Original

Anthropometric Assessment of Nutritional Status of Under-Five Children Attending Paediatrics Clinic in University of Uyo Teaching Hospital, Nigeria

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Abstract

Background: Nutrition plays a pivotal role in the growth and development of under-five children. This study assessed the nutritional status of under-fives using anthropometric assessment in Paediatrics clinic, University of Uyo Teaching Hospital, Uyo.

Methods: This was a descriptive cross-sectional study. A pre-tested, interviewer administered semi-structured questionnaire was used to obtain information from guardians of under-fives, while measurements were done on the children using various anthropometric tools. Quantitative data was analyzed using IBM SPSS version 23 to obtain proportions and test for associations. Significance level was set at $P<0.05$.

Results: A total of 134 respondents participated in the study. The prevalence rates of overweight/obesity, stunting, wasting, and underweight were 28.4%, 13.4%, 11.2%, and 6.7% respectively. Stunting was significantly higher among under-fives aged 0-23 months (19.4%) compared to 24-59 months (7.5%), ($P = 0.043$, $X^2 = 4.107$) and among children whose mothers had no formal education (40.0%) compared to 0% in children whose mothers had tertiary education. The highest proportion of stunting (50.0%) was seen in children whose mothers were single compared to (11.6%) in children whose mothers were married (Fisher's exact = 0.026). Stunting of 30.0% was also seen in children whose mothers were unemployed compared to (12.1 %) in children whose mothers were employed ($P = 0.110$).

Conclusion: The nutritional status of under-five children was influenced by maternal education, occupation, marital status, and child's age. Maternal education and employment should be encouraged. Nutritional education by health workers should address obesity and particularly target mothers of under-fives aged 0-23 months.

Keywords: Anthropometric assessment, Nutritional status, Children Under-5, stunting, obesity.

How to cite this article

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Introduction

Nutrition is important for the overall well-being of a child and has influence on the child's growth rate, health, physical and mental development. Nutritional status is the balance between the intake of nutrients by organisms and the expenditure of these in processes of growth, reproduction and health maintenance[1]. Nutrition can be either proper nutrition or malnutrition[2]. Proper nutrition is the intake of adequate nutrients needed for physical, mental growth and development and generalized well-being; on the other hand, malnutrition can either be under-nutrition which is inadequate intake of nutrients that is sufficient for body's growth or over-nutrition which is excessive intake of nutrients leading to accumulation of body fats that affects health causing overweight and obesity[2].

Nutrition plays a pivotal role in the growth and development of children under five years. This age group is particularly vulnerable as it encompasses the crucial period of rapid physical and cognitive development[3]. Proper nutrition during this time is vital for lifelong health and well-being. However, improper nutrition whether through under-nutrition or over-nutrition can have irreversible consequences on a child's future potential[3].

Nutritional assessment is the comprehensive, systematic evaluation of nutritional status of an individual or group of people which consists of a detailed history taking, examination and investigations in order to classify a person or group of people as well-nourished or malnourished for proper subsequent treatment[3, 4]. In order to determine the health status of an individual, different types of nutritional assessment are usually carried out, which are; anthropometry, biochemical/biophysical method, clinical method and dietary method[3, 4].

Malnutrition is a significant global health issue, particularly among children under five years[5]. It encompasses a range of conditions caused by deficiencies, excesses, or imbalances in nutrient intake[5]. Malnutrition in children under five is especially concerning because it affects physical growth, cognitive development, and overall health, often with long-term consequences[5]. The World Health Organization (WHO) categories malnutrition into three main types: under-nutrition, micronutrient-related malnutrition and over-nutrition. Under-nutrition is classified into the following subtypes: stunting (low height for age), wasting (low weight for height) and under-weight (low weight for age) [5].

Despite global efforts to combat malnutrition, the prevalence of malnutrition continues to pose significant challenges[6]. Worldwide, in 2021, 149 million, 45 million and 39 million children under five were stunted, wasted and overweight respectively[6]. These conditions can lead to delayed physical and cognitive development, increased susceptibility to infections, and reduced economic potential later in life[6]. Nigeria has the second highest burden of stunted children in the world, with a national prevalence rate of 32% of children under five[7]. An estimated 2 million children in Nigeria suffer from severe acute malnutrition (SAM), but only two out of every 10 children affected are currently reached with treatment[7]. This study aimed at assessing the nutritional status of under-five children using anthropometric method in Pediatrics clinic, University of Uyo Teaching Hospital (UUTH)

Methodology

Study Setting

This study was carried out in University of Uyo Teaching Hospital, Uyo, Akwa Ibom. Uyo is one of the local government areas and also the capital city of Akwa Ibom state with a projected population of 390,400 as at 2022 [8]. The hospital is a tertiary hospital located in the central part of Uyo. It is a 500-bed capacity hospital and has a total of 25 departments, comprising of 21 clinical, four non-clinical departments as well as several support units[9]. In the pediatrics department, regular services are offered to children at Children's Emergency Ward (CHEW), Children's Outpatient Clinic (CHOP) and Pediatrics/surgical ward. The clinic days are Monday, Tuesday, Wednesday and Friday [10].

Study Design/Population

This was a cross-sectional study carried out among under-five children attending pediatrics clinic.

Sample size determination

The sample size was calculated using the Leslie-Kish formula [11]for population over 10,000, $N = Z^2pq/d^2$, where Z is the standard normal deviate at 95% confidence interval, p is the probability of success (population of under 5 children that were malnourished = 0.41 (41.2%) based on previous study), [12] and d is the

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absolute error or precision, = 0. 05. However, since the sample size for this study was expected to be less than 10,000, adjusted sample size was calculated[11]. The adjusted sample size of the study population was 134.

Sampling Technique

A total sampling technique was used to select under-five children that attended the pediatric outpatient clinic whose caregivers gave consent, until the desired sample size was achieved.

Data collection

Data was collected using a pre-tested, semi-structured, interviewer-administered questionnaire. Information collected included demographic and socio-economic characteristics of the respondents, and caregivers. Data collection was carried out by seven medical students who were in their fifth year. Completeness of each questionnaire was checked daily, before electronic data entry was done.

Anthropometric Measurements

Tools that were used for the nutritional status assessment of the under-five children included a digital scale/ bassinet scale calibrated in kilogram, infantometer calibrated in centimetres, a stadiometer calibrated in centimeters, a measuring tape and shakir strip. All measurements were carried out to the nearest decimal place.

Weight: The weights of children 0-2 years were measured using a bassinet scale. The weighing scale was placed on a flat, stable surface. The children were placed on the scale naked or with minimal clothing, with their head in the center and their back flat against the scale, making sure that they were as still as possible. Thereafter, the weights were recorded to the nearest 0.1 kg. The weights of the children 2-5 years were measured using a digital scale of 150 kg capacity. Care was taken to ensure that the children being measured were barefooted, wore light outfits and carried nothing in their pockets before standing at the center of the platform in an upright position with their toes pointing straight ahead and back straight without leaning against the vertical pole. The weight was measured to the nearest 0.1 kg.

- **Height:** The length of children who could not stand was measured using an infantometer. They were placed on their backs on the equipment with their heads at the zero point and their feet flat against the end of the board, ensuring that their backs and legs were straight. The sliding ruler was placed against the infants' heads and heels. The distance between the infants' heads and heels was then measured to the nearest 0.1 cm. The heights of under- fives who could stand unsupported was measured using a stadiometer. They were positioned to stand upright against the stadiometer, with their feet flat on the ground and their backs straight without shoes. The sliding bar was adjusted so that it touched the top of the children's heads. While each child looked straight ahead without moving, the measurement was taken to the nearest 0.1 cm.

- **Mid Upper Arm Circumference (MUAC):** A MUAC tape was wrapped around the mid-upper arm midway between the tip of the shoulder and elbow. With the arm hanging straight down, measurements were taken to the nearest 0.1 centimeter.

Data Analysis

Data was analyzed using IBM Statistical Package for Social Sciences (SPSS) Version 23. Descriptive statistics were done using proportions, means and standard deviation. The associations between socio- demographic characteristic of the respondents/parents and stunting**,** and socio- demographic characteristic of the respondents/parents and wasting, were determined using Fischer's exact and chi-square test with the confidence interval set at 95% and significance level at $p < 0.05$.

Ethical Considerations

Ethical approval was obtained from the Health Research Ethics Committee (HREC) of University of Uyo Teaching Hospital. A written informed consent was obtained from all caregivers before administration of the questionnaires. Participation in the study was entirely voluntary. Confidentiality and anonymity were ensured at all stages of the study.

Results

Anthropometric Measurements of Study Respondents

A total of 134 under five children participated in the study, 72 (53.7%) males and 62 (46.3%) females. Mean

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(±SD) weight, height and MUAC of male under five children were 12.6 (±4.0)kg, 84.6 ±14.7 cm and 15.8 ±23.3 cm respectively and for female under five children 13.1 ±4.9 kg, 88.2 ±16.6 cm and 15.3 ±16.0 cm respectively. (Table 1)

Prevalence of Malnutrition

The prevalence of overweight/obesity, stunting (H/A), wasting (W/H) and underweight (W/A) among the children was (28.4%), (13.4%), (11.2%) and (6.7%), respectively. (Table 2)

Nutritional Assessment of Respondents by Sex

Overweight/obesity was more noted among male under-five children (33.4%) compared to female under-five children (22.6%). Stunting was more noted among the male under-five children (16.7%) compared to female under five children (9.7%), (X^2 = 1.399, p = 0.237). The highest proportion of wasting (12.9%) was seen in female under-five children compared to male under five children (9.7%). Under-weight was more prevalent among the female under-five children (8.1%) compared with (5.6%) of male under-five children, (X^2 = 0.335, p = 0.563). (Table 2)

Demographic and socio-demographic characteristics of the Caregivers of Respondents

Seventy-seven (57.5%) of the respondents' mothers were within the age range of 30 to 39 years. More than half (62.0%) had secondary education. Majority (90.3%) of the respondents' mothers were married. The largest proportions (92.5%) of the respondents' mothers were employed. Fifty-four (40.3%) of the respondents' mothers earned a monthly income of ≥N100,000. (Table 3)

Relationship between socio-demographic characteristic of the respondents/parents and stunting among under-five children

The prevalence of stunting was (19.4%) in children aged 0-23 months, compared to (7.5%) in children 24-59 months, (P = 0.043, X^2 = 4.107). Prevalence of stunting was (16.7%) in male under-five children compared to (9.7%) in female. Stunting was found in (40.0%) of children whose mothers had no formal education, compared to (0%) in children whose mothers had tertiary education. A significantly higher proportion (50.0%) of stunting was seen in children whose mothers were single compared to (11.6%) in children whose mothers were married (Fisher's exact = 0.026). The highest proportion of stunting (30.0%) was seen in children whose mothers were unemployed compared to (12.1%) in children whose mothers were employed. Stunting was seen in (16.3%) of under-five children whose parents' household income was < N100,000 compared to (9.3%) in under-fives whose parents household income was ≥ N100,000 (Table 4)

Relationship between socio- demographic characteristic of the respondents' parents and wasting among under-five Children

Wasting was (13.4%) in under-five aged 0-23 months, compared to (9.0%) in those aged 24-59 months, (P= 0.411, X^2= 0.676). A higher prevalence of wasting (12.9%) was found in female under-five children compared to (9.7%) in male. The prevalence of wasting was (20.0%) among children whose mothers had no formal education, compared to (0%) in children whose mothers had tertiary education, (P= 0.845, X^2= 0.818). The highest proportion of wasting (50.0%) was seen in under-fives whose mothers were < 20 years compared to (7.7%) in children whose mothers were ≥ 40 years. Wasting of (16.7%) was seen in children whose mothers were single compared to (11.6%) in under-five children whose mothers were married. A higher prevalence of wasting (20.0%) was seen in children whose mothers were unemployed compared to (10.5%) in children whose mothers were employed, (P= 0.359, X^2 = 0.843). The prevalence of wasting was (11.3%) in under-five children whose parents' household income was < N100,000 compared to (11.1%) in those whose parents household income was ≥ N100,000. (Table 5)

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Table 1: Anthropometric Measurements of Study Respondents (N = 134)

Anthropometric measurement	Child Sex	
	Male (N=72) n (%)	Female (N=62) n (%)
Age (months)		
0-23	38 (52.8)	29 (46.8)
24-59	34 (47.2)	33 (53.2)
	Mean (SD)	**Mean (SD)**
Weight (Kg)	12.6 (4.0)	13.1 (4.9)
Height (cm)	84.6 (14.7)	88.2 (16.6)
MUAC (cm)	15.8 (23.3)	15.3 (16.0)

Table 2: Nutritional Assessment of Respondents

Nutritional Assessment	Child Sex		Total N=134	Statistical Indices
	Male (N=72) n (%)	Female (N=62) n (%)		
Weight for Height				
Wasting	7 (9.7)	8 (12.9)	15(11.2)	X^2 =1.975
Normal	41 (56.9)	40 (64.5)	81(60.4)	P= 0.372
Overweight/Obese	24 (33.4)	14 (22.6)	38(28.4)	
Weight for age				
Under nutrition	4 (5.6)	5 (8.1)	9(6.7)	X^2 = 0.335
Well nourished	68 (94.4)	57 (91.9)	125(93.3)	P = 0.563
Height for age				
Normal	60 (83.3)	56 (90.3)	116 (86.6)	X^2 = 1.399
Stunting	12 (16.7)	6 (9.7)	18(13.4)	P = 0.237

Table 3: Demographic and socio-demographic characteristics of the Caregivers of Respondents

Variables	Frequency (n=134)	Percentage (%)
Maternal age		
< 20	2	1.5
20-29	42	31.3
30-39	77	57.5
40 and above	13	9.7
Maternal education		
No formal education	5	3.7
Primary	45	33.6
Secondary	83	62.0
Tertiary	1	0.7
Maternal marital status		
Single	6	4.5
Married/cohabiting	121	90.3
Previously married	7	5.2
Maternal occupation		
Employed	124	92.5
Unemployed	10	7.5
Household monthly Income (N)		
< 100,000		
≥100,000	80	59.7
	54	40.3

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Table 4: Relationship between socio- demographic characteristic of the respondents/parents and Stunting among under-five Children (N = 134)

Characteristics	Height for age		Statistical indices
	Stunting (N=18); n(%)	Normal (N=116); n(%)	
Age			
0-23	13 (19.4)	54 (80.6)	X^2=4.107
24-59	5 (7.5)	62 (92.5)	P =0.043*
Sex			
Male	12 (16.7)	60 (83.3)	X^2=1.400
Female	6 (9.7)	56 (90.3)	P =0.237
Maternal age (years)			
< 20	0 (0.0)	2 (100.0)	
20-29	8 (19.0)	34 (81.0)	Fisher's exact =
30-39	9 (11.7)	68 (88.3)	0.623
40 and above	1 (7.7)	12 (92.3)	
Maternal level of education			
No formal education	2 (40.0)	3 (60.0)	
Primary	7 (15.6)	38 (84.4)	Fisher's exact =
Secondary	9 (10.8)	74 (89.2)	0.244
Tertiary	0 (0.0)	1 (100.0)	
Marital status			
Single	3 (50.0)	3 (50.0)	
Married /Cohabiting	14 (11.6)	107 (88.4)	Fisher's exact =
Previously married	1 (14.3)	6 (85.7)	0.026*
Maternal occupation			
Employed	15 (12.1)	109 (87.9)	X^2 = 2.551
Unemployed	3 (30.0)	7 (70.0)	P = 0.110
Household monthly income (Naira)			
<100,000	13 (16.3)	67 (83.8)	X^2 = 1.355
≥100,000	5 (9.3)	49 (90.7)	P = 0.244

***Statistically significant**

Table 5: Relationship between socio- demographic characteristic of the Respondents/ parents and wasting among under five Children (N = 134)

Characteristics	Weight for height		Statistical indices
	Wasting (N=15);n=%	Normal (N=119);(n=%)	
Age (months)			
0-23	9 (13.4)	58 (86.6)	X^2= 0.676
24-59	6 (9.0)	61 (91.0)	P= 0.411
Sex			
Male	7 (9.7)	65 (90.3)	X^2=0.339
Female	8 (12.9)	54 (87.1)	P= 0.560
Maternal age (years)			
< 20	1 (50.0)	1 (50.0)	
20-29	4 (9.5)	38 (90.5)	

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Characteristics	Weight for height		Statistical indices
	Wasting (N=15);n=%	Normal (N=119);(n=%)	
30-39	9 (11.7)	68 (88.3)	Fisher's exact =
40 and above	1 (7.7)	12 (92.3)	0.377
Maternal level of education			
No formal education	1 (20.0)	4 (80.0)	
Primary	4 (8.9)	41 (91.1)	Fisher's exact =
Secondary	10 (12.0)	73 (88.0)	0.599
Tertiary	0 (0.0)	1 (100.0)	
Marital status			
Single	1 (16.7)	5 (83.3)	Fisher's exact =
Married /cohabiting	14 (11.6)	107 (88.4)	0.526
Previously married	0 (0.0)	7 (100)	
Maternal occupation			
Employed	13 (10.5)	111 (89.5)	$X^2 = 0.843$
Unemployed	2 (20.0)	8 (80.0)	P= 0.359
Household monthly income (Naira)			
< 100,000	9 (11.3)	71 (88.7)	$X^2 = 0.0006$
≥100,000	6 (11.1)	48 (88.9)	P= 0.980

Discussions

This study assessed the nutritional status of under-five children attending paediatric clinic in University of Uyo Teaching Hospital. The mean weight, height and mid upper arm circumference (MUAC) of the under-fives which were 12.85kg, 86.4cm and 15.55cm respectively were observed to be higher than those reported in a nutrition survey in rural Bangladesh among under-fives where the mean values of weight, height and MUAC were 10.1kg, 81.5cm, and 13.6cm, respectively[13]. This variation may be attributed to better nutritional practices, access to healthcare services, and higher socio-economic conditions of caregivers in the present study setting which is in an urban location compared to caregivers in a rural setting in Bangladesh.

In the present study, prevalence rates of overweight/obesity, stunting (H/A), wasting (W/H) and underweight (W/A) among under-five children were (28.4%), (13.4%), (11.2%) and (6.7%), respectively. This highlights the growing burden of over-nutrition, which can be attributed to increased consumption of calories-dense foods, nutrient-poor foods and reduced physical activity among under-fives. Similarly, a study carried out in South Africa found that overweight and obesity were more prevalent than under-nutrition among school-ongoing children[14]. The prevalence of stunting was lower (13.4%) in the present study compared to (37%) reported in National Demographic Health Survey (NDHS) 2018 in Nigeria[15]. However, prevalence of wasting (11.2%) was higher in the present study than (7%) by NDHS[15]. The prevalence of underweight (6.7%) in the present study was lower than (22%) reported in the national survey[15]. These differences may be due to the fact that the prevalence reported in NDHS reflected the national average, while the present study was institution based and was limited to only those attending clinic in that location.

In the present study, (19.4%) of children aged 0-23 months were stunted, compared to (7.5%) of children aged 24-59 months; this difference was statistically significant. This is comparable to findings of a similar study carried out in Sub-Saharan Africa which also reported higher values of stunting and wasting in children aged 0-23 months compared to those aged 24-59 months[16]. During the first 0-23 months, children experience rapid growth and development, making them highly vulnerable to malnutrition. From the age of 6 months when breast milk alone is no longer sufficient to supply the nutrients needed by the growing child, malnutrition may set in if complementary feeding is poorly carried out. This can be attributed to poor feeding practices, inadequate breastfeeding, and lack of adequate and appropriate complementary foods in such children.

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Maternal education plays a very important role in the nutritional status of children, particularly the under-fives. Findings from the present study shows that 4 out of every 10 under-five children whose mothers had no formal education were stunted and one fifth were wasted, while the prevalence was zero for both conditions among children of mothers with tertiary education. This is similar to a study conducted in West African countries (Nigeria, Ghana and Ivory Coast) where higher maternal education significantly reduced malnutrition rate[17]. Educated mothers are more likely to understand the importance of balanced diets, hygiene practices, and healthcare, which directly impact their children's growth and development.

Marital status of the caregivers of under-five children plays a role in the nutritional status of their children. The present study shows that (50.0%) of stunting was seen in children whose mothers were single compared to 11.6% in children whose mothers were married. This is similar to findings of a study conducted in Sub-Saharan Africa where more children of single mothers were reported to experience stunting, wasting and underweight compared to children born to married mothers[18].

In the present study, (16.3%) under-five children whose parents household income was < N100, 000 experienced stunting, compared to (9.3%) in under-five whose parents household income was ≥ N100, 000. This can possibly be attributed to insufficient funds to purchase protein rich meals which are usually more expensive than carbohydrate foodstuff. This may consequently affect the growth of the under-five children. Families with limited income struggle to afford diverse and nutrient-rich diets, leading to deficiencies in essential vitamins and minerals. The finding of the present study is similar to a study carried out in Nigeria which revealed that food insecurity is often linked to low household income, and significantly impacts the nutrient adequacy of under-five children[19].

Maternal occupation affects the nutritional status of under-five children, (30.0%) of stunting was seen in children whose mothers were unemployed compared to (12.1%) in children whose mothers were employed. This is similar to a systematic review carried out in Nigeria, which highlighted that unemployment and poverty exacerbate malnutrition among young children, as caregivers face challenges in providing consistent and quality meals[20]. In contrast, study carried out in Kano State, Nigeria, reported that children of employed mothers faced higher risks of malnutrition. The dual role of earning and caregiving often led to time constraints, which negatively impacted meal quality and feeding practices[21]. Overall, employed caregivers are more likely to afford the appropriate meals for the children, thus reducing the prevalence of malnutrition.

Strengths and limitations of the study

Strength of the study

- Anthropometric assessments provide standardized, measurable data that enhance the study accuracy.
- Identifying nutritional deficiencies in young children can help guide timely interventions, improving their long-term health and development.
- The findings of this study can be directly applied in paediatric healthcare settings, aiding better nutritional counseling and treatment plans.
- This study can inform policy decisions regarding child nutrition programs and preventive healthcare strategies.

Limitation of the study

- Clinic-Based Sample: The study focuses only on children attending a paediatrics clinic, which limit its generalizability to the broader population, including those who do not seek medical care.
- Short-Term Data Collection: the study is cross-sectional; it may not capture long-term trends in child growth and nutritional status.

Implications of the findings of the study

- Public Health Interventions: the findings could inform targeted nutrition programs such as food supplementation initiatives and maternal education programs. Early detection of stunting or wasting may guide policymakers in implementing community-based nutritional interventions aimed at improving child health.
- Clinical and Healthcare Practices: Paediatricians can use the results of this study to refine patient screening and monitoring, ensuring that children with nutritional deficiencies or obesity receive timely interventions.
- Policy Development: socioeconomic disparities in child nutrition are identified. Governments need to

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reassess existing child welfare programs and improve access to healthcare resources.

- Educational and Parental Awareness: Parents and caregivers should be informed on the importance of proper nutrition, leading to improved feeding practices and dietary choices. Healthcare providers can develop educational materials based on findings, guiding families on balanced diets and early intervention strategies.

Conclusion

Different types of malnutrition existed among this study population. The nutritional status of the under-fives in this study was influenced by various socio-demographic factors, including maternal education, employment status, household income, marital status, and the child's age. Higher maternal education and employment would enhance caregiving and nutritional practices, while low-household income and food insecurity tends to increase vulnerability to malnutrition. The emerging double burden of malnutrition, characterized by the coexistence of under-nutrition and over-nutrition, highlights the growing prevalence of overweight and obesity among under-five children compared to stunting, wasting and underweight. Addressing these challenges requires integrated approaches that prioritize maternal education, food security, balanced diets, and physical activity, alongside supportive policies for working mothers.

Declarations

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Competing Interest: The authors declare that there are no conflicts of interest related to this study.

Authors' Contribution: The first author was involved in the conceptualization and supervision of the entire research work and manuscript preparation. The second author drafted the manuscript, while the first author critically revised the manuscript for intellectual content. The third to nineth authors were involved in research conceptualization, design, literature review, data collection, data analysis and presentation of the initial research work from which this manuscript was prepared. All authors, having met the authorship criteria, approved the manuscript, confirming that it represents honest and original work.

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