A LONGITUDINAL STUDY ON NUTRITIONAL ASSESSMENT OF MATERNAL AND INFANTS (<1 YEAR) OF SELECTED URBAN POPULATION IN VIJAYAPURA DISTIRCT, KARNATAKA

Abstract

Background: Stunting remains a major public health concern in India, particularly in regions like Vijayapura, Karnataka, where under nutrition and poor infant feeding practices are prevalent. Despite national nutrition programs, maternal and infant malnutrition persist, necessitating region-specific interventions.
Objective: This study aims to assess the socioeconomic and nutritional status of lactating mothers and infants, evaluate breastfeeding and complementary feeding knowledge, attitudes, and practices (KAP), and analyze the impact of nutrition education interventions.
Methods: A cross-sectional study was conducted among 100 lactating mothers (18–35 years) with infants (0–12 months) in urban Vijayapura. Socioeconomic data were collected using structured questionnaires. Maternal anthropometric measurements and dietary intake were assessed. Infant growths parameters, including weight, height, and head circumference, were recorded. A KAP questionnaire was used to evaluate breastfeeding and complementary feeding practices. A nutrition education intervention was provided, and data were analyzed statistically.
Results: While all mothers had good breastfeeding knowledge, 76% exhibited a neutral attitude. Nutritional assessments revealed 45% of mothers were overweight or obese, with inadequate energy and micronutrient intake. Among infants, 83% were exclusively breastfed, but 30% of mothers believed breast milk was insufficient post-six months. Bottle-feeding was practiced by 40%, with only 40% following proper sterilization.
Conclusion: Despite awareness of breastfeeding, gaps in maternal diet and complementary feeding practices persist. Targeted nutrition education is essential to improve maternal nutrition and infant feeding practices, reducing malnutrition risks.

Keywords: Breastfeeding, Maternal Nutrition, Infant Growth, Socioeconomic Status, Nutritional Interventions, RDA, WHO Growth Standards.

Introduction: Stunting is a major public health issue impacting child development from conception through early childhood. It is defined as a length-for-age measurement below two standard deviations (moderate stunting) or three standard deviations (severe stunting) from the WHO Child Growth Standards median. Stunting results from inadequate maternal nutrition, intrauterine growth retardation, suboptimal breastfeeding, and frequent infections. It has long-term consequences, including increased morbidity, impaired cognitive and physical development, and higher risks for chronic diseases such as diabetes and hypertension. Stunted children who experience rapid weight gain post-infancy are also at higher risk of obesity later in life, contributing to cycles of malnutrition and poverty.

Despite national programs like Integrated Child Development Services (ICDS) and the mid-day meal scheme, under nutrition remains prevalent. According to NFHS-5 (2019-21), 35.5% of Indian children under five are stunted, and 32.1% are underweight, with Karnataka, especially Vijayapura, showing high rates exceeding 40%. India faces a triple burden of malnutrition, with under nutrition, rising obesity, and micronutrient deficiencies necessitating region-specific interventions. Effective strategies such as breastfeeding promotion, age-appropriate complementary feeding, and maternal nutrition education are crucial. NFHS data indicate that only 41.8% of Indian infants initiate breastfeeding within the first hour, and 63.7% receive exclusive breastfeeding for six months, highlighting gaps in knowledge and practice. As per the Niti Aayog report (2022), Vijayapura has 103,806 stunted children, 33,924 wasted children, 88,201 underweight children, and 132,459 anemic cases. While child wasting declined by 4% between 2016 and 2020, stunting decreased by only 1%, and anemia by 3%, demonstrating persistent nutritional challenges. This study aims to assess maternal and infant nutritional status, evaluate socio-economic influences, and determine the impact of nutrition interventions on child health. The specific objectives include:

- Assessing the socioeconomic and nutritional status of lactating mothers and infants.
- Evaluating knowledge about breastfeeding and complementary feeding and studying the impact of interventions.

Materials and Methods

Study Design and Sampling: A purposive sampling technique was employed to select 100 lactating mothers aged 18-35 years with infants aged 0-12 months from selected urban areas of Vijayapura district. Participant recruitment was conducted through Anganwadi centers and government hospitals. The study objectives were thoroughly explained, and informed consent was obtained from all participants before data collection.

Socioeconomic Profile: A structured questionnaire was used to collect information on participants' age, education, occupation, family structure, family size, and annual income.

Knowledge, Attitude, and Practices (KAP) on Breastfeeding and Weaning: The KAP of lactating mothers regarding breastfeeding and weaning were assessed using a structured questionnaire. Knowledge was evaluated through a six-item questionnaire, with scores categorized as Good Knowledge (10-12 points) and Poor Knowledge (6-9 points). Attitude was measured using a 10-item Likert scale, classified into Positive (38-50 points), Neutral (25-37 points), and Negative (10-24 points). This assessment provided insights into maternal awareness, perceptions, and practices related to breastfeeding and infant nutrition.

Nutritional Assessment of Mother and Infants: Maternal nutritional status was assessed using anthropometric measurements and dietary intake assessments. Anthropometric measurements included height and weight, which were recorded following Jelliffe's (1966) guidelines. Body Mass Index (BMI) was calculated to classify the mothers' nutritional status by dividing the weight of the mother over their height squared. Dietary intake was evaluated using a 24-hour dietary recall method to estimate macronutrient and micronutrient consumption. Nutrient intake was further analyzed using the Indian Food Composition Tables (Gopalan et al., 2010), providing insights into dietary adequacy and deficiencies.

Infant nutritional status was assessed using anthropometric measurements based on Jelliffe's (1966) guidelines. Weight was measured using an infant weighing scale with an accuracy of 0.2 kg, while lengthwas recorded using an infantometer with precision up to 0.1 cm. Head circumference was measured using a flexible, non-stretchable measuring tape, ensuring consistency in data collection. Chest circumference was recorded at the nipple line using a non-stretchable measuring tape to evaluate growth patterns and overall infant health.2.5 Nutrition Education Intervention

Nutrition Education interventions: Educational sessions were conducted for lactating mothers and caregivers to enhance knowledge about breastfeeding and complementary feeding. Methods included group discussions, lectures, and visual aids (posters, charts). Sessions were delivered in individual and group formats, tailored to participant needs.

Statistical Analysis: Descriptive statistics (mean, standard deviation, and percentage distributions) were used to summarize the data. Correlation and regression analyses were applied to determine associations between maternal nutritional status, breastfeeding practices, and infant growth parameters.

Result and discussion: Table no. 1 presents the socio-demographic profile of respondents, revealing a predominantly young population, with 96% aged 18-30 years. The majority (69%) are Hindus, followed by Muslims (29%) and Christians (2%). A significant proportion (72%) resides in joint families, reflecting strong cultural values of family support. Education levels indicate that 58% hold a degree, while none reported having only primary education. Occupationally, 78% of respondents are housewives, with limited employment in government (5%) and non-government (15%) sectors. Income distribution highlights that 47% earn above ₹30,000, while 1% earn below ₹10,000, indicating economic disparities within the community.

Table No.1: Socio economic profile of the subjects

Characteristics	Particulars	Number of Subjects (N=100)	Percentage (%)

Age of Respondent (Years)	18-25	55.0	55.00
	26-30	41.0	41.00
	31-35	04.00	04.00
	>35	00.0	0.00
	Total	100	100
Religion	Hindu	69.0	69.00
	Christian	2.00	2.00
	Muslim	29.0	29.00
	Others	0.00	0.00
	Total	100	100
Nature of family	Nuclear	28.0	28.00
	Joint	72.0	72.00
	Total	100	100
Education	Illiterate	0.00	00
	Primary	0.00	00
	High school	16.0	16.00
	PUC	15.0	15.00
	Degree	58.0	58.00
	Diploma	0.00	00.00
	>Degree	11.00	11.00
	Total	100	100.00
Occupation	House wives	78.0	78.00
	Labor	2.00	2.00
	Govt-employee	5.00	5.00
	Non-Govt	15.0	15.00

Table No. 02: Knowledge, Attitude, and Practices of the subjects

Parameters	**Before intervention (n=30)**	**After intervention (n=30)**

I. Knowledge		
Good knowledge (9 to 12)	22 (73.3%)	28(93.3%)
Poor knowledge (6 to 9)	8(26.7%)	2(6.7%)
II. Attitude		
Negative Attitude (10-24 point)	3 (10%)	1(3.3%)
Neutral Attitude (25-37 point)	22(73.3%)	20 (66.7%)
Positive Attitude (38-50 point)	5(16.7%)	9(30%)
III. Practices		
Poor Practices (7-10 points)	1(3.3%)	0%
Good Practices (11-14 points)	29(96.6%)	30(100%)

Table no. 2 shows that The Nutrition Education Intervention (NEI) significantly improved participants' knowledge, attitude, and practices. The percentage of mothers with good knowledge increased from 73.3% to 93.3%, while those with poor knowledge decreased from 26.7% to 6.7%. A positive shift in attitude was observed, with positive attitude scores rising from 16.7% to 30% and negative attitudes reducing from 10% to 3.3%. Practices showed the most improvement, as 100% of participants adopted good practices post-intervention compared to 96.6% before. These findings highlight the effectiveness of NEI in enhancing maternal awareness and behavior towards infant nutrition.

BMI Classification The results indicated (Fig 1) that 15% of mothers were underweight (BMI <18.5), 30% had an ideal BMI (18.5-22.9), and 45% were overweight or obese. This highlights the need for targeted nutritional interventions, as both underweight and overweight mothers may face complications that affect maternal and infant health.

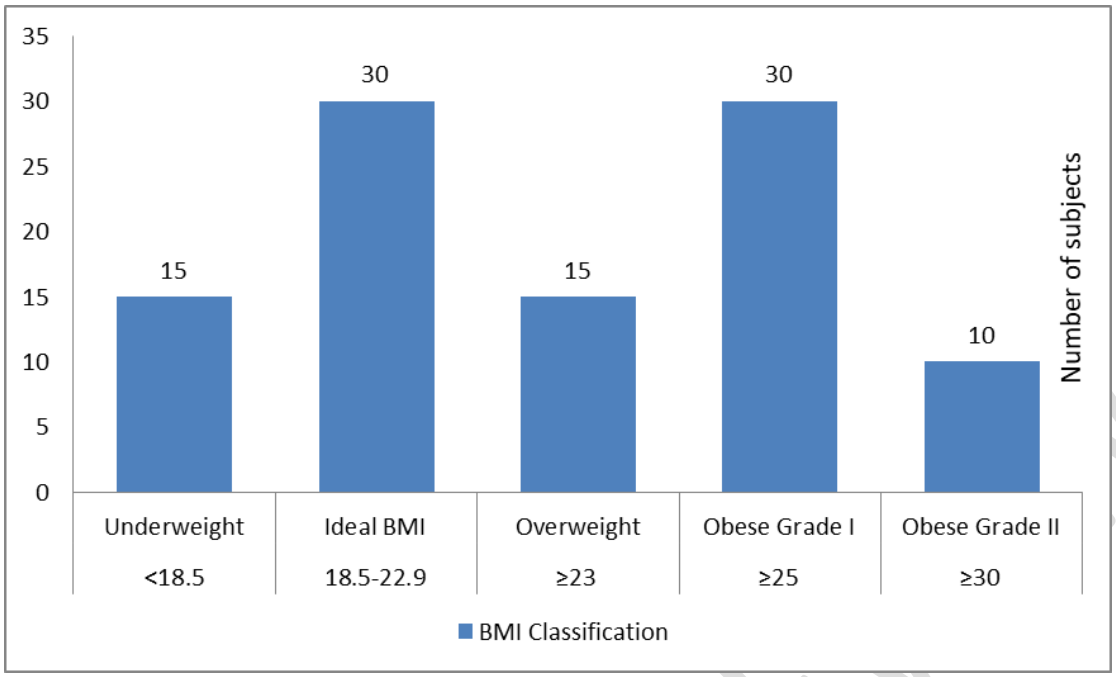

Fig 1:

Classification of subjects according to BMI

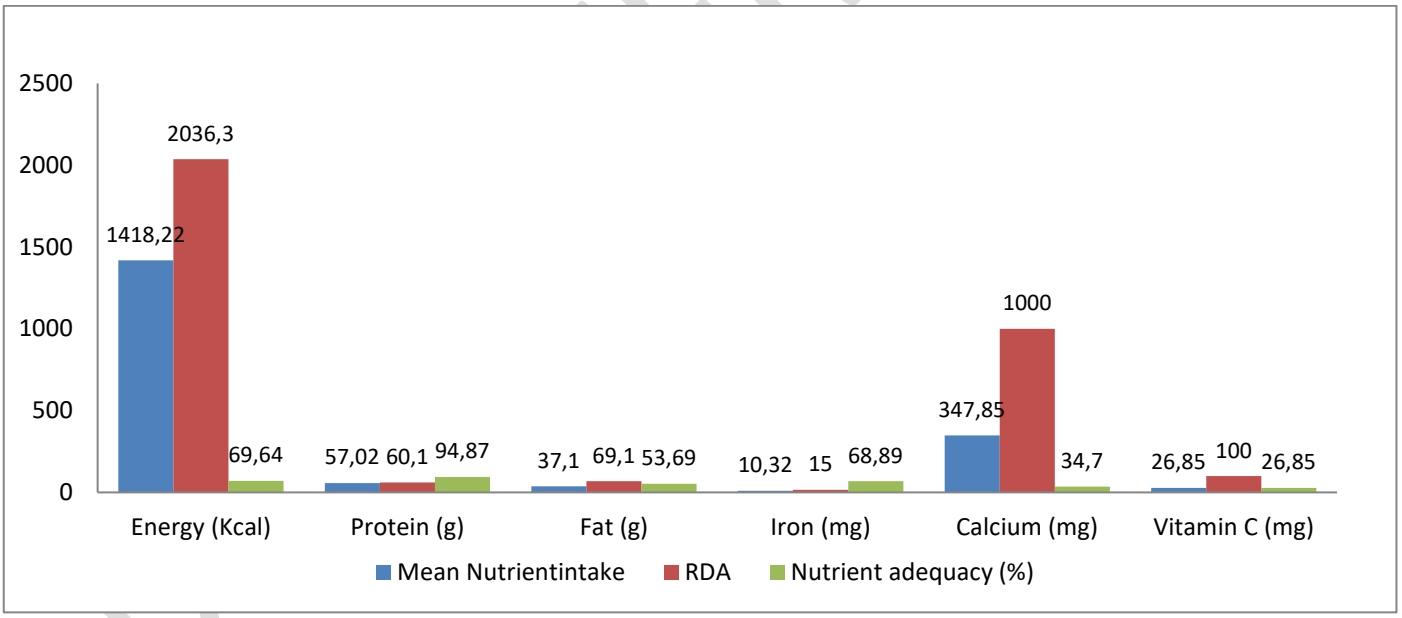

Fig 2: Mean Nutrients intake and Adequacy of the Subjects

Fig 2 shows that Mean Nutrient Intake and Adequacy. The average energy intake was 1418.22 kcal, covering 69.64% of the RDA, suggesting a caloric deficit. Protein intake (94.87% adequacy) was satisfactory, but fat intake (53.69%) was lower than recommended levels. Iron (68.89%) and calcium (34.7%) intake were inadequate, increasing the risk of anemia and bone health issues. Similarly, vitamin C intake (26.85%) was below recommended levels, indicating a need for dietary improvements.

Most infants (83%) were exclusively breastfed, with minimal supplementation of cow (4%) or buffalo (1%) milk. However, 30% of mothers believed breast milk alone was insufficient after six months, emphasizing the need for better breastfeeding education. Weaning practices aligned with recommendations, as 73% introduced complementary foods after six months. However, 53% of mothers used commercial weaning foods, highlighting a shift towards convenience over homemade options. Additionally, 40% of infants were bottle-fed, with only 40% of mothers sterilizing bottles, raising hygiene concerns. **(Table 3)**

The anthropometric measurements of male and female infants were assessed and compared with WHO growth standards and presented in **table no. 4 & 5**. The findings indicate significant deviations from the reference values, highlighting potential risks of under nutrition and growth retardation.

For male infants (N=55), the mean weight across all age groups was consistently lower than the WHO 5th–95th percentile range. The mean height followed a similar trend, with recorded values falling below the expected range. The mean head circumference was also lower in certain age groups, suggesting potential developmental concerns. Notably, in the 0–3 month's group, the mean weight was 3.73 kg, which is lower than the WHO range (4.6–6.8 kg). In the 3–6 months group, the mean weight was 4.61 kg, falling short of the WHO standard (6.2–8.9 kg).

Table No.3 Breast feeding and complimentary practices of Infants

Characteristics	Particulars	Number of Subjects (N=30)	Percentage (%)
Ordinal position	First	19	63.33
	Middle	07	23.33
	Last	04	13.33
If milk supplements are given, which type of milk is given?	Cow	04	13.33
	Buffalo	01	03.33
	Goat	-	-
	Breast Milk	25	83.33
If yes ratio of dilution with water	1:01		
	1:1/2	01	03.33
	1:1/4	01	03.33
Any tinned milk is given or not	Yes	05	16.66
	No	25	83.33
If tinned milk is given specify the brand name	Similac	01	03.33
	Royale	01	03.33
	Carnation	01	03.33
	Optifeed	01	03.33

Form of feeding?	Lactodex	01	03.33
	Powder	-	-
	Liquid	05	16.66
Follow the instruction for quantity	Yes	05	16.66
	No	-	-
Quantity of milk given /per feed	10-20ml	-	-
	30-40ml	24	80.00
	50-60ml	06	20.00
Do you feel breast milk is sufficient for your child after 6 months	Yes	-	-
	No	30	100.00
If no, at what age did you introduce weaving food	After 3 months	-	-
	After 6 months	22	73.33
	After 9 months	08	26.67
Are you using commercially prepared weaning food	Yes	16	53.33
	No	14	46.67
If yes Name of the weaning food			
Do you follow the instructions for quantity?	Yes	21	70.00
	No	09	30.00
Are you bottle feeding your child?	Yes	12	40.00
	No	18	60.00
No. of bottles in house	1	03	10.00
	2	05	16.67
	3	04	13.33
Do you sterilize the bottles	Yes	12	40.00
	No	18	60.00
No. of Time of sterilization of the bottle	1-2 time	07	23.33
	2-3 time	02	06.67
	3-4 time	03	10.00

Table No. 4: Mean Anthropometric Measurements of Male infants with WHO Standards

Age Group (months) N=55	Weight (kg)		Height (cm)		Head Circumference (cm)	
	Mean	WHO Range (5th-95th percentile)	Mean	WHORange (5th-95th percentile)	Mean	WHO Range (5th-95th percentile)
0-3 (N=46)	3.73	4.6 - 6.8	54.32	50.8 - 62.1	55.90	37.8 - 43.4
3-6 (N=07)	4.61	6.2 - 8.9	54.32	57.5 - 67.5	26.78	41.6 - 47.1
6-9 (N=01)	5.70	7.6 - 10.3	-	62.8 - 72.3	-	43.8 - 49.1

9-12 (N=01)	7.00	8.7 - 11.6	55.00	66.1 - 75.5	24.00	45.0 - 50.2

Similarly, for female infants (N=45), the anthropometric measurements reflected patterns similar to those observed in male infants. The mean weight of female infants in all age groups was below the WHO reference range, with the 0–3 month's group having a mean weight of 3.69 kg compared to the WHO range of 4.5–6.7 kg. The mean height and head circumference were also lower than the WHO standards in multiple age groups.

Discussion: The study highlights critical findings in maternal and infant health. The socio-demographic data show a predominantly young population with strong cultural ties to joint families. Education levels are relatively high, yet occupational engagement remains low, with most mothers being housewives. Despite 100% of respondents demonstrating good knowledge of breastfeeding, only 24% had a positive attitude, and 76% maintained a neutral stance. This indicates that knowledge alone does not always translate into positive behavioral changes, reinforcing the need for targeted awareness campaigns to improve attitudes and practices.

Table No.5: Mean Anthropometric Measurements of Female infants with WHO Standards

Age Group (months) N= 45	**Weight (kg)**		**Height (cm)**		**Head Circumference (cm)**	
	Mean	**WHO Range (5th-95th percentile)**	**Mean**	**WHO Range (5th-95th percentile)**	**Mean**	**WHO Range (5th-95th percentile)**
0-3 (N=32)	3.69	4.5 - 6.7	54.33	50.7 - 62.0	28.88	37.5 - 43.1
3-6 (N=11)	4.63	6.0 - 8.7	52.50	57.3 - 67.4	28.50	41.2 - 46.8
6-9 (N=02)	5.30	7.3 - 10.0	57.00	62.3 - 71.8	31.33	43.4 - 48.7
9-12 (N=00)	-	8.4 - 11.3	-	65.4 - 74.9	-	44.6 - 49.9

Nutritional assessment among lactating mothers revealed both underweight (15%) and overweight/obese (45%) categories. This suggests dual nutritional challenges—malnutrition and excessive weight gain—both of which can impact maternal and infant health. Low energy and nutrient intake, particularly inadequate fat, calcium, iron, and vitamin C levels, further highlight the need for dietary improvements. The study also found reliance on commercially prepared weaning foods (53%), indicating a shift towards convenience rather than traditional, nutrient-rich home-prepared foods.

Infant growth data revealed that both male and female infants exhibited weight and height measurements consistently below WHO growth standards. These findings raise concerns about under nutrition and stunted growth, which can have long-term effects on cognitive and physical development. The inadequacy of breastfeeding beyond six months, as reported by 30% of mothers, further supports the need for interventions promoting proper complementary feeding practices.

Conclusion: The study findings emphasize the urgent need for comprehensive maternal and infant nutrition

interventions in urban Vijayapura. While breastfeeding knowledge is high, attitudinal shifts are required to ensure better adherence to recommended practices. Nutritional inadequacies among lactating mothers and suboptimal infant growth metrics indicate persistent challenges that must be addressed through targeted dietary education and intervention programs. Strengthening community-based nutrition programs, increasing awareness on complementary feeding, and addressing both maternal under nutrition and obesity will be crucial in improving overall maternal and child health outcome.

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