

Original Research Article

Maternal nutritional knowledge and nutritional status of children in Tirupati Urban, Andhra Pradesh

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Received: 26 May 2026

Revised: 13 July 2026

Accepted: 14 July 2026

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ABSTRACT

Background: Mothers' knowledge regarding child nutrition plays a significant role in determining pediatric health, dietary quality, and long-term development. This study observed the association between maternal nutritional knowledge and the nutritional status of children aged 2-6 years in Tirupati Urban, Andhra Pradesh.

Methods: A systematic stratified random sampling technique was employed to select 321 pairs of mothers and children from ten Anganwadi centers. Anthropometric data (height, weight, mid-upper arm circumference, and head circumference) were collected from the children, and a structured 42-item questionnaire evaluated mothers' nutritional knowledge across growth, nutrition, and hygiene domains. Data were evaluated using Z-scores and Chi-square analyses.

Results: A high prevalence of underweight (55.7%) and stunting (16.2%) was observed among the children. The overall mother's nutritional knowledge mean score was 17.25 ± 2.60 , representing a moderate baseline. Chi-square tests revealed that the statistically significant association between lower mothers' nutritional knowledge and poor child nutritional indicators, including height, weight, mid-upper arm circumference, and head circumference ($p \leq 0.001$).

Conclusions: Lower mothers' nutritional awareness strongly associates with adversative child's nutritional outcomes. Integrating targeted nutrition education programs into early childhood care services is crucial to improve regional child health indicators.

Keywords: Anganwadi centers, Anthropometry, Children (2-6 years), Mother's nutritional knowledge, Nutritional status, Tirupati urban

INTRODUCTION

A child's first few years of life are crucial for development and establishes the foundation for good health, growth, and nervous development. This critical window period requires special attention, particularly in low- and middle-income countries that face the highest rates of child malnutrition, along with significant morbidity and mortality rates.¹

Malnutrition is a major health burden in developing countries, manifesting as overnutrition and

undernutrition. Malnutrition poses one of the most serious consequences of food insecurity for children under the age of 5 years. Acute malnutrition can result in illness, death, and disability, as well as hinder cognitive and physical development. Additionally, it increases the risk of concurrent infection.² In 2022, it was estimated that 149 million children under five globally were stunted (too short for their age), 45 million were wasted (too thin for their height) and 37 million were overweight or living with obesity, an estimated 4.9 million children under the age of five died.³ At the state level, the National Family Health Survey-5 (2019-2021) reported that in Andhra

Pradesh, 31.2% of children under five years were stunted, 16.1% were wasted, and 29.6% were underweight.⁴ These figures highlighted that despite urbanization and programmatic efforts, under nutrition remains a major public health challenge in the region. Hence, continuous assessment of nutritional status of children below 2 to 6 years helps to find out the reasons for malnutrition among children. Research has shown that mothers having good knowledge will tend to provide nutritious food.⁵

Nutrition knowledge is the understanding of different types of food and how food nourishes the body and influences health. Mothers who had increased knowledge related to nutrition can choose nutritious food leading to better nutritional outcomes among their children.

The present study was conducted to assess the nutritional knowledge of mothers, and the nutritional status of children aged 2-6 years in Tirupati, Andhra Pradesh. Furthermore, it seeks to establish the association between the nutritional knowledge of mothers and the nutritional status of their children within this age group. The following are the objectives of this study.

Objectives

To assess the nutritional status of the children based on Z scores as per WHO growth standards. To assess the nutritional knowledge of sample mothers. To determine the association between mother's nutritional knowledge and the nutritional status of their children.

METHODS

Sample

The sample were children in the age group of two to six years who are attending pre-schools run by government sectors (Anganwadi centers) in Tirupati District of Andhra Pradesh state. Systematic stratified random sampling technique was employed to select the sample from ten centers and thus 321 children and their mothers constituted the sample.

Data collection was carried out over a fixed period from 27 June 2023 to 10 February 2024 following official administrative clearances. Anthropometric and socio-demographic data of children was collected from Anganwadi centers.

Tool

A questionnaire with 42 questions was specially developed for the present research to measure Mothers' nutritional knowledge about their children's 42 questions distributed under three categories about: a) growth of the child; b) child's nutrition and c) hygiene and sanitation along with their personal data. The validity of questionnaire was established by giving to experts in the field of nutrition. Test-retest reliability was established

and was found to be significant. The minimum possible score was 0 and max score was 42. Anthropometric measurement were measured using calibrated digital weighing scale to measure weight, and a stadiometer was used to measure height.

Inclusion and exclusion criteria

Mothers with their children aged 2-6 who were attending Anganwadi centers were included in the study.

Children under 2 years old, those who were sick, or those who had any congenital/birth defects were excluded. Mothers who did not give consent were also excluded from the study.

Data collection

Permission was obtained from the child development project officer (CDPO), Tirupati Urban, located in the Tirupati district. Informed consent was obtained from the mothers. The questionnaire was framed in English and Telugu (the local language). The researcher with the help of Anganwadi worker administered questionnaire to the participants, and it took approximately 30 minutes for them to complete it. The researcher recorded answers from illiterate participants. The heights and weights of the children were measured at school premises. Thus, the data was collected from 321 children and 321 mothers.

Data analysis

The data was analyzed using appropriate statistical tools. Relevant statistical analysis was performed and presented in following table.

RESULTS

A total of 321 mother and child pairs participated in the study. 55.5% of the children were boys (n=178) and 44.5% were girls (n=143). Nearly one third (32.08%) of the children belonged to the 3-4-year age group, followed by 24.29% in the 4-5-year age group and 23.67% in the 2-3-year age group. Children aged 5-6 years constituted 15.57%, while only 4.39% were older than six years, indicating that the majority of participants were preschool children (Table 1).

The socio-demographic characteristics of the mothers are presented in Table 2. The largest proportion (30.2%) were aged 26-30 years, followed by 27.1% aged 36-40 years and 23.1% aged 31-35 years. Regarding educational attainment, 34.6% had completed undergraduate education, whereas 24.0% were illiterate. Nearly one-third (29.7%) of the families reported a monthly income between ₹20,001 and ₹30,000, while the remaining participants were distributed across other income categories, reflecting a heterogeneous socioeconomic background.

Table 1: Gender wise distribution of sample according to socio-demographic characteristics.

Age group of children (in years)	Girls		Boys		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
2-3	34	23.77	42	23.59	76	23.67
3-4	42	29.37	61	34.26	103	32.08
4-5	38	26.57	40	22.47	78	24.29
5-6	21	14.68	29	16.29	50	15.57
>6	08	5.59	06	3.37	14	4.39
Total	143	100.0	178	100.0	321	100.0

Table 2: Distribution of sample mothers according to socio-demographic characteristics.

Mother's age group (in years)	Number	Percentage
21-25	35	10.0
26-30	97	30.2
31-35	74	23.1
36-40	87	27.1
>40	28	8.7
Total	321	100.0
Mother's education qualifications		
Illiterate	77	24
10th class	25	7.8
Plus two	35	10.9
UG	111	34.6
PG	73	22.7
Total	321	100.0
Family income (monthly)		
>Rs 10,000/-	7	2.2
Rs 10,000-20,000/-	73	22.7
Rs 20,001-30,000/-	95	29.7
Rs 30,001-40,000/-	73	22.7
Rs 40,000/- Above	73	22.7
Total	321	100.0

Nutritional status of children

The nutritional status of the children based on anthropometric indicators is presented in Table 3. Based on the WHO growth standards, 16.2% of the children were below normal for height-for-age (HAZ), indicating stunting, while 68.3% were within the normal range and 15.5% were above normal. More than half of the children (55.7%) were underweight according to weight-for-age (WAZ), whereas 30.5% had normal weight and 13.8% were above normal. Similarly, 20.5% of the children had below-normal mid-upper arm circumference (MUAC), while 70.1% had normal MUAC. Head circumference assessment revealed that only 4.1% of children were below normal, whereas 94.0% had normal head circumference, indicating relatively preserved brain growth among most participants.

Comparison with regional and national estimates

As shown in Table 4, the prevalence of stunting (16.2%) observed in the present study was substantially lower than the estimates reported for Chittoor district (27.0%), Andhra Pradesh (31.2%), and India (35.5%) according to the National Family Health Survey-5. In contrast, the prevalence of underweight children (55.7%) was considerably higher than the district, state, and national averages. Likewise, the prevalence of low MUAC (20.5%) exceeded the corresponding regional estimates, suggesting a greater burden of acute undernutrition among children attending Anganwadi centres in Tirupati Urban [International Institute for Population Sciences (IIPS) and ICF, 2021].

Mothers' nutritional knowledge

The descriptive statistics of mothers' nutritional knowledge are presented in Table 5. The overall mean nutritional knowledge score was 17.25 ± 2.60 , indicating a moderate level of nutritional awareness among the participants. Among the three knowledge domains, the highest mean score was observed for growth knowledge (7.19 ± 1.70), followed by nutrition knowledge (5.34 ± 1.55) and sanitation and hygiene knowledge (4.70 ± 0.69). The relatively small standard deviations suggest moderate consistency in maternal nutritional knowledge across the study population.

Association between mothers' nutritional knowledge and children's nutritional status

The association between mothers' nutritional knowledge and the anthropometric indicators of children is presented in Table 6. Chi-square analysis demonstrated statistically significant associations between maternal nutritional knowledge and all four nutritional indicators. For height-for-age, a statistically significant association was observed ($\chi^2=30.50$, $df=4$, $p=0.001$). Children with above-normal height were more likely to have mothers with good nutritional knowledge (38.0%), whereas children classified as below normal were more frequently associated with mothers having poor nutritional knowledge (23.1%).

Table 3: Distribution of sample children according to their nutritional status.

Children nutritional status	Height (HAZ)	Weight (WAZ)	MUAC (MUACZ)	HC (HCZ)
Below normal	52 (16.2)	179 (55.7)	66 (20.5)	13 (4.1)
Normal	219 (68.3)	98 (30.5)	225 (70.1)	302 (94.0)
Above normal	50 (15.5)	44 (13.8)	30 (9.4)	06 (1.9)
Total	321 (100.0)	321 (100.0)	321 (100.0)	321 (100.0)

Table 4: Comparison of nutritional indicators in Tirupati study versus regional/national benchmarks.

Below Normal	Tirupati	Chittor District (NFHS-5)	Andhra Pradesh (NFHS-5)	India (NFHS-5)
Height-for-age (HAZ)	16.2%	27.0%	31.2%	35.5%
Weight-for-age (WAZ)	55.7%	28.0%	25.6%	32.1%
MUAC	20.5%	15.0%	16.1%	19.3%
Head circumference	4.1%	-	-	-

Table 5: Descriptive statistics of mother's nutritional knowledge.

Descriptive statistics				
	Growth knowledge	Nutrition knowledge	Sanitation and hygiene knowledge	Total knowledge
Mean	7.19	5.34	4.70	17.25
SD	1.70	1.55	0.69	2.60
Median	7.00	5.00	5.00	17.00
Mode	8.00	5.00	5.00	17.00
Range	8.00	8.00	3.00	12.00
Minimum	3.00	1.00	3.00	12.00
Maximum	11.00	9.00	6.00	24.00

Table 6: Relationship between mother's nutritional knowledge and nutritional status of children.

Children's nutritional status		Mother's nutritional knowledge			
		Good	Moderate	Poor	Total
Height (cm)	Below normal	7 (13.5)	33 (63.5)	12 (23.1)	52 (100.0)
	Normal	18 (8.2)	135 (61.6)	66 (30.1)	219 (100.0)
	Above normal	19 (38.0)	26 (52.0)	5 (10.0)	50 (100.0)
	Total	44 (13.7)	194 (60.4)	83 (25.9)	321 (100.0)
	$\chi^2=30.501^{**}$; $p=0.001$; $df=4$				
Weight (kg)	Below normal	15 (8.1)	128 (69.2)	36 (22.7)	179 (100.0)
	Normal	16 (16.3)	48 (49.0)	34 (34.7)	98 (100.0)
	Above normal	13 (34.2)	18 (47.4)	13 (18.4)	44 (100.0)
	Total	44 (13.7)	194 (60.4)	83 (25.9)	321 (100.0)
	$\chi^2=26.261^{**}$; $p=0.001$; $df=4$				
MUAC (cm)	Below normal	15 (22.7)	24 (36.4)	27 (40.9)	66 (100.0)
	Normal	19 (8.4)	152 (67.6)	54 (24.0)	225 (100.0)
	Above normal	10 (33.3)	18 (60.0)	2 (6.7)	30 (100.0)
	Total	44 (13.7)	194 (60.4)	83 (25.9)	321 (100.0)
	$\chi^2=35.467^{**}$; $p=0.001$; $df=4$				
HC (cm)	Below normal	4 (30.8)	5 (38.4)	4 (30.8)	13 (100.0)
	Normal	37 (12.3)	186 (61.6)	79 (26.1)	302 (100.0)
	Above normal	3 (50.0)	3 (50.0)	0 (0.0)	6 (100.0)
	Total	44 (13.7)	194 (60.4)	83 (25.9)	321 (100.0)
	$\chi^2=29.34^{**}$; $p=0.001$; $df=4$				

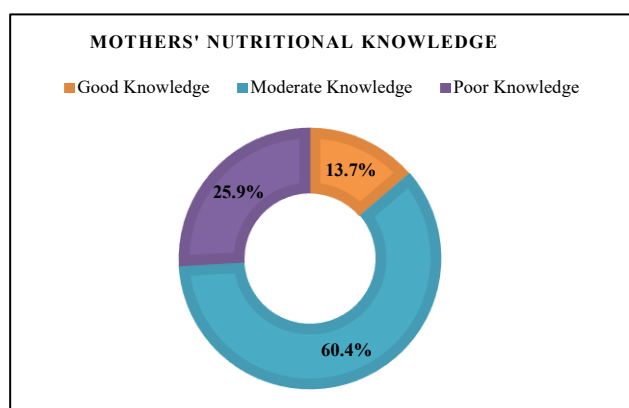


Figure 1: Mothers' nutritional knowledge.

Similarly, weight-for-age showed a significant association with maternal nutritional knowledge ($\chi^2=26.26$, $df=4$, $p=0.001$). Although most underweight children belonged to mothers with moderate nutritional knowledge (69.2%), the proportion of mothers with good nutritional knowledge increased among children with above-normal weight (34.2%), suggesting a positive influence of maternal nutritional awareness on children's body weight.

A statistically significant association was also found between maternal nutritional knowledge and mid-upper arm circumference (MUAC) ($\chi^2=35.47$, $df=4$, $p=0.001$). Children with below-normal MUAC were more likely to have mothers with poor nutritional knowledge (40.9%), whereas only 6.7% of children with above-normal MUAC belonged to mothers with poor nutritional knowledge.

Likewise, head circumference was significantly associated with maternal nutritional knowledge ($\chi^2=29.34$, $df=4$, $p=0.001$). The majority (61.6%) of children with normal head circumference had mothers with moderate nutritional knowledge, whereas poor maternal nutritional knowledge was more common among children with below-normal head circumference (30.8%).

DISCUSSION

The present study examined the association between mothers' nutritional knowledge and the nutritional status of children aged 2-6 years attending Anganwadi centres in Tirupati Urban, Andhra Pradesh. The findings demonstrated a significant relationship between maternal nutritional knowledge and children's anthropometric outcomes, indicating that mothers' awareness of child nutrition plays an important role in promoting healthy growth and development.

One of the major findings of the study was the high prevalence of underweight children (55.7%), while 16.2% of children were stunted and 20.5% had below-normal mid-upper arm circumference (MUAC). Although the

prevalence of stunting was lower than the estimates reported for Andhra Pradesh (31.2%) and India (35.5%), the proportion of underweight children was substantially higher than the corresponding district, state, and national estimates reported in the National Family Health Survey-5.⁴ These findings suggest that despite improvements in long-term linear growth, inadequate body weight continues to be a major nutritional concern among preschool children. Similar observations have been reported by, who identified undernutrition as a persistent public health problem affecting child growth and development in low- and middle-income countries.²

The study also found that 94.0% of the children had normal head circumference despite evidence of undernutrition in other anthropometric measures. This finding indicates that brain growth was relatively preserved among most children, which may be attributed to the biological phenomenon of brain sparing during nutritional stress. Similar findings have been reported by, who observed that neurological development is generally maintained unless malnutrition becomes severe or prolonged.¹⁰

Another important finding was that mothers exhibited a moderate level of nutritional knowledge, with an overall mean score of 17.25 ± 2.60 . Mothers scored relatively higher in growth-related knowledge than in nutrition and hygiene practices, suggesting that although basic awareness exists, important knowledge gaps remain regarding appropriate feeding practices, dietary diversity, and sanitation. Comparable findings have been reported in Ghana.¹ In India, where mothers demonstrated moderate nutritional knowledge but required further education on practical child-feeding behaviours.⁸

The principal finding of the study was the statistically significant association between maternal nutritional knowledge and children's nutritional status. Children whose mothers had better nutritional knowledge were significantly more likely to have normal anthropometric measurements, whereas poor maternal knowledge was more common among children with stunting, underweight, low MUAC, and below-normal head circumference. Significant associations were observed for height ($\chi^2=30.50$, $p<0.001$), weight ($\chi^2=26.26$, $p=0.001$), MUAC ($\chi^2=35.47$, $p<0.001$), and head circumference ($\chi^2=29.34$, $p<0.001$), demonstrating that maternal nutritional knowledge is closely related to children's growth outcomes.

These findings are consistent with previous studies. Higher maternal nutrition-related knowledge significantly improved children's nutritional outcomes in Nigeria. Similarly, mothers with better nutritional knowledge practiced healthier childcare behaviours, resulting in improved child growth.^{6,7} Furthermore, a systematic review concluded that nutrition education interventions effectively enhance maternal knowledge, improve feeding practices, and contribute to better nutritional status among

young children. Collectively, these studies support the present findings that maternal nutritional knowledge is an important determinant of child nutrition.⁵

Nevertheless, maternal knowledge alone may not completely prevent childhood malnutrition. Child nutritional status is influenced by multiple factors, including household income, maternal education, food security, healthcare accessibility, sanitation, and cultural feeding practices. Even knowledgeable mothers may face financial or environmental constraints that limit their ability to provide balanced diets. Nutrition education should be complemented by socioeconomic support and improved healthcare services to achieve sustainable improvements in child nutrition.⁸

The findings of the present study have important public health implications. Strengthening nutrition education through integrated child development services (ICDS), Anganwadi centres, and Poshan Abhiyaan can improve maternal nutritional awareness and promote healthy child-feeding practices. Regular nutrition counselling, growth monitoring, hygiene education, and behaviour change communication should be integrated into maternal and child health programmes to reduce the burden of childhood undernutrition.

This study possesses distinct limitations that must be acknowledged. First, it relied on a cross-sectional framework, which prevents drawing positive causal conclusions regarding the observed variables. Second, the study did not fully explore other critical determinants of child development, such as underlying genetic profiles, household food security levels, and access to primary medical care, which may also influence childhood anthropometric outcomes. Finally, the data was restricted to government-run Anganwadi centers within Tirupati Urban, which might limit the generalizability of the findings to populations using private preschool services.

CONCLUSION

In conclusion, the present study demonstrates that mothers' nutritional knowledge is significantly associated with children's nutritional status among Anganwadi children in Tirupati Urban. Although mothers exhibited moderate nutritional knowledge, the high prevalence of underweight and acute undernutrition indicates the need for continued nutrition education and comprehensive community-based interventions. Improving mothers' nutritional awareness, together with strengthening food security and access to quality healthcare services, can substantially contribute to better child growth and nutritional outcomes. Future longitudinal studies are recommended to establish causal relationships and evaluate the effectiveness of nutrition education programmes in falling childhood malnutrition.

ACKNOWLEDGEMENTS

Authors express gratitude to the child development project officer (CDPO) of Tirupati Urban for allowing permission to access the centers. Authors thank the Anganwadi workers for their operational support during fieldwork and all the mothers and children whose voluntary participation made this research study possible.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Kumar TM, Anuradha K. Maternal nutritional knowledge and nutritional status of children in Tirupati Urban, Andhra Pradesh. *Int J Community Med Public Health* 2026;13:4393-8.