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A cross-sectional study of feeding practice status in children (6–23 months), association with malnutrition, and impacts of maternal determinants

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ABSTRACT

Background: Inadequate complementary feeding practices lead to poor cognition, stunting, and increased rate of infections. Insight into deficiencies of complementary feeding practices could help in planning and implementing newer approaches at various levels of intersection. **Aims and Objectives:** The aim and purpose of the study were to determine the complementary feeding practices, to identify maternal determinants of each practice, and to analyze the associations between complementary feeding practices with malnutrition. **Materials and Methods:** A prospective observational study was conducted at the Department of Pediatrics, of a tertiary hospital over a 14-week period. All children aged 6–23 months were included in the study. Data were collected using a pre-structured questionnaire based on the World Health Organization Infant and Young Child Feeding (IYCF) indicators for assessing IYCF practices. **Results:** A total of 400 mothers participated in the study. The mean age of children was 12.58 20 ± 5.02 months, male: female = 1.6:1. The mean age of starting complementary feeding was 6.81 ± 1.79 months. Semisolid food was introduced in 90.2% of children, minimum dietary diversity was received by 61.0%, minimum meal frequency by 83.8%, and minimum acceptable diet by 58.2%, eggs and flesh by 14.2% and 3.5% children, respectively; only 9.2% received vitamin A rich fruits and 38.5% did not receive any vegetable or fruit. Bottle feeding was present in 55.5% of population. Maternal parameters (education, employment access to media) and socioeconomic status were significantly associated with feeding practices ($P < 0.05$). A significant difference was found in the nutritional status (wasting and stunting) of children who did not receive minimum dietary diversity ($P < 0.01$). **Conclusion:** Wide gap exists in feeding practices even in urban settings and was significantly associated with child's nutritional status.

Key words: Infant and young child feeding; Malnutrition; Maternal determinants; North central India

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INTRODUCTION

Complementary feeding is described as the introduction of safe and nutritionally balanced solid, semi-solid, or soft foods in addition to breast milk for children aged 6–23 months.[1] Link between complementary feeding practices and malnutrition is well established.[2] According to the World Health Organization (WHO), undernutrition is associated with 45% of all childhood deaths. Infants and young children (IYC) >6 months of age are at increased risk of malnutrition when breast milk alone is insufficient to meet nutritional requirements.[3] Not only nutrition during early childhood is critical for decreasing morbidity and mortality during infancy and early childhood but also it is an opportunity for child's adequate growth and development.[4] Insufficient quantity and inadequate quality

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of complementary feeds, poor childhood feeding practices, and high rates of infections are detrimental to child's health and growth. Children receiving inadequate complementary feeds are more vulnerable to poor cognitive development and stunting and are at increased risk of developing infectious diseases (acute respiratory infections [ARIs] and 58 diarrhea).[5,6] If children do not receive sufficient dietary diversity and meal frequency after 59.6 months of age, they remain stunted even after optimum breastfeeding.[7] According to a meta-analysis published in 2016, only 37% of children younger than 6 months of age are exclusively breastfed. They demonstrated that breastfeeding is protective against childhood infections and malnutrition, increases intelligence, and probably has effect on reducing the incidence of overweight and diabetes. In addition, the nursing women are protected against breast cancer, ovarian cancer, and type 2 diabetes and improve birth spacing.[8] 8.23 Lacs death in under 5 children could be prevented by scaling up breastfeeding to near-universal level.[8] Poor nutrition in the first 1,000 days of life can cause stunting, which can lead to impaired cognition and reduced performance in school. Global percentage of children under 5 affected by stunting is 22% and wasting is 6.7% according to the World Bank Joint Child Malnutrition Estimates, 2021 Edition.[9] The lack of evidence and consensus on simple indicators of appropriate feeding practices in children 6–23 months of age has hampered progress in measuring and improving feeding practices, thus limiting improvements in the nutritional outcomes of infant and young child.[10] Insight into deficiencies in complementary feeding practices can lead to decrease in malnutrition and eventually morbidity and mortality in early childhood by implementing programs for complementary feeding at various administrative levels. This study was designed with the aim to assess the complementary feeding practices among mothers of children aged 6–23 months using the WHO Infant and Young Child Feeding (IYCF) indicators and to establish its association with nutritional status. The primary objective was to estimate the prevalence of complementary feeding practices using the WHO IYCF feeding indicators which include timely introduction of complementary feeding, minimum dietary diversity (MDD), minimum meal frequency (MMF), minimum acceptable diet (MAD) among children 6–23 months and to explore the association of the WHO IYCF feeding indicators with nutritional status among children 6–23 months.

MATERIALS AND METHODS

Study design

This is a prospective observational cross-sectional study.

Study settings

Pediatrics outpatient and inpatient department, immunization center, Department of Pediatrics, JA Group of Hospital, G. R. Medical College, Gwalior (MP).

Ethical approval

The study was approved by the Institutional Ethical Committee (IEC-GRMC/839/2021) under the Dean of G.R. Medical College, Gwalior.

Study duration

Fourteen weeks.

Study population

All children aged 6–23 months attending the pediatrics outpatient and inpatient department and immunization center were included in the study. The children (6–23 months) whose parents were not willing to participate in the study were excluded.

Sample size

The sample size for the study was based on a study by National Family Health Survey-4, who reported the prevalence of adequate complementary feeding practices as 50.1% in urban settings. To achieve a 95% confidence level that the actual value falls within ±5% of the measured or surveyed value, at least 385 or more measurements or surveys are required and for making round figure, we have taken 400 respondents.

Sampling technique

Purposive sampling.

Study tools

A pre-structured questionnaire based on the WHO IYCF indicators for assessing infant and young child feeding practices.[10]

Study variables

The exposure variables

Child characteristics: Age, sex, birth weight, birth order, exclusive breastfed or not, immunization status, and history of illness in the past. Maternal characteristics include age, education/literacy, employment status, earning capacity, employment status, status in household decisions, marital status, access to media, access to health-care services, number of antenatal check-ups (ANC) visits, place of delivery, and socioeconomic status.

Outcome variables

Outcome variables include IYCF indicators, i.e., introduction of solid semi-solid or soft food, MDD, MMF, and MAD.

Data collection

Data were collected by face-to-face interview using a pre-structured questionnaire based on the WHO IYCF

indicators for assessing infant and young child feeding practices. A pre-tested semi-structured interviewer-administered questionnaire on complementary feeding was used to collect data on sociodemographic characteristics and complementary feeding practices. Nutritional status of children was assessed by standard methods measuring weight and height/length of child and mid-upper arm circumference. The measurements were plotted on the WHO growth charts.

RESULTS

Baseline details

Table 1 shows the baseline characteristics of the children (6–23 months) and their mothers. The mean age was 12.58±5.02 months, male: female=1.6:1, majority of children were 2nd in birth order (48.2%), immunized for age (99.8%), born to mothers who completed 3 ANC visits (96.5%), at institution/hospital (99.0%) and belonged to upper lower socioeconomic class (80.5%) as per Agarwal classification.[11] Feeding practices and IYCF indicators: Figure 1 shows the complementary feeding practices and IYCF indicators. The mean age of starting the complementary feeding was 6.81±1.79 months. Semisolid food was introduced in 90.2% of children, MDD was received by 61.0%, minimum meal frequency was received by 83.8%, and MAD by 58.2%. Grains were consumed by 98.8%, thin porridge-93.2% legumes-91%. eggs and flesh were received by only 14.2% and 3.5% children, respectively. Only 9.2% received vitamin A rich fruits and 38.5% did not receive any vegetable or fruit. Bottle feeding was present in 55.5% of population (Figure 2).

Maternal education status, employment, number of antennal checkups, and socioeconomic status were significant determinants of MDD and MAD (P<0.05) (Table 2). Maternal access to media, employment, and socioeconomic status were significantly associated with timely introduction of complementary feeds and mother's access to media, antenatal visits, and socioeconomic status were significantly associated with minimum meal frequency. Maternal education has also been linked with greater MDD (P<0.01) and MAD (P<0.001). A significant difference was found in the nutritional status (wasting and stunting) of children who received MDD (P<0.01), MAD (P<0.01), and MMF (P<0.01) (Table 3).

Table 1: Baseline characteristics of children 6–23 months of age and their mothers

Baseline data	Observed parameters
Age, n (%)	
<1 Year	200 (50.0)
>1 Year	200 (50.0)
Age (months) (mean±SD)	12.58±5.02
Gender, n (%)	
Male	247 (61.8)
Female	153 (38.2)
Birth weight, n(%)	
<2.5 kg	18 (4.5)
>2.5 kg	382 (95.5)
Birth order, n (%)	
1st	153 (38.2)
2nd	193 (48.2)
3rd	44 (11.0)
4th	8 (2.0)
5th	2 (0.5)
Immunization status, n (%)	
Incomplete immunization	399 (99.8)
Unimmunized	1 (0.2)
Complementary feeding started at (months) (mean±SD)	6.81±1.79
History of ARI/Diarrhoea, n (%)	96 (24.0)
Mother's age (years) (mean±SD)	25.56±2.79
Literacy of mother, n (%)	126 (31.5)
Employment status of mother, n (%)	57 (14.2)
Mother's participation in household decision making, n (%)	37 (9.2)
Marital status (married), n (%)	400 (100.0)
Mother's access to media, n (%)	290 (72.5)
Mother's access to health care, n (%)	380 (95.0)
Number of ANC visits, n (%)	
<3	14 (3.5)
≥3	386 (96.5)
Place of delivery, n (%)	
Home	4 (1.0)
Hospital	396 (99.0)
Socioeconomic status Agarwal AK scale, n (%)	
Lower	16 (4.0)
Lower middle	62 (15.5)
Upper lower	322 (80.5)

SD: Standard deviation, ARI: Acute respiratory infections, ANC: Antenatal check-ups

DISCUSSION

IYCF practices are the main determinants of nutritional status, growth, and development of children 0–23 months of age, and therefore its vital to improve them. The WHO recommends exclusive breastfeeding for the first 6 months of life with early initiation and continuation of breastfeeding for 2 years or more together with nutritionally adequate, safe, age-appropriate complementary feeding starting at 6 months.[12] The WHO guiding principles for complementary feeding of the breastfed child along with guiding principles for feeding non-breastfed children 6–24 months of age provide global guidance on optimal feeding practices for supporting growth, health, and behavioral development for IYC under 2 years of age.[4,13] To support programmatic action and to contribute to monitoring progress on IYCF, indicators for assessing IYCF practices were published in 2008.[14,15] They recommended a set of eight core and seven optional indicators. In 2017 and 2018, the WHO and UNICEF recommended revised indicators. Unlike in 2008, no distinction is made between

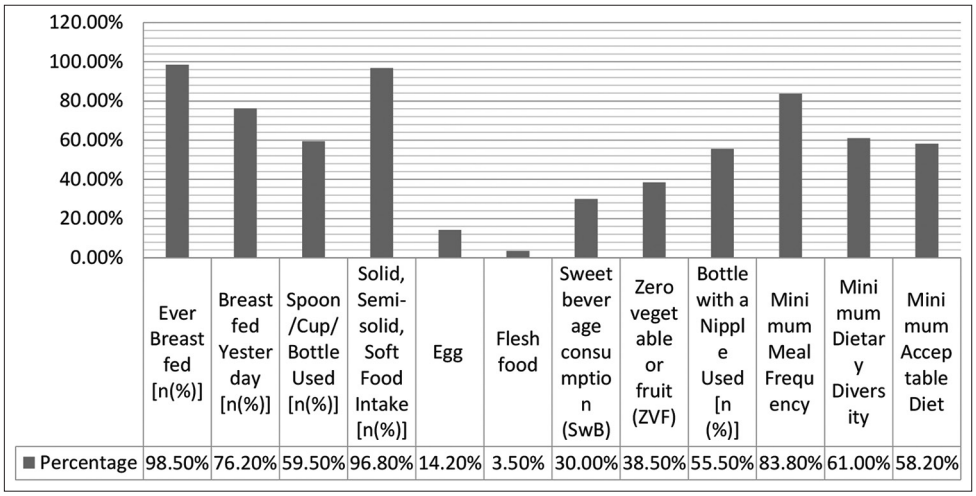

Figure 1: Complementary feeding practices

Table 2: Association of complementary feeding practices with maternal parameters

Parameters	Educated mother n (%)	Employed mother n (%)	Mothers access to media n (%)	Number of ANC visits n (%)		Socioeconomic status n (%)		
				<3	>3	Lower	Lower middle	Upper lower
TICF								
Present (n=358)	117 (32.7)	56 (15.6)	266 (74.3)	12 (3.4)	346 (96.6)	11 (3.1)	60 (16.8)	287 (80.2)
Absent (n=39)	8 (20.5)	1 (2.6)	22 (56.4)	2 (5.1)	37 (94.9)	5 (12.8)	2 (5.1)	32 (82.1)
	P=0.120	P=0.027	P=0.017	P=0.637			P=0.003	
MDD								
Present (n=244)	91 (37.3)	44 (18.0)	195 (79.9)	5 (2.0)	9 (5.8)	3 (1.2)	49 (20.1)	192 (78.7)
Absent (n=156)	35 (22.4)	13 (8.3)	95 (60.9)	239 (98.0)	147 (94.2)	13 (8.3)	13 (8.3)	130 (83.3)
	P=0.002	P=0.007	P<0.001	P=0.048			P<0.001	
MMF								
Present (n=335)	112 (33.4)	52 (15.5)	266 (79.1)	5 (1.5)	330 (98.5)	6 (1.8)	59 (17.6)	270 (80.6)
Absent (n=65)	14 (21.5)	5 (7.7)	25 (38.5)	9 (18.8)	56 (86.2)	10 (15.4)	3 (4.6)	52 (80.0)
	P=0.059	P=0.098	P<0.001	P<0.001			P<0.001	
MAD								
Present (n=233)	89 (38.2)	43 (18.5)	189 (81.1)	3 (1.3)	230 (98.7)	3 (1.3)	4.8 (20.6)	182 (78.1)
Absent (n=167)	37 (22.2)	14 (8.4)	101 (60.5)	11 (6.6)	156 (93.4)	13 (7.8)	14 (8.4)	140 (83.8)
	P<0.001	P=0.004	P<0.001	P=0.004			P<0.001	

TICF: Timely introduction of complementary feeding, MDD: Minimum dietary diversity, MMF: Minimum meal frequency, MAD: Minimum acceptable diet, NC: Antenatal check-ups, ANC: Antenatal check-ups

Table 3: Association of complementary feeding practices with nutritional status

Parameter	TICF n (%)	MDD n (%)	MMF n (%)	MAD n (%)	Vegetable/ fruit intake n (%)	Egg/Flesh intake n (%)	Bottle feed n (%)	Sweet beverage n (%)
Stunting (present)	53 (98.1)	17 (31.5)	35 (64.8)	17 (31.5)	18 (33.3)	2 (3.7)	29 (53.7)	9 (16.7)
Stunting (absent)	305 (88.9)	227 (65.6)	300 (86.7)	216 (62.4)	228 (65.9)	55 (15.9)	209 (60.4)	111 (32.1)
P value	0.034	<0.001	<0.001	<0.001	<0.001	0.017	0.351	0.022
Wasting (present)	48 (94.1)	12 (23.5)	31 (60.8)	12 (23.5)	11 (21.6)	4 (7.8)	28 (54.9)	7 (13.7)
Wasting (absent)	310 (89.6)	232 (66.5)	304 (87.1)	221 (63.3)	235 (67.3)	53 (15.2)	210 (60.2)	113 (32.4)
P-value	0.311	<0.001	<0.001	<0.001	<0.001	0.161	0.474	0.007

TICF: Timely introduction of complementary feeding, MDD: Minimum dietary diversity, MMF: Minimum meal frequency, MAD: Minimum acceptable diet

core and optional indicators in this set of recommendations consisting 17 indicators.

Role of exclusive breastfeeding in the first 6 months followed by adequate complementary feeding is well established and advocated but still a wide gap exists in the practices. The current study highlights the major gaps in feeding practices of an urban setting in North India using the WHO complementary feeding indicators. According to the National Family Health Survey-5 (NFHS-5) 2019–2021,

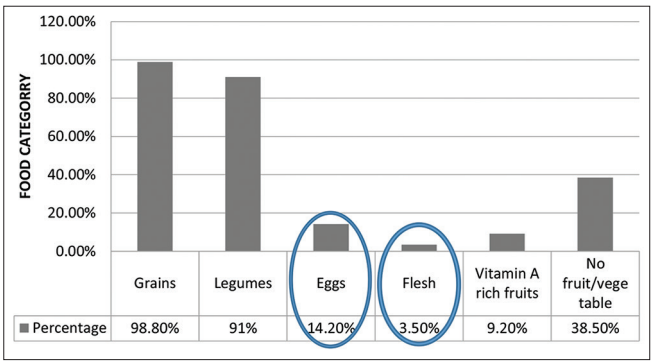

Figure 2: Food categories child eats

only 63.7% of children under age 6 months were exclusively breastfed, children aged 6–8 months who received solid or semisolid food and breastmilk was 45.9% and only 11.3% of total children age 6–23 months receive adequate diet.[16] In the current study, the complementary feeding practices are better than NFHS-5 data but still far from satisfactory. The MDD was 61%, MMF-83.8%, MAD-53.2%, egg consumption-14.2%, flesh consumption-3.5%, Vitamin A rich fruits-9.2%, and 38.5% did not receive any vegetable or fruit. These findings were comparable to the study from Central India conducted by Jain et al., where MDD was 57%, MMF was 86% and MAD was received by 58% of children.[17] The current study in Delhi and that conducted in Bhopal, both were single-center studies from Indian metro cities, study population being children attending immunization clinics, and therefore, their results cannot be generalized to rural population and peripheries.[17] Furthermore, Nguyen et al., in 2018, studied the progress and inequalities of IYCF practices in India from 2006 to 2016. They reported modest improvement in MDD (15–21%) but no change in adequate diet (~9%).[18]

Further associations were drawn first to determine underlying factors responsible for varying feeding practices and second whether these feeding practices have any significant association with child's nutritional status. The results demonstrated that maternal educational status, maternal employment, ANC>3, maternal access to media, and socioeconomic status were significantly associated with better feeding practices. Educated mothers provide their children better dietary diversity and meal frequency as compared to less educated/uneducated mothers. Furthermore, a significant difference was found in the nutritional status (wasting and stunting) of children who received MDD (P<0.01), MAD (P<0.01), and MMF (P<0.01). These results are in line with the secondary data analysis of NFHS 2005–2006 w done to estimate the prevalence of feeding practices using the WHO IYCF indicators and their determinants.[18] They suggested that mothers with more ANC visits and mothers who watched media (television) had higher rates of timely complementary feeding (odds ratio [OR]=0.57 and OR=0.75, respectively).[18] A study from Malawi has shown that mothers living in urban areas were more likely to provide MDD to their children. They also reported mothers who listened to radio were more likely to provide minimum meal frequency and the children who met minimum meal frequency and MAD were less likely to be underweight whereas no significant association was reported with stunting.[19] They reported a significant association between maternal characteristics from the five domains with indicators of optimal breastfeeding and complementary feeding.[19] Other studies have reported socioeconomic status inequalities mainly for MDD and iron-rich foods.[20] Such inequalities are determinants of maternal education status, access to information, nutrition, health services, antenatal care visits, birth spacing, etc., indirectly affecting the IYCF practices.[20]

Flesh, eggs, and fish are rich sources of protein, essential fatty acids, iron, vitamin D and B12, zinc, selenium, and phosphorus.[21,22] Evidence-based studies have demonstrated a strong association between their consumption and better linear growth, in children.[21,23] Therefore, the WHO has recommended daily consumption of poultry, meat, eggs, and fish.[4] The WHO has also advised against the use of sugar-sweetened beverages (SSB) and advocated high fruits and vegetable intake.[4] Studies have proved that high intake of sweetened beverages in early infancy leads to childhood obesity and low fruits and vegetables consumption led to increased risk of non-communicable diseases.[24-26] These modifiable dietary factors are strongly linked with increased morbidity not only in childhood period but also have its roots for adult disease. In this study, the consumption of eggs and flesh was very low (14.2% and 3.5%, respectively), also 38.5% of children did not consume any vegetable or fruit and 30% consumed SSB. Prevalent sociocultural beliefs and limited resources are some of the factors responsible for the lower intake of eggs and flesh whereas higher socioeconomic status and media exposure are responsible for SSB intake but detailed large population studies are required at various levels to determine the cause and to intervene or to suggest suitable alternatives.

The rate of bottle feeding was alarmingly higher in this study as compared to others (55.5% vs. 20%–30%).[27,28] Bottle-fed children have higher risk of ARIs, excessive weight gain, malocclusion, dental caries, etc.[29,30] Studies have shown high bottle-feeding rates in mothers with higher socioeconomic status, employment, urban population, etc.[31] Despite its detrimental effects and interference with breastfeeding, increase in bottle feeding rate reflects lack of awareness in community, pharmaceutical companies driven false perception of its benefit, lack of motivation in caregiver

and mothers, and wide counseling/communication gap at the level of health-care workers.

A clear message should be communicated clearly right from the antenatal period and continuous advocacy of IYCF feeding practices should be done during follow-ups in well-baby clinics, immunization center, and anganwadi. Mere provision of printed media without communication is not helpful. The use of IEC (information, education, and communication) media should be stepped up and trained personnel exclusively for infant and young child feeding should be appointed. They shall assess and teach the best infant and young child feeding practices as recommended by the WHO and can intervene timely. This will decrease childhood morbidity and mortality and will provide equal opportunities to all growing children.

Limitations of the study

Every research study has limitations, and it's important to acknowledge these limitations to provide a balanced and transparent view of the research. Here are some common limitations related with the study of design, recall bias, social desirability bias, as well as maternal determinants complexity. Information collected through self-reporting may not always reflect actual behaviors, especially when it comes to sensitive topics or practices.

CONCLUSION

The study concluded that malnutrition among children age 6–23 months in India are major public health challenges that require urgent action. Children should be fed with diverse food groups including iron-rich foods according to WHO complementary feeding guidelines. While further prospective research is needed to determine the effect of feeding practices on linear growth, interventions such as iron supplementation and nutritional education programs could help prevent and might reduce their prevalence of malnutrition among these children in India.

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