DOI: 10.7860/JCDR/2025/74933.20699

Original Article

Community Section

Impact of Nutritional Education Intervention on Mothers Knowledge, Practices and Nutritional Status of Children Under-five in Rural Mangaluru, Karnataka: A Quasi-experimental Pilot Study

SAVITHA NAIK[1], ABHAY NIRGUDE[2], PRIYA RESHMA ARAHNA[3]

ABSTRACT

Introduction: Understanding the effectiveness of nutritional education interventions in rural settings is crucial for developing strategies to combat malnutrition and promote healthy growth in children. Enhancing mothers' knowledge and practices can lead to better child health and development, and also contribute to more favourable long-term outcomes for both children and their communities.

Aim: To implement a Nutrition Intervention Program (NIP) to enhance the nutritional status of children under-five by improving mothers' knowledge and practices regarding child nutrition, thereby supporting the optimal growth and development of their children.

Materials and Methods: A quasi-experimental study was conducted among parents of children under-five in the selected rural areas of Kukkuttu and Bhagambila, Mangaluru, Karnataka, India. The total sample size was 78 participants, with 39 in the intervention group and 39 in the control group. Data were collected using a structured knowledge questionnaire and an observational practice checklist. The parameters studied included height, weight, Mid-Upper Arm Circumference (MUAC), and the anthropometric indicators: weight for height, height for age, weight for age, and Body Mass Index (BMI) for age. These indicators are categorised based on growth and development standards established by the World Health Organisation (WHO). Epi Antro software was used to assess undernutrition, overnutrition and normal nutritional status among children under-five. Statistical analyses, including frequency, percentage, mean and standard deviation, multivariate ANOVA, two-factor repeated measures of ANOVA, Fisher's exact test, Chi-square test, and post-hoc analysis, were used to analyse the data.

Results: The mean age of the children under-five in the intervention group was 26.39±9.43 months and control group 22.74±10.65 months. The mean birth weight of the children in the intervention group was 2.75±0.28 kg and control group 2.64±0.27 kg. The mean birth order of the children in the intervention group was 2.02±1.15 and in the control group 3.10±1.75. There was a significant difference in parental knowledge scores within the groups (p-value=0.001, F=315.439) and between the groups (p-value=0.001, F=20.455). Parental practice scores also showed significant differences within the groups (p-value=0.001, F=333.897) and between the groups (p-value=0.001, F=196.446). There was a significant difference in stunting and underweight between the pretest and post-test (p-value <0.05) among children under-five.

Conclusion: The study demonstrates that implementing a NIP effectively enhances mothers' knowledge and practices related to child nutrition. Therefore, such interventions are valuable for promoting better health outcomes in children by educating and empowering mothers with the necessary knowledge and practices for optimal child nutrition.

Keywords: Child nutrition, Health education, Nutritional status, Parents, Physiological phenomena

INTRODUCTION

Malnutrition remains a pressing global issue, affecting both developed and developing countries. Its roots lie in poverty and a lack of nutritional understanding, making it imperative to prioritise worldwide nutritional education, access to clean water, and nutritious whole foods [1]. Malnutrition encompasses both undernutrition and overnutrition, with children being the most vulnerable population. As children often cannot advocate for their own dietary needs, special attention must be given to ensure their nutritional wellbeing [2]. A balanced diet rich in diverse whole foods is critical for preventing malnutrition, highlighting the importance of maternal nutritional education. Mothers play a key role in promoting the health of their families, and enhancing their understanding of nutrition can significantly reduce the risk of nutritional deficiencies among children [3].

Globally, children under-five years old represent about 29% of the population, with an estimated 121.3 million children under-five in India alone. Alarmingly, approximately 80% of under-five mortality occurs in Sub-Saharan Africa and South Asia [4]. In India, 26 million children are born each year, comprising 13% of the total population as per the 2011 Census [5]. The nutritional status of children serves as a critical indicator of a country's economic development, reflecting the health implications of nutrient intake and utilisation. Malnutrition manifests in various forms, including wasting, stunting, and underweight, as well as overweight and obesity, necessitating a comprehensive approach to measurement and intervention [6].

The WHO utilises Z-scores to assess growth and nutritional status among children, measuring deviations from the expected values in reference populations. Key indicators include wasting (low weight for height), stunting (low height for age), and underweight (low weight for age). For Severe Acute Malnutrition (SAM) and Moderate Acute Malnutrition (MAM), MUAC serves as an effective and easily performed measurement. Regular growth monitoring through MUAC is essential for ongoing nutritional assessment [6].

Recent statistics underscore the gravity of malnutrition: in 2022, 2.5 billion adults were overweight, 890 million lived with obesity, and 390 million were underweight. Among children under-five, 149 million were stunted, 45 million were wasted, and 37 million were overweight. Undernutrition contributes to nearly half of all deaths in this age group, predominantly in low- and middle-income countries. The impacts of malnutrition extend beyond individual health, affecting economic, social, and medical dimensions at community and national levels [7].

In South Asia, the prevalence of undernutrition has risen from 9.4% in 2015 to 11.5% in 2016, indicating a growing public health challenge. Undernutrition increases susceptibility to infections and complicates recovery, highlighting the need for effective interventions. Despite global initiatives aimed at improving the nutritional status of children under-five, malnutrition remains a significant public health concern, especially in developing countries [8]. Various methods, including dietary, biochemical, and anthropometric assessments, are used to evaluate nutritional status. Anthropometry, particularly through measurements of height, weight and MUAC, is cost-effective and practical for community use. These measurements categorise children based on muscle wasting and overall nutritional status, facilitating targeted interventions [9].

The Indian government has initiated several programmes, such as the Integrated Child Development Services (ICDS), the mid-day meal scheme, and the National Food Security Mission, to address malnutrition. Despite these efforts, challenges persist, and the Sustainable Development Goals (SDGs) aim to reduce malnutrition, specifically stunting, as a target (SDG 2.2) [10]. While extensive research has been conducted on malnutrition, there remains a notable gap regarding the effectiveness of specific nutritional education programmes targeting children under-five in developing countries. Many existing studies focus on broad nutritional interventions without assessing the direct impact of educational initiatives on child health outcomes. This study aims to fill this gap by evaluating the effectiveness of a targeted nutritional education programme, thereby providing valuable insights into best practices for combating malnutrition at the community level.

This study focusses specifically on a nutritional education programme tailored for mothers and caregivers of children under-five years old. By assessing the programme's impact on children's nutritional status, the research aims to provide evidence-based recommendations that can inform policy and enhance existing initiatives. This targeted approach seeks not only to address immediate nutritional deficiencies but also to empower families with the knowledge needed for long-term health and wellbeing. The aim of this study was to evaluate the effectiveness of the nutritional education programme and improve children's nutritional status, ultimately providing recommendations for policy enhancement and family empowerment.

MATERIALS AND METHODS

A quasi-experimental pilot study was conducted among mothers with children aged between 1-5 years residing in the rural areas of Kukkuttu and Bhangambila, within the Anganwadi field practice area of Yenepoya Nursing College, Karnataka, India, from January 2022 to June 2023. Ethical clearance was obtained from the YEC Ethics Committee (protocol number 2019/153), and informed consent was secured from all participants.

Inclusion criteria: Mothers with children aged 1 to 5 years who could read and understand Kannada, as well as children receiving Anganwadi services were included in the study.

Exclusion criteria: Parents with physical or psychological conditions that hinder participation (e.g., blindness, deafness) and children who were seriously ill or receiving treatment for undernutrition were excluded from the study.

Sample size: The sample size was estimated using G*Power with a target of 90% power and a 5% significance level, resulting in a total of 78 subjects included after accounting for a 15% dropout rate.

A total of 100 mothers and their children were screened for the study. Out of these, 78 mothers were included (39 in the intervention group and 39 in the control group), while 22 mothers and their children were excluded. The reasons for exclusion included an inability to read Kannada, children not receiving Anganwadi services, mothers with physical or psychological conditions, children who were seriously ill, and those unwilling to participate in the study.

Methodology and Parameter Studied

Data were collected using a demographic proforma for children under-five, which included variables such as age in months, gender, birth order, birth weight (in kg), religion, immunisation status, and deworming status. The socio-economic status of the mothers was assessed using the Udai Pareek Socio-Economic Scale [11]. A structured knowledge questionnaire and an observational practice checklist on child nutrition were also utilised.

The structured knowledge questionnaire comprised 36 questions categorised into six domains: balanced diet, behaviour and socialisation, food safety and storage, hand hygiene, healthy cooking, and healthy feeding. This questionnaire was validated by subject matter experts and demonstrated reliability (r=0.82). Knowledge scores were graded as follows: adequate (25-36), moderate (13-24), and inadequate (≤12) [12-14]. The observational practice checklist also included 36 statements across the same six domains and was similarly validated (r=0.84). Practice scores were categorised as good (25-36), moderate (13-24), and poor (≤12) [12-14]. The grading for both tools was established arbitrarily, drawing on the insights of subject matter experts to ensure it accurately reflects the knowledge levels relevant to the population studied.

For anthropometric assessments, weight was measured using a calibrated digital weighing scale, height was assessed using an infantometer and a stadiometer, and MUAC was measured with a Shakir tape. The classifications for MUAC were as follows: severely acute malnutrition (MUAC <12.5 cm), moderately acute malnutrition (MUAC between 12.5 cm and 13.5 cm), and normal (MUAC >13.5 cm) [15]. The nutritional status of children was evaluated based on WHO growth standards using WHO Anthro software (Version 1.0.4) [16]. Epi Antro software was used to assess undernutrition, overnutrition, and normal nutritional status among children under-five.

Underweight (weight for age) classifications based on Z-scores include mild underweight (Z-score less than -2), moderate underweight (Z-score between -2 and -3), and severe underweight (Z-score less than -3). Stunting (height for age) classifications based on Z-scores include mild stunting (Z-score less than -2), moderate stunting (Z-score between -2 and -3), and severe stunting (Z-score less than -3). Wasting (weight for height) classifications based on Z-scores include mild wasting (Z-score less than -2), moderate wasting (Z-score between -2 and -3), and severe wasting (Z-score less than -3). A Z-score between -1 SD and +1 SD is considered to indicate normal nutritional status [17,18] according to the WHO (2006) reference standards. Overweight is defined as a BMI for age Z-score greater than +1 SD, while obesity is defined as a BMI for age Z-score greater than +2 SD. Normal BMI for age is defined as a Z-score between -2 SD and +1 SD [19,20].

In the development of an intervention on child nutrition, the researcher created a video covering child nutrition that discusses a balanced diet, different food groups (energy-yielding, body-building, and protective foods), their importance in children's growth and development, common mistakes mothers might make in ensuring normal growth, and a demonstration of various food groups. Additionally, the researcher developed information pamphlets addressing breastfeeding, complementary feeding, kitchen hygiene, food safety and storage, hand hygiene, nutritional deficiency disorders, and the preparation of highly nutritious foods to combat nutritional deficiencies in children under-five. These pamphlets include methods, ingredients, and nutritional values for 15 energy- and protein-rich recipes that are locally available, affordable, culturally appropriate, and easy to prepare at home. The ultimate goal was to enhance mothers' knowledge and practices regarding child nutrition for children aged 1-5 years. Content validation was conducted with seven subject matter experts for both the video and the pamphlets.

Data collection procedure: Two Anganwadi areas were purposefully selected to serve as the intervention and control groups. Contact details of parents with children meeting the inclusion criteria were obtained from the Anganwadi centres. The investigator visited these homes along with ASHA workers, introduced them, and explained the study's purpose. Written informed consent was obtained from each participant, ensuring confidentiality. Demographic information for both children and parents was collected, and a pretest was conducted on the same day at their homes.

Children's nutritional status was assessed in terms of height, weight, and MUAC. Parents' knowledge and practices regarding child nutrition were evaluated in both the intervention and control groups. Anthropometric measurements were taken using a digital weighing scale and stadiometer, with height measured to the nearest 0.1 cm and weight to the nearest 0.5 kg using standard methods. Children were asked to remove their footwear, ribbons, and high hairdos, and they were instructed to stand on the stadiometer with their feet together, heels against the backboard, knees straight, looking straight ahead, and arms gently by their sides. Height was measured in centimetres at the exact point to the nearest 0.1 cm. Weight was measured with the child standing still, facing forward, and with arms at their sides, using a digital weighing machine. Footwear and socks were removed prior to weighing [21].

For infants who could not stand, height and weight were measured using an infantometer. The infantometer was placed on a flat, stable surface, and bulky clothing was removed. The infant was placed on their back on the infantometer, and the weight was recorded once the scale stabilised. For height, the infant's head was gently positioned against the fixed headboard, legs extended fully, and the movable headboard was slid down to touch the infant's heels. The height measurement was then recorded. MUAC was measured using a Shakir tape with the child seated comfortably, their upper arm relaxed and hanging naturally by their side. The midpoint on the left upper arm, between the acromion and olecranon, was identified, and the arm was encircled at this midpoint with the tape snugly against the skin but not compressing it. The measurement was recorded to the nearest millimetre [21].

Parents in the intervention group received a 30-minute educational video session on child nutrition and participated in a 15-minute interactive session with the researcher at their convenience. Videos and informational pamphlets were provided to the intervention group. To reinforce the NIP, weekly SMS messages and bi-weekly telephone communications were conducted over six months to keep parents informed. Post-test assessments were conducted after three months and again after six months for both the intervention and control groups.

STATISTICAL ANALYSIS

Statistical analyses, including frequency, percentage, mean, standard deviation, multivariate ANOVA, two-factor repeated measures ANOVA, Fisher's exact test, Chi-square test, and post-hoc analysis, were used to analyse the data. Statistical Package for the Social Sciences (SPSS) Statistics Version 26.0 and WHO Epi Antro software were utilised. The results were presented in tables and graphs.

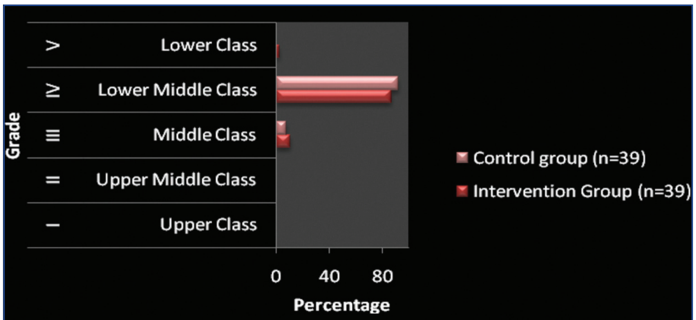
RESULTS

As illustrated in [Table/Fig-1], The mean age of the children under-five in the intervention group was 26.39±9.43 months and control group 22.74±10.65 months. The mean birth weight of the children in the intervention group was 2.75±0.28 kg and control group 2.64±0.27 kg. The mean birth order of the children in the intervention group was 2.02±1.15 and in the control group 3.10±1.75. Notably, the two groups showed differences in gender distribution, with a higher proportion of males in the intervention group and females in the control group. Both groups had similar immunisation and deworming status, with all children in both groups being fully immunised and dewormed.

Demographic variables	Intervention group n (%)	Control group n (%)
Age (months)		
12-24	11 (28.2)	10 (25.6)
24-36	8 (20.5)	15 (38.5)
Above 36	20 (51.3)	14 (35.9)
Gender		
Male	26 (66.7)	8 (20.5)
Female	13 (33.3)	31 (79.5)
Birth weight (kg)		
<2.75	24 (61.5)	24 (61.5)
2.75-3.5	15 (38.5)	15 (38.5)
Birth order		
1	13 (33.3)	5 (12.8)
2	18 (46.2)	13 (33.3)
3 and above	8 (20.5)	21 (53.8)
Religion		
Hindu	-	5 (12.8)
Muslim	39 (100)	34 (87.2)
Immunisation status		
Fully immunised	39 (100)	39 (100)
Dewormimg	39 (100)	39 (100)

[Table/Fig-1]: Distribution of the children under-five in the intervention and control groups based on demographic characteristics N=39+39=78.
frequency (n) with the percentage in parenthesis (%)

[Table/Fig-2] shows that more than three-fourths (87.2% in the intervention group and 92.3% in the control group) of the mothers belonged to the lower middle-class socio-economic status, respectively, according to Uday Pareek's scale for socio-economic status.



[Table/Fig-2]: Grading of the socio-economic status of mothers according to Uday Pareek's scale.

[Table/Fig-3] shows the grading of knowledge scores of the mothers regarding child nutrition. In the pretest, more than half (69.2%) of the mothers in the intervention group had a moderate level of knowledge, 30.8% had inadequate knowledge, and none of them had an adequate level of knowledge regarding child nutrition. At the time of the post-test assessment, six months after the intervention given by the investigator, 15.4% of the mothers had an adequate level of knowledge, 84.6% had a moderate level of knowledge, and none of them had inadequate knowledge regarding child nutrition.

Testing of Hypothesis

A hypothesis test was conducted to determine the significant difference between the mean knowledge scores regarding child nutrition. The following null hypothesis was tested at the 0.05 level of significance.

H_{01}: There is no difference in the mean mothers' knowledge scores within and between the intervention and control groups.

S. No.	Knowledge grading	Range of knowledge scores	Intervention group n (%)			Control group n (%)		
			Pretest	Post-test 1	Post-test 2	Pretest	Post-test 1	Post-test 2
1	Adequate	25-36	-	6 (15.4)	36 (92.3)	-	2 (5.1)	7 (17.9)
2	Moderate	13-24	27 (69.2)	33 (84.6)	3 (7.7)	29 (74.4)	35 (89.8)	32 (82.1)
3	Inadequate	0-12	12 (30.8)	-	-	10 (25.6)	2 (5.1)	-

[Table/Fig-3]: Comparison of the mothers knowledge in the intervention and control groups based on their pretest and post-test knowledge scores regarding child nutrition N=39+39=78.
Study group: Knowledge was assessed using structured knowledge questionnaire developed by the researcher and validated by experts (n=7); Maximum knowledge scores=36. The data of the two groups are expressed as frequency (n) with the percentage in parenthesis (%)

A two-factor repeated measures ANOVA was performed using the F-statistic to test H_{01}. [Table/Fig-4] shows an increase in knowledge scores before and after the nutrition education intervention in the intervention group compared to the control group as follows: 14.33±3.40>21.28±2.95>27.67±2.16. There was a significant difference in parental knowledge levels within the groups (p-value <0.001, F=315.439) and between the groups (p-value <0.001, F=20.455).

Furthermore, post-hoc analysis was conducted using the Bonferroni test to compare the mean differences in knowledge scores regarding child nutrition at different times of observation, i.e., pretest, post-test 1, and post-test 2, in the intervention and control groups.

The post-hoc analysis revealed that, in the intervention group, there was a significant mean difference in knowledge scores regarding child nutrition among mothers of children under-five between the time points (p-value=0.001). Based on this, the null hypothesis (H_{01}) was rejected, concluding that there was a difference in knowledge scores both within and between groups.

[Table/Fig-5] shows the grading of practice scores of the mothers regarding child nutrition. In the pretest, the majority of mothers in the intervention group (89.7%) had a moderate level of practice, 10.3% had poor practice, and none of them had a good level of practice regarding child nutrition. At the time of the post-test assessment, six months after the intervention conducted by the investigator, 97.4% of the mothers had a good level of practice, 2.6% had a moderate level of practice, and none of them had a poor level of practice regarding child nutrition.

Testing of Hypothesis

Hypothesis testing was conducted to find the significant difference between the mean practice scores of mothers regarding child nutrition. The following null hypothesis was tested at a 0.05 level of significance.

H_{02}: There will be no difference in the mean practice scores of mothers within and between the study and control groups.

A two-factor repeated measures ANOVA test statistic (F) was used to test H_{02}. [Table/Fig-6] shows that there is an increase in practice scores before and after the NIP, as follows: 16.13±2.89>25.79±2.61>27.67±2.16. There was a significant difference in the level of mothers' practice within the groups (p-value <0.001, F=333.897) and between the groups (p-value=0.001, F=196.446).

Furthermore, post-hoc analysis was conducted using the Bonferroni test to compare the mean differences in practice scores regarding child nutrition at different times of observation, i.e., pretest, post-test 1, and post-test 2, in the study and control groups. The post-hoc analysis indicates that, in the intervention group, there was a significant mean difference in practice scores regarding child nutrition among mothers of children under-five between the time points (p-value=0.001). Based on this, the null hypothesis (H_{02}) was rejected, concluding that there was a difference in practice scores within and between groups.

[Table/Fig-7] shows a consistent increase in height, weight, and MUAC at different time points, and a significant mean difference was found within the groups (p-value <0.05 level of significance).

Variable		Groups		Two factors repeated measures ANOVA			
		Intervention	Control	Comparison within groups		Comparison between groups	
	Observation	Mean±SD	Mean±SD	F	p-value	F	p-value
Mothers knowledge	Pretest	14.33±3.40	15.18±4.06	315.439	0.001***	20.455	0.001***
	Post-test 1	21.28±2.95	17.62±4.28				
	Post-test 2	27.67±2.16	21.36±4.09				

[Table/Fig-4]: Comparison of the mean pre-and post-test scores of mothers' knowledge within and between the groups N=39+39=78.
Abbreviations used: SD: Standard deviation; the data presented is the mean±SD of knowledge scores of the intervention and control groups at different times of observation. Statistical test used: Repeated measures ANOVA F; Level of significance-*p<0.05, significant ***p<0.001 very highly significant

S. No.	Mothers practice		Intervention group n (%)			Control group n (%)		
	Grade	Scores	Pretest	Post-test 1	Post-test 2	Pretest	Post-test 1	Post-test 2
1	Good	25-36	-	28 (71.8)	38 (97.4)	-	1 (2.6)	9 (23.1)
2	Moderate	13-24	35 (89.7)	11 (28.2)	1 (2.6)	21 (53.8)	37 (94.9)	30 (76.9)
3	Poor	0-12	4 (10.3)	-	-	18 (46.2)	1 (2.6)	-

[Table/Fig-5]: Comparison of the mothers practice in the intervention and control groups based on their pretest and post-test practice scores regarding child nutrition N=39+39=78.
Study group: practice was assessed by using observational checklist developed by the researcher and validated by experts (n=7); Maximum knowledge scores=36. The data of the two groups are expressed as frequency (n) with the percentage in parenthesis (%)

Variables		Groups		Two factors repeated measures ANOVA			
		Intervention	Control	Comparison within group		Comparison between group	
	Observation	Mean±SD	Mean±SD	F	p-value	F	p-value
Mothers practice	Pretest	16.13±2.89	15.18±4.06	333.897	0.001**	196.446	0.001**
	Post-test 1	25.79±2.61	17.62±4.28				
	Post-test 2	27.67±2.16	21.36±4.09				

[Table/Fig-6]: Comparison of the mean pre-and post-test scores of mothers' practice on child nutrition within and between the groups N=39+39=78.
Abbreviations used: SD: Standard deviation; the data presented is the mean±SD of practice scores of the intervention and control groups at different times of observation. Statistical test used: Repeated measures ANOVA F; Level of significance-*p<0.05, significant ***p<0.001 very highly significant

Anthropometric measurements	Observations	Intervention group	Control group	Comparison within the group		Comparison between the group	
		Mean±SD	Mean±SD	F value	p-value	F value	p-value
Height (cm)	Pretest	91.25±10.36	94.32±11.13	6.380	0.002**	1.122	0.293
	Post-test -1	92.27±9.81	94.78±11.06				
	Post-test -2	92.50±9.83	94.88±11.02				
MUAC (cm)	Pretest	14.30±1.05	14.25±1.03	10.326	<0.001***	0.077	0.782
	Post-test -1	14.25±1.05	14.25±1.03				
	Post-test -2	14.33±1.03	14.25±1.03				
Weight (kg)	Pretest	12.63±2.17	12.62±1.96	69.761	<0.001***	0.082	0.775
	Post-test -1	12.86±2.04	12.69±1.94				
	Post-test -2	12.97±2.06	12.76±1.97				

[Table/Fig-7]: Comparison of height, weight and MUAC among children under-five based on the pretest, post-test 1 and post-test 2 N=39+39=78.
Abbreviations used SD standard deviation; the data presented is the mean±SD of practice scores of the intervention group and control group at different times of observation. Statistical test used: Repeated measures ANOVA F; Level of significance-*p<0.05, significant ***p<0.001 very highly significant

[Table/Fig-8] indicates that the intervention group showed consistent levels of wasting over the study period, with no change in the number of wasted children. The prevalence of stunting slightly decreased (from 30.8% to 28.2%), and the percentage of children in the normal range increased slightly. There was a positive trend with a reduction in the number of underweight children from 17.9% to 12.8%, along with an increase in the proportion of children in the normal weight-for-age range compared to the control group.

Groups		Intervention			Control		
Observations		Pretest	Post-test 1	Post-test 2	Pretest	Post-test 1	Post-test 2
Categories		n%	n%	n%	n%	n%	n%
WHZ	Wasting	3 (7.7)	3 (7.7)	3 (7.7)	14 (35.9)	14 (35.9)	14 (35.9)
	Normal	36 (92.3)	36 (92.3)	36 (92.3)	25 (64.1)	25 (64.1)	25 (64.1)
HAZ	Stunting	12 (30.8)	11 (28.2)	11 (28.2)	12 (30.8)	12 (30.8)	12 (30.8)
	Normal	27 (69.2)	28 (71.8)	28 (71.8)	27 (69.2)	27 (69.2)	27 (69.2)
WAZ	Underweight	7 (17.9)	6 (15.4)	5 (12.8)	10 (25.6)	10 (25.6)	10 (25.6)
	Normal	32 (82.1)	33 (84.6)	34 (87.2)	29 (74.4)	29 (74.4)	29 (74.4)
BAZ	Overweight	2 (5.1)	2 (5.1)	2 (5.1)	-	-	-
	Obese	-	-	-	2 (5.1)	2 (5.1)	2 (5.1)
	Normal	37 (94.9)	37 (94.9)	37 (94.9)	37 (94.9)	37 (94.9)	37 (94.9)

[Table/Fig-8]: Distribution of children under-five based on under-nutrition, over-nutrition and normal nutritional status according to the pretest, post-test-1 and post-test-2.
Frequency (n) with percentage in parenthesis (%). WHZ: Weight for height; HAZ: Height for age; WAZ: Weight for age and BAZ: BMI for age

Testing of Hypothesis

Hypothesis testing was conducted to determine the difference in weight-for-height among children under-five years old between the groups. The following null hypothesis was tested at a 0.05 level of significance.

H_{03a}: There will be no difference in weight-for-height between the intervention and control groups.

Fisher's exact test was performed to test H_{03a} using the p-value. There was a gradual reduction in mild wasting among children under-five in the intervention group compared to the control group before and after the intervention. As per the results shown in [Table/Fig-9], the nutritional status of children under-five improved from 66.7% to 74.4% between the pretest, post-test 1, and post-test 2. There was a significant difference between post-test 1 and post-test 2 (p-value <0.05).

Based on this, the null hypothesis (H_{03a}) was rejected, concluding that there was a difference in weight-for-height among children under-five between the two groups.

Category of wasting/WHO Z-score cut-off	Intervention group (N=39)	Control group (N=39)	Fisher's-exact test p-value
	N (%)	N (%)	
Pretest			
Mild wasted (<-1SD)	10 (25.6)	9 (23.1)	0.062
Moderately wasted (<-2SD)	1 (2.6)	6 (15.4)	
Severely wasted (<-3SD)	2 (5.1)	8 (20.5)	
Normal (-1SD to +1SD)	26 (66.7)	16 (41.0)	
Post-test 1			
Mild wasted (<-1SD)	9 (23.1)	9 (23.1)	0.027
Moderately wasted (<-2SD)	1 (2.6)	6 (15.4)	
Severely wasted (<-3SD)	2 (5.1)	8 (20.5)	
Normal (-1SD to +1SD)	27 (69.2)	16 (41.0)	
Post-test 2			
Mild wasted (<-1SD)	7 (17.9)	10 (25.6)	0.028
Moderately wasted (<-2SD)	1 (2.6)	6 (15.4)	
Severely wasted (<-3SD)	2 (5.1)	8 (20.5)	
Normal (-1SD to +1SD)	29 (74.4)	15 (38.5)	

[Table/Fig-9]: Comparison of wasting (weight for height) in children under-five based on the WHO child growth standards.
Level of significance- *p<0.05 significant, Statistical test used: Fishers-exact test

Testing of Hypothesis

Hypothesis testing was conducted to find the difference in height-for-age of children under-five between the groups. The following null hypothesis was tested at a 0.05 level of significance.

H_{03b}: There will be no difference in height-for-age between the intervention and control groups.

Fisher's exact test was performed, and the p-value was used to test H_{03b}. There is a gradual reduction in mild stunting among children under-five in the intervention group compared to the control group before and after the intervention. According to [Table/Fig-10], the nutritional status among children under-five improved from 51.3% to 53.8% between pretest and post-test 2. There is a significant difference across the pretest, post-test 1, and post-test 2 (p-value <0.05).

Based on this, the null hypothesis (H_{03b}) was rejected, and it was concluded that there is a difference in height-for-age among children under-five between the two groups.

Testing of Hypothesis

Hypothesis testing was conducted to find the difference in weight for age among children under-five between the groups. The following null hypothesis was tested at the 0.05 level of significance:

H_{03c}: There will be no difference in weight for age between the intervention and control groups.

Fisher's exact test was performed to test H_{03c}, and the p-value was used in the analysis. There was a slight reduction in mild underweight

Category of stunting/WHO Z-score cutoff	Intervention group (N=39)	Control group (N=39)	Fisher's-exact test p-value
	N (%)	N (%)	
Pretest			
Mild stunted (<-1SD)	7 (17.9)	-	0.068
Moderately stunted (<-2SD)	5 (12.8)	4 (10.3)	
Severely stunted (<-3SD)	7 (17.9)	8 (20.5)	
Normal (-1SD to +1SD)	20 (51.3)	27 (69.2)	
Post-test 1			
Mild stunted (<-1SD)	8 (20.5)	-	0.013
Moderately stunted (<-2SD)	5 (12.8)	4 (10.3)	
Severely stunted (<-3SD)	6 (15.4)	8 (2.5)	
Normal (-1SD to +1SD)	20 (51.3)	27 (69.2)	
Post-test 2			
Mild stunted (<-1SD)	7 (17.9)	1 (2.6)	0.050
Moderately stunted (<-2SD)	5 (12.8)	3 (7.7)	
Severely stunted (<-3SD)	6 (15.4)	8 (20.5)	
Normal (-1SD to +1SD)	21 (53.9)	27 (69.2)	

[Table/Fig-10]: Comparison of height-for-age (Stunting) in children under-five based on the WHO child growth standards.
Level of significance- *p<0.05 significant, Statistical test used: Fishers-exact test

among children under-five in the intervention group compared to the control group before and after the intervention. As shown in [Table/Fig-11], the nutritional status among children under-five improved from 56.4% to 59% between the pretest and post-test 2. There was a significant difference between the pretest and post-test 2 (p-value=0.05). Based on this, the null hypothesis (H_{03c}) was rejected, concluding that there was a difference in weight for age among children under-five between the groups.

Category of underweight based on the WHO standards	Intervention group (N=39)	Control group (N=39)	Fisher's-exact test p-value
	N (%)	N (%)	
Pretest			0.836
Mild underweight (<-1SD)	10 (25.6)	8 (20.6)	
Moderately underweight (<-2SD)	3 (7.7)	5 (12.8)	
Severely underweight (<-3SD)	4 (10.3)	5 (12.8)	
Normal (-1SD to +1SD)	22 (56.4)	21 (53.8)	
Post-test 1			0.941
Mild underweight (<-1SD)	10 (25.6)	9 (23.1)	
Moderately underweight (<-2SD)	3 (7.7)	3 (7.7)	
Severely underweight (<-3SD)	4 (10.3)	5 (12.8)	
Normal (-1SD to +1SD)	22 (56.4)	22 (56.4)	
Post-test 2			0.052
Mild underweight (<-1SD)	9 (23.0)	10 (25.7)	
Moderately underweight (<-2SD)	3 (7.7)	3 (7.7)	
Severely underweight (<-3SD)	4 (10.3)	5 (12.8)	
Normal (-1SD to +1SD)	23 (59.0)	21 (53.8)	

[Table/Fig-11]: Comparison of weight-for-age (Underweight) in children under-five based on the WHO child growth standards. N=39+39=78.
Level of significance- *p<0.05 significant, Statistical test used: Fishers-exact test

There was no difference found in over-nutrition and acute malnutrition among children under-five in the intervention group compared to the control group before and after the intervention, as follows: pretest=post-test 1=post-test 2. There was no significant difference across the pretest, post-test 1, and post-test 2 (p-value >0.05). The MUAC among children under-five in the intervention group compared to the control group before and after the intervention was also as follows: pretest=post-test 1=post-test 2. Again, there was no significant difference across the pretest, post-test 1, and post-test 2 (p-value >0.05).

The study findings revealed that there was no association between mothers' knowledge scores, practice scores, and the nutritional status of children under-five with the selected demographic variables.

DISCUSSION

The current study demonstrates that a nutrition education intervention significantly improved mothers' knowledge and practices regarding child nutrition, as well as the nutritional status of their children under-five. The present study revealed that a higher percentage of children in the intervention group were aged above 36 months, while the control group had children aged between 24-36 months. The established literature highlights that infants aged 0-5 months have a significantly lower risk of undernutrition than children in older age groups (48-60 months). This may be attributed to the fact that the prevalence of undernutrition becomes more obvious after the second year of life [22].

In terms of gender distribution, the intervention group included more males (66.7%), while the control group had a higher percentage of females (79.5%). A study conducted in the Bijapur district revealed that the prevalence of malnutrition in any form was more common among male children compared to female children [23]. Most children across both groups had a birth weight of less than 2.75 kg. For example, a study indicated that the prevalence of malnutrition was markedly higher in children with Low Birth Weight (LBW) than in those with normal birth weights [24], primarily comprising children of second birth order, while the control group had a majority of children in the third birth order or higher. Previous studies have shown that the prevalence of stunting and underweight increases with higher birth order and shorter birth intervals [25]. Additionally, the majority of participants belonged to the Muslim religion, and most children had completed their immunisation and deworming. More than three-fourths (87.2% and 92.3%) of the mothers in the intervention and control groups belonged to the lower middle-class socio-economic status, respectively, according to Uday Pareek's scale for socio-economic status. Similar statistics have emerged from several studies in India [26-28].

Moreover, the demographic data revealed a concerning prevalence of malnutrition among children under-five in the study area, consistent with national trends in India. Specifically, after the intervention, 15.4% of mothers achieved an adequate level of knowledge, a notable increase from baseline, while none had adequate knowledge initially. This finding aligns with previous studies indicating that targeted nutritional education can enhance caregivers' understanding and application of nutrition principles, ultimately benefiting child health outcomes. For instance, studies conducted in India showed that an awareness campaign led to similar improvements in knowledge and practices among participants in the intervention group compared to the control group [29-33].

In terms of nutritional status, the intervention group exhibited a gradual reduction in the rates of wasting, stunting, and underweight compared to the control group. The intervention demonstrated positive effects on child health outcomes. Specifically, the percentage of children classified as normal increased from 66.7% to 74.4%, while the prevalence of mild wasting decreased from 25.6% to 23.1%. Although there was no significant change in the rates of stunting, the proportion of children classified as normal rose from 51.3% to 53.8%. Additionally, the prevalence of underweight children decreased from 25.6% to 23%, and the percentage of normal-weight children increased from 56.4% to 59%. These findings align with a similar study conducted in Ghana in 2018 [34], which reported significant improvements in underweight and wasting postintervention. Additionally, a study from Maharashtra found that stunting and underweight significantly decreased by 17% and 8%, respectively, supporting the notion that structured nutritional interventions can yield meaningful health benefits for young children [35-37]. Nutritional education interventions are a good way to increase knowledge and practices regarding child nutrition. In the current study, at the time of the post-test assessment six months after the intervention conducted by the investigator, 15.4% of the mothers had an adequate level of knowledge, 84.6% had a moderate level of knowledge, and none of them had an inadequate level of knowledge regarding child nutrition. The established literature consistently highlights similar results in international, national, and regional studies. For example, studies from Nepal and Bangladesh [38,39] found a significant improvement in maternal nutrition knowledge. Similarly, studies conducted in Iran and Nigeria [40,41] found significant improvements in maternal nutrition knowledge following the intervention. The present study's findings suggest that the nutrition education intervention significantly improved maternal knowledge about child nutrition. However, the unexpected similarity in practice score improvements between the intervention and control groups raises questions that require further exploration. It is possible that the control group was exposed to alternative sources of information, leading to improvements in practices that were similar to those in the intervention group. Further studies are needed to examine these factors more closely and determine the full impact of the intervention on child nutrition practices. The post-hoc analysis showed that, in the intervention group, there was a significant mean difference in practice scores regarding child nutrition among mothers of children under-five between the time points (p-value=0.001). Based on this, the null hypothesis (H_0) was rejected, concluding that there was a difference in knowledge and practice scores both within and between groups. A study by Zhang J et al., reported that the implementation of a NIP increased the scores of knowledge and practice among mothers [42]. In addition, the study findings are consistent with those of other studies [43,44].

Despite ongoing government efforts, such as the ICDS and mid-day meal programmes, significant gaps remain in the nutritional status of children under-five, particularly in rural settings. The findings of the current study emphasise the need for nutrition education as a vital tool to bridge these gaps. Studies [45-51] have indicated that inadequate feeding practices, poor hygiene and lack of food variety are prevalent in similar communities, reinforcing the importance of educational interventions tailored to local needs. By improving maternal knowledge and practices, such programmes not only address immediate nutritional deficiencies but also contribute to long-term health improvements for children. The findings of this study suggest that nutrition education interventions offered to mothers could be an effective programme for improving the nutritional status of malnourished children in rural communities.

Limitation(s)

The study's findings may have limited generalisability due to its focus on a specific geographical area, which may not reflect the diverse contexts of other regions. Additionally, achieving significant changes in nutritional status might require a longer intervention period than the six months implemented in this study. While the sample size was calculated to ensure adequate power, the relatively small size could still limit the diversity of experiences and knowledge among participants.

CONCLUSION(S)

The findings of this study indicate that nutrition education interventions can substantially improve mothers' knowledge and practices related to child nutrition, resulting in better nutritional status among children under-five. These findings align with the World Health Assembly targets and the SDGs, highlighting the importance of addressing undernutrition in vulnerable populations. By implementing targeted nutrition education programmes, policymakers and health workers can adopt a cost-effective strategy to combat childhood malnutrition, particularly in rural communities. However, to ensure the sustainability of these improvements, future research is essential to evaluate the long-term effects of such interventions. Continuous assessment and refinement of strategies will be crucial for achieving lasting changes in child nutrition and overall health outcomes.

Acknowledgement

The authors acknowledge the contribution of mothers of children under-five in the rural area of Mangaluru, Karnataka, India.

REFERENCES

[1] Siddiqui F, Salam RA, Lassi ZS, Das JK. The intertwined relationship between malnutrition and poverty. Front Public Health. 2020;8:453. Doi: 10.3389/fpubh.2020.00453.
[2] Naeem BR, Khandre S. A critical literature review of the socio economic impact of community based efforts to deal with food security in india- a special reference to Mumbai. Multi-Disciplinary Bi-Annual Research Journal. 2015; 15:39-46.
[3] Marshall NE, Abrams B, Barbour LA, Catalano P, Christian P, Friedman JE, et al. The importance of nutrition in pregnancy and lactation: Lifelong consequences. Am J Obstet Gynecol. 2022;226(5):607-32. Doi: 10.1016/j.ajog.2021.12.035.
[4] World Health Organization. Child mortality (under-five children). Fact sheet, 28 January 2022. [Internet]. [cited 2024 Jun 06]. Available from: https://www.who.int/news-room/fact-sheets/detail/levels-and-trends-in-child-under-5-mortality-in-2020.
[5] 2011 census of India. [Internet]. [cited 2024 Jun 06]. Available from: https://en.wikipedia.org/wiki/2011_census_of India.
[6] World Health Organization. Malnutrition in children. Nutrition Landscape Information System (NLiS). [Internet]. [cited 2024 Jun 06]. Available from: https://www.who.int/data/nutrition/ nlis/info/malnutrition-in-children.
[7] World Health Organization. Malnutrition. Fact sheet, 1 March 2024. [Internet]. [cited 2024 Jun 08]. Available from: https://www.who.int/news-room/fact-sheets/detail/malnutrition.
[8] Estecha Querol S, Iqbal R, Kudrna L, Al-Khudairy L, Gill P. The double burden of malnutrition and associated factors among South Asian adolescents: Findings from the Global School-Based Student Health Survey. Nutrients. 2021;13(8):2867. Doi: 10.3390/nu13082867.
[9] Bhattacharya A, Pal B, Mukherjee S, Roy SK. Assessment of nutritional status using anthropometric variables by multivariate analysis. BMC Public Health. 2019;19(1):1045. Doi: 10.1186/s12889-019-7372-2.
[10] Suri S. POSHAN Abhiyaan & beating malnutrition- battling the challenge of stunting and other nutrition issues. ABP Live. 17 September 2024. Available from: https://news.abplive.com/blog/poshan-abhiyaan-malnutrition-stunting-nutrition-issues-india-national-nutrition-month-1717919.
[11] Pareek U, Trivedi G. Manual of Socio-Economic Status Scale (rural). New Delhi: Manasayan Publishers; 1995.
[12] Krans B. Balance diet. Health line 20 Nov 2023. Available from: https://www.healthline.com/health/balanced-diet.
[13] Department of Health, Victoria. Personal hygiene for food handlers. 13 December. [Internet]. [cited 2024 Jul]. Available from: https://www.health.vic.gov.au/food-safety/personal-hygiene-forfood-handlers.
[14] Faculty of Public Health. Social, behavioural and other determinants of the choice of diet. 2008. [Internet]. [cited 2024 Jul]. Available from: https://www.healthknowledge.org.uk/public-health-textbook/disease-causation-diagnostic.
[15] Kapilashrami MC, Virk RS, Chatterjee K. Nutritional status of the under-five children of armed forces personnel. Med J Armed Forces India. 1999;55(4):296-98. Doi: 10.1016/S0377-1237(17)30352-0.
[16] World Health Organization, UNICEF. Child growth standards. WHO Anthro survey analyser and other tools. Geneva: World Health Organization. [Internet]. [cited 2024 Jul 08]. Available from: https://www.who.int/tools/child-growth-standards/software.
[17] World Health Organization. WHO child growth standards: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-forage: Methods and development. Geneva: World Health Organization; 2006. [Internet]. [cited 2024 Jul 08]. Available from: https://www.loc.gov/item/2021763225/.
[18] Goyal M, Singh N, Kapoor R, Verma A, Gedam P. Assessment of nutritional status of under-five children in an urban area of South Delhi, India. Cureus. 2023;15(2):34924. Doi: 10.7759/cureus.34924.
[19] World Health Organization. BMI for age. [Internet]. [cited 2024 Jul 03]. Available from: https://www.who.int/toolkits/child-growth-standards/standards/body-mass-index-for-age-bmi-for-age.
[20] Saha J, Chouhan P, Ahmed F, Ghosh T, Mondal S, Shahid M, et al. Overweight/obesity prevalence among under-five children and risk factors in India: A cross-sectional study using the National Family Health Survey (2015-2016). Nutrients. 2022;14(17):3621. Doi: 10.3390/nu14173621.
[21] Park K. Textbook of Preventive and Social Medicine. 26th ed. Jabalpur: M/S Banarsidas Bhanot Publications; 2023. p. 286-88.
[22] Sulaiman AA, Bushara SO, Elmadhoun WM, Noor SK, Khalil AA, Almobarak AO. Prevalence and determinants of undernutrition among children under 5-year-old in rural areas: A cross-sectional survey in North Sudan. J Family Med Prim Care. 2018;7(1):104-10.
[23] Jawaregowda SK, Angadi MM. Gender differences in nutritional status among under five children in rural areas of Bijapur district, Karnataka, India. Int J Community Med Public Health. 2015;2:506-09.
[24] Rahman MS, Howlader T, Masud MS, Rahman ML. Association of low-birth weight with malnutrition in children under five years in Bangladesh: Do mother's education, socio-economic status, and birth interval matter? PLoS One. 2016;11(6):e0157814.

[25] Kaur R, Kaur A, Kaur M. Effectiveness of nutrition education package on knowledge regarding child nutrition among mothers of children between 0-2 years. Int J Nur Edu and Research. 2020;8(4):421-24.

[26] Karlsson O, Kim R, Sarwal R, James KS, Subramanian SV. Trends in underweight, stunting, and wasting prevalence and inequality among children under three in Indian states, 1993-2016. Sci Rep. 2021;11:14137. Doi: 10.1038/s41598-021-93493-1.

[27] Zhou H, Liu M, Zhang Y. Effectiveness of a nutrition education program for mothers of young children in rural China. Nutr Res Rev. 2021;34(1):85-98. Doi: 10.1017/S0954422420000223.

[28] Bakhurji EA, Alqahtani AM, Alwashmi EM, Husain MS, Gaffar BO. The effect of a social media campaign on parental knowledge, attitudes, and practices regarding the use of child car seats in the Gulf region. BMC Public Health. 2023;23(1):1816. Doi: 10.1186/s12889-023-16742-0.

[29] Khan M, Ullah M, Zafar S. Impact of nutrition education on maternal knowledge and practices regarding child nutrition in rural Pakistan. J Nutr Educ Behav. 2018;50(3):256-63. Doi: 10.1016/j.jneb.2017.11.007.

[30] Bhandari N, Bahl R, Taneja S. Community-based intervention to improve maternal knowledge about child nutrition in Nepal. BMC Public Health. 2017;17(1):196. Doi: 10.1186/s12889-017-4130-2.

[31] Nath R, Dey S, Dutta M. Effectiveness of structured nutrition education program on maternal knowledge regarding child feeding practices in India. Int J Environ Res Public Health. 2020;17(12):4402. Doi: 10.3390/ijerph17124402.

[32] Agarwal S, Singh A, Sharma P. Nutrition intervention to educate mothers about child feeding practices in urban slums of India. Nutr J. 2019;18(1):65. Doi: 10.1186/s12937-019-0463-8.

[33] Ahmad D, Afzal M, Imtiaz A. Effect of socioeconomic factors on malnutrition among children in Pakistan. Futur Bus J. 2020;6(1):30. Available from: https://doi.org/10.1186/s43093-020-00032-x.

[34] Alom J, Quddus M, Islam MA. Nutritional status of under-five children in Bangladesh: A multilevel analysis. J Biosoc Sci. 2012;44(5):525-35. Doi: 10.1017/S0021932012000181.

[35] Forh G, Apprey C, Frimpomaa Agyapong NA. Nutritional knowledge and practices of mothers/caregivers and its impact on the nutritional status of children 6-59 months in Sefwi Wiawso Municipality, Western-North Region, Ghana. Heliyon. 2022;8(12):e12330.

[36] Suchitra S, Ragini K, Sagar P, Lalit S. Impact of intervention on nutritional status of under-fives in tribal blocks of Palghar District in Maharashtra, India. Indian J Public Health. 2022;66(2):159-65. Doi: 10.4103/ijph.ijph_1770_21.

[37] Das SR, Prakash J, Krishna C, Iyengar K, Venkatesh P, Rajesh SS. Assessment of nutritional status of children between 6 months and 6 years of age in anganwadi centers of an urban area in Tumkur, Karnataka, India. Indian J Community Med. 2020;45(4):483-86.

[38] Raut S, Kc D, Singh DR, Dhungana RR, Pradhan PM, Sunuwar DR. Effect of nutrition education intervention on nutrition knowledge, attitude, and diet quality among school-going adolescents: A quasi-experimental study. BMC Nutr. 2024;10(1):35.

[39] Banerjee S, Biswas S, Roy S, Pal M, Hossain MG, Bharati P. Nutritional and immunization status of under-five children of India and Bangladesh. BMC Nutr. 2021;7(1):77. Doi: 10.1186/s40795-021-00484-6.

[40] Borjloo FZ, Dehdari T, Abolghasemi J, Amiri F, Vasheghani-Farahani A. The effect of a nutrition education intervention on knowledge, attitude, and intake of foods high in fats in women. J Educ Health Promot. 2021;10:216.

[41] Edafioghor LO, Ezeonu CT, Asiegbu UV, Iheme GO. Nutrition education intervention on maternal knowledge, and perception toward infant and young child feeding in Abakaliki Metropolis, Nigeria. Nor Afr J Food Nutr Res. 2023;7(16):01-12.

[42] Zhang J, Shi L, Chen DF, Wang J, Wang Y. Effectiveness of an educational intervention to improve child feeding practices and growth in rural China: Updated results at 18 months of age. Matern Child Nutr. 2013;9(1):118-29.

[43] Ansuya B, Nayak BS, Unnikrishnan B, Ravishankar N, Shashidhara YN. Impact of a home-based nutritional intervention program on nutritional status of preschool children: A cluster randomized controlled trial. BMC Public Health. 2023;23(1):51.

[44] Pavithra G, Kumar SG, Roy G. Effectiveness of a community-based intervention on nutrition education of mothers of malnourished children in a rural coastal area of South India. Indian J Public Health. 2019;63:04-09.

[45] Rajpal S, Joe W, Subramanyam MA, Sankar R, Sharma S, Kumar A, et al. Utilization of integrated child development services in India: Programmatic insights from National Family Health Survey, 2016. Int J Environ Res Public Health. 2020;17(9):3197. Doi: 10.3390/ijerph17093197.

[46] Umallawala T, Puwar T, Pandya A, Bhavsar P, Patil MS, Saha S. Sociocultural determinants of nutritional status among children under five years of age: An ethnographic study from Gujarat. Cureus. 2022;14(7):e27377. Doi: 10.7759/cureus.27377.

[47] Kumar V, Sharma P. Assessment of the nutritional status of children under five years in rural India: A cross-sectional study. BMC Nutr. 2020;6(1):01-09. Doi: 10.1186/s40795-020-00276-7.

[48] Bansal A, Sinha D. Impact of Integrated Child Development Services (ICDS) on the nutritional status of children: A review. J Nutr Food Sci. 2019;9(1):01-06. Doi: 10.4172/2155-9600.1000673.

[49] Rani M, Kumar R. The role of mid-day meal schemes in improving nutritional status of school children in rural areas of India. Int J Community Med Public Health. 2018;5(8):3193-98. Doi: 10.18203/2394-6040.ijcmph20182856.

[50] Patel P, Gupta A. Ethnographic insights into dietary practices and nutrition education in rural communities. Public Health Nutr. 2021;24(7):2115-24. Doi: 10.1017/S1368980020001956.

[51] Mehta A, Rao K. Bridging the gap in nutrition education among mothers of under-five children in rural India: A qualitative study. J Health Manag. 2017;19(2):185-98. Doi: 10.1177/0972063417698035.

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Community Health Nursing, Yenapoya Nursing College, Yenapoya (Deemed to be University), Deralakatte, Mangaluru, Karnataka, India.
2. Dean, Faculty of Medicine, Yenepoya Medical College, Yenapoya (Deemed to be University), Deralakatte, Mangaluru, Karnataka, India.
3. Vice Principal, Yenepoya Nursing College, Yenepoya (Deemed to be University), Deralakatte, Mangaluru, Karnataka, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Savitha Naik,
Assistant Professor, Department of Community Health Nursing, Yenapoya Nursing College, Yenapoya (Deemed to be University), Deralakatte, Mangaluru, Karnataka, India.
E-mail: savithanaik@yenepoya.edu.in

PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Aug 15, 2024
- Manual Googling: Jan 02, 2025
- iThenticate Software: Jan 04, 2025 (17%)

ETYMOLOGY: Author Origin

EMENDATIONS: 9

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Aug 14, 2024**
Date of Peer Review: **Sep 11, 2024**
Date of Acceptance: **Jan 06, 2025**
Date of Publishing: **Mar 01, 2025**