6. H Cir (cm)				-	0.587**	0.374**	0.445**
7. C Cir (cm)					-	0.557**	0.403**
8. MAC (cm)						-	0.134**
9. C A(mnth)							-

C Wt; Child weight, C lth; Child lenth, A Cir; Abdominal Circumference, H Cir; Head circumference, C Cir; Chest Circumference, MAC; Mid arm circumference, PCV; Pack cell volume, C A; Child Age.

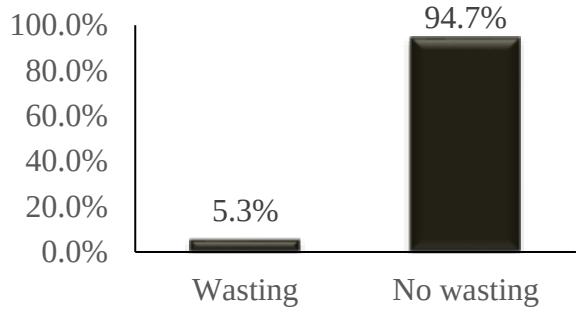

Figure 2: MUAC adjusted Z-score classification in total subjects

The result from figure 2 revealed that 27 (5.3%) of the children from the study population were seen to be wasting, while 478 (94.7%) were not wasting based on the MUAC adjusted z-scores.

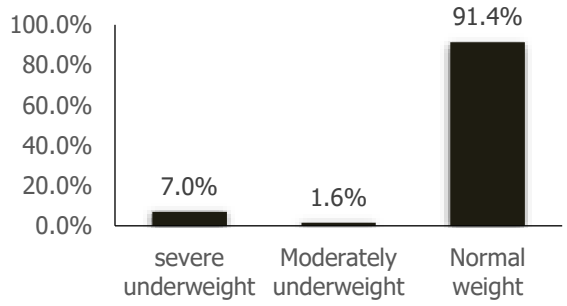

Figure 3: weight for age z-score in Primary health care

Result from Figure 3, revealed that 13 (7%) of the children born in the Primary Health Care Hospital were observed to be severely underweight, 3 (1.6%) of the children were moderately underweight while, 170 (94.40%) were seen to have normal weight, based on weight for age adjusted z-scores.

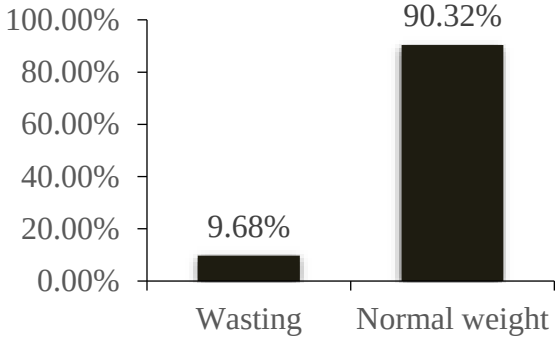

Figure 4: Weight for height z-score in Primary health care

The result from table 4, revealed that 18 (9.68%) of the children born in the Primary Health Care Hospital were wasting and 168 (90.32%) were normal based on weight for height adjusted z-scores.

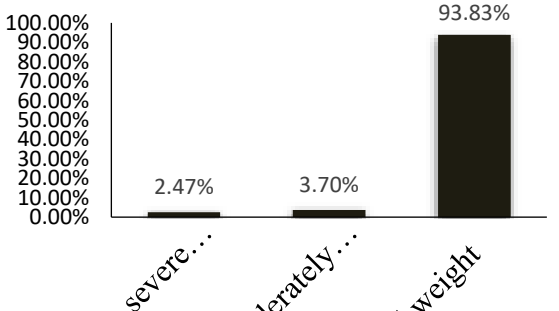

Figure 5: weight for age z-score in Secondary health care

The result from figure 5, revealed that 2 (2.4%) of the children born in the Secondary Health Care Hospital were severely underweight, 3 (3.70%) were moderately underweight while, 76 (93.83%) were had

normal weight based on weight for age adjusted z-scores. The subjects were normal for weight for height and height for age adjusted z-scores.

DISCUSSION

This study examined the prevalence of some anthropometric parameters among children age 6-24 months attending Tertiary Health care, Secondary Health care and Primary Health care in Sokoto state.

Result from this study shows that more of the children born in the Primary Health Care to be 170 (94.40%) were seen to have normal weight, based on weight for age adjusted z-scores and 168 (90.32%) also had normal weight, based on weight for height adjusted z-scores. The result from this study also revealed that 76 (93.83%) of the children born in the Secondary Health Care had normal weight based on weight for age adjusted z-scores and 27 (5.3%) of the children were seen to be wasting, while 478 (94.7%) were not wasting based on the MUAC adjusted z-scores, which showed remarkable improvement when compared to result of stunting, wasting and underweight discovered in a study conducted by Ali *et al.* [24]. This result indicates that malnutrition causes decrease in anthropometric variables, most especially weight, height and mid upper arm. In this study, results obtained using MAC adjusted z-scores revealed that of the 505 Children recruited, (66.5%) of them were normal, (19%) have moderate acute malnutrition (MAM) (moderate wasting) and (14.5%) severe acute malnutrition (SAM) (severe wasting), which is in line with the findings observed by existing research carried out by NDHS[13], which reported that wasting is highest in Sokoto state than any other state within the country, having 21% from the total results obtained. The result was seen to have a better nutritional status than that observed in a study conducted by Olodu *et al.* [29] in which they found 18.6% to be stunted, 25.3% to be wasted and 29.5% to be underweight. The differences were observed to be significant between the children born the Secondary and Tertiary Health Care Hospitals, children born in a secondary health facility were seen to have higher anthropometric values.

Weight, chest circumference and mid arm circumference of the Hausa tribe appears to be much higher than other ethnic groups in the state (Fulani), which is in the line with the work reported by NDHS [13], that the proportion of children who are underweight is greater in rural areas (29%) than urban areas (16%), the Fulani ethnic group in Sokoto State mostly dwells in rural areas. From the result of this study it was also observed that all the anthropometric parameters have strong positive correlation with each other. However, a strong negative correlation was seen between abdominal circumference with mid arm circumference. These differences were statistically significant at $p \leq 0.005$ this agreed with study of Bhattacharya *et al.* [25] in which the they found out that anthropometric data can be used to evaluate nutritional status.

Most of the Children in the study were born during hot season. The result presented the effect of season of birth on the anthropometric parameters of the children in the study population, differences were observed across the tribes but, the differences were not statistically significant except for chest and mid upper arm circumferences which, was statistically significant at $p \leq 0.001$, which was in agreement to the studies conducted by Kalu and Etim, [30] who stated that MUAC is a very good indicator of nutritional status. Fathers' occupation has great effect on their Children' nutritional level, as it has been reported that malnutrition is a condition that is associated with poverty since it comes with hunger and lack of food at the right quantity and quality [31]. Fathers' occupational status was seen to have effects on the anthropometric parameters of the children in the study population, which

agreed with the work of Etim [31], this was however not in agreement to study conducted by James and Opiah [32] who stated that occupational status has no effects on nutritional status. The differences were observed across and were statistically significant at p≤0.001 except for chest circumference. Mothers' occupational status was seen to have effect on the anthropometric parameters of the children, the differences were observed across; but the differences were only statistically significant at p≤0.001for mid upper arm circumference. However, the difference was statistically significant at p≤0.005 for weight.

Proportion of 6-24 months Children with SAM (severe acute malnutrition) and MAM (moderate acute malnutrition) decreased significantly with increase in parents' level of formal education from the results obtained from this current research. Significantly higher proportion of anthropometric measurements were observed from Children of high literate parents (tertiary level of education) compared to those whose parents' only attained Secondary or Primary level of education. Likewise, Children whose parents' attained only Secondary level of educations showed to be of higher nutritional status than those whose parents' only attained Primary level of formal education. This was in agreement to the works carried out in India by Kumar *et al.* [33]; Laxmikant *et al.* [34]; Kalu and Etim [30]; Assi and Peters [26]; Goodluck and Nwogu [6] who their studies gave credence to parental educational status on nutritional status of children. This is also in line with the works of Ali *et al.* [24], Sufiyan *et al.* [23], and NDHS [13] who found that children of uneducated mothers are at risk of stunting than children whose mothers have been to school. Maternal education has been reported to have an impact on the overall health and nutritional status of infants, since the mother is enlightened on the proper skills for child care and increase on her awareness on vast nutritional needs [35].

From the Children used in this study, 5.3% of them were seen to be wasted, using MAC adjusted z-score, which was similar to the finding by the national average of Nigerian NDHS (2018) for Sokoto State, who although observed 8.4% to be wasted. The results obtained in this study using Z-scores it was observed that the prevalence of underweight, wasting and stunting from the three selected health facilities was in line with the earlier assessment of nutritional status using MAC adjusted z-scores in this same research. Which revealed the high severity of malnutrition in Children attending Primary health facility. The three indices, wasting, stunting and underweight all shows to be higher at Primary health facility. There was no evidence of stunting and wasting in Children attending Secondary and Tertiary health facility. However, for Children attending Tertiary health facility, the prevalence of underweight was 1.3%, while those attending Secondary health facility shows a prevalence of 3.7% moderate underweight and 2.47% severe underweight. Children from the three health facilities both suffer an overall malnutrition, because Children from the three clinics all suffer from Underweight (weight for age), which is reported to be a composite index of both height-for-age (stunting) and weight-for-height (wasting) which are indices for acute and chronic undernutrition respectively, therefore, Underweight (weight for age) is a general indicator of overall nutritional status [13].

CONCLUSSION

The study concluded that, anthropometric indicators such as height, weight and body circumferences can be used to assess nutritional status of infants and children. Therefore, nutritional status is largely influenced by parents' socio economic and demographic patterns, season of birth, mothers' age and health status.

Malnutrition is still an important problem among children 6-24 months of age in the Sokoto Metropolis. Stunting, wasting and underweight observed in this study need to be taken serious so address the issue of malnutrition in which Health institutions of the Government should tackle this.

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