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Research Article

Feeding Practices and Their Correlation with Nutritional Status of Children Aged 6-24 Months in Rural Sagar, Madhya Pradesh: A Community-Based Cross-Sectional Study

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ABSTRACT
Background: Complementary feeding practices are a key modifiable determinant of undernutrition in children aged 6–24 months. Madhya Pradesh reports among the highest rates of minimum dietary diversity failure in India, yet rural, block-level correlational data from Sagar district are scarce.
Objectives: To assess complementary feeding practices and to determine their correlation with the nutritional status of children aged 6–24 months in rural Sagar.
Methods: A community-based cross-sectional study was conducted among 425 children aged 6–24 months in the rural field practice area of Sagar, using multistage random sampling. Complementary feeding practices were assessed using WHO/UNICEF (2021) IYCF indicators via a pre-tested questionnaire and 24-hour dietary recall; nutritional status was classified using WHO Child Growth Standards. Analysis was performed using SPSS v26, with chi-square test, odds ratio, and multivariate logistic regression.
Results: Minimum Dietary Diversity was met by 31.1% and Minimum Acceptable Diet by only 22.6% of children. Overall, 35.1% of children were stunted, 19.1% wasted, and 30.8% underweight. Inadequate dietary diversity (x^2=15.80, p<0.001; OR=2.61, 95% CI: 1.63–4.18), inadequate meal frequency (p<0.001; OR=2.28), and failure to achieve MAD (p<0.001; OR=4.09) were significantly associated with stunting. On multivariate analysis, MAD not achieved (AOR=2.92), inadequate MDD (AOR=2.14), maternal illiteracy (AOR=1.96), and lower socioeconomic status (AOR=1.71) independently predicted stunting.
Conclusion: A high burden of undernutrition coexists with poor complementary feeding practices in rural Sagar. Strengthening dietary diversity and meal frequency through Anganwadi/ASHA-led IYCF counselling under POSHAN 2.0 is warranted.

Keywords: Complementary Feeding, Minimum Dietary Diversity, Minimum Acceptable Diet, Stunting, Wasting, Nutritional Status, Rural Sagar, Madhya Pradesh.

INTRODUCTION

Adequate nutrition during infancy and early childhood is foundational to survival, growth, cognitive development, and long-term human capital. The World Health Organization (WHO) recommends exclusive breastfeeding for the first six months of life, followed by the timely introduction of nutritionally adequate, safe, and age-appropriate complementary foods while breastfeeding continues up to two years of age or beyond [1]. The period of 6–24 months represents a phase of rapid growth and disproportionately high nutrient requirement, coinciding with the window in which growth faltering and undernutrition most commonly begin.

Globally and within India, complementary feeding indicators remain markedly suboptimal. As per the National Family Health Survey (NFHS-5, 2019–21), only a minority of Indian children aged 6–23 months receive an adequate diet, and Madhya Pradesh figures among the states with the highest documented prevalence of minimum dietary diversity failure (85.1%) [2]. Undernutrition indicators stunting, wasting, and underweight also remain high in Madhya Pradesh despite modest improvement between NFHS-4 and NFHS-5 [2].

Rural and tribal-belt districts such as Sagar, where access to diverse foods, maternal literacy, and health-system contact are comparatively limited, continue to bear a disproportionate share of this burden. While national surveys provide state-level estimates, they inherently limit the ability to capture district-specific determinants and programme bottlenecks influencing feeding practices at the community level. Generating locally grounded evidence linking specific feeding behaviours to anthropometric outcomes can help Anganwadi

workers, ASHAs, and Medical Officers tailor Infant and Young Child Feeding (IYCF) counselling more precisely under ongoing POSHAN Abhiyaan/POSHAN 2.0 programming [3].

The present study was undertaken to assess complementary feeding practices among children aged 6–24 months and to determine their correlation with nutritional status in the rural field practice area of Sagar district, Madhya Pradesh, thereby generating evidence to strengthen community nutrition interventions in this setting.

MATERIAL AND METHODS

Study Design:

A community-based, cross-sectional, analytical study was conducted to assess complementary feeding practices and their correlation with the nutritional status of children aged 6–24 months, allowing capture of exposure (feeding practice) and outcome (nutritional status) variables at a single point in time.

Study Setting

The study was conducted in the rural field practice area of the Department of Community Medicine, Bundelkhand Medical College, Sagar, Madhya Pradesh.

Sample Size

The sample size was calculated using the standard formula for estimating a single population proportion:

$n = Z^2pq / e^2$

Where we considered: n = sample size, Z = 1.96 (at 95% confidence level), p = 50% (taken as the most conservative estimate, as no Sagar-specific prevalence of "appropriate complementary feeding practice" was available in published literature), q = (1−p), and e = margin of error, taken as 5%.

Substituting the values: $n = (1.96)^2 \times 0.5 \times 0.5 / (0.05)^2 = 384.16$, rounded to 385. Considering a 10% non-response/incomplete-record rate, the final sample size was adjusted to 425 children aged 6–24 months.

Sampling Method

A multistage random sampling strategy was adopted. Sub-centre areas under the field practice area were listed and selected; villages under the selected sub-centres were enumerated and chosen by simple random sampling; eligible mother–child pairs within selected villages/Anganwadi catchments were then enrolled by systematic random sampling until the calculated sample size was achieved.

Data Collection Tool and Procedure

The study included children aged 6 to 24 completed months who had resided in the study area for at least six months. Children with congenital anomalies, chronic systemic illness, or those currently under NRC/CMAM management for severe acute malnutrition were excluded, as were those whose caregivers were not available after two repeat visits or did not consent. Data were collected using a pre-tested, semi-structured, interviewer-administered questionnaire (Hindi), adapted from the WHO/UNICEF (2021) Indicators for Assessing Infant and Young Child Feeding Practices [4], and pilot-tested on 5% of the sample size outside the study area. Information collected included socio-demographic characteristics, a single 24-hour dietary recall for assessment of dietary diversity, meal frequency and minimum acceptable diet, and anthropometric measurements (weight and length/height) taken in duplicate by a standardised examiner.

Nutritional status was classified as stunted (length/height-for-age Z-score < −2SD), wasted (weight-for-height Z-score < −2SD), and underweight (weight-for-age Z-score < −2SD) against the WHO (2006) Child Growth Standards [5], computed using WHO Anthro software.

Data Analysis

Data were entered into Microsoft Excel and analysed using SPSS software version 26. Data were checked for missing variables and none were found. Continuous variables such as maternal age were converted into categorical variables for bivariate analysis. Association between complementary feeding indicators and nutritional status was tested using the chi-square test, with strength of association expressed as odds ratio (OR) with 95% confidence interval. Variables with $p < 0.20$ on bivariate analysis were entered into a multivariate binary logistic regression model to identify independent predictors of stunting. A two-tailed p-value < 0.05 was considered statistically significant.

RESULTS

A total of 425 children aged 6–24 months were included using a multistage random sampling technique. Table 1 shows the sociodemographic characteristics of the study population.

The age distribution showed that the largest proportion of children belonged to the 18–24 months group (36.0%), followed by 12–17 months (32.9%) and 6–11 months (31.1%). The sex distribution was fairly balanced, with a slight male predominance (52.0%). Nearly half of the mothers (41.0%) had education up to primary level or were illiterate, and over half of the households (50.6%) belonged to lower socioeconomic status (Modified B.G. Prasad classification).

Table 1: Sociodemographic Characteristics of Study Participants (n = 425)

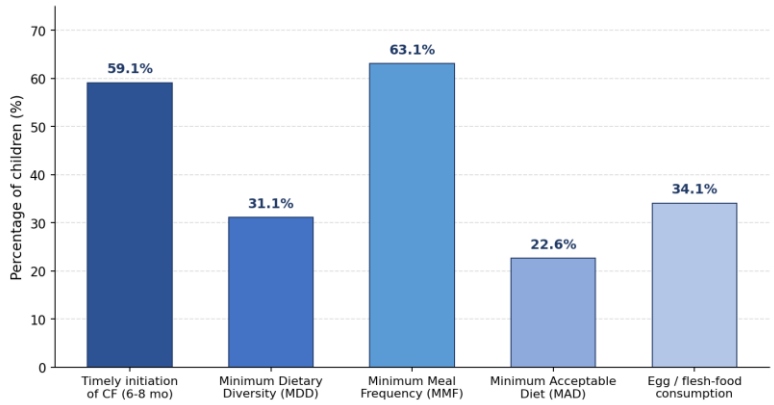
Variable	Category	n (%)
Age of child (months)	6–11	132 (31.1)
	12–17	140 (32.9)
	18–24	153 (36.0)
Sex of child	Male	221 (52.0)
	Female	204 (48.0)
Birth order	First	189 (44.5)
	Second	154 (36.2)
	Third or more	82 (19.3)
Maternal education	Illiterate	78 (18.4)
	Primary	96 (22.6)
	Middle	88 (20.7)
	High school	94 (22.1)
	Intermediate & above	69 (16.2)
Socioeconomic status (Modified B.G. Prasad)	Upper (Class I–II)	58 (13.6)
	Middle (Class III)	152 (35.8)
	Lower (Class IV–V)	215 (50.6)
Type of family	Nuclear	251 (59.1)
	Joint / extended	174 (40.9)

The distribution of complementary feeding practice indicators is presented in Table 2. Timely initiation of complementary feeding at 6–8 months was reported in 59.1% of children. However, only 31.1% of children met the Minimum Dietary Diversity (MDD) criterion, and just 22.6% achieved a Minimum Acceptable Diet (MAD), indicating substantial gaps in the quality of complementary feeding despite reasonably high Minimum Meal Frequency (MMF) coverage (63.1%). Egg and/or flesh-food consumption in the previous 24 hours was reported in only 34.1% of children.

Table 2: Complementary Feeding Practice Indicators (n = 425)

Complementary Feeding Indicator	n (%) meeting indicator
Timely initiation of complementary feeding (6–8 months)	251 (59.1)
Minimum Dietary Diversity (MDD, ≥5 of 8 food groups)	132 (31.1)
Minimum Meal Frequency (MMF)	268 (63.1)
Minimum Acceptable Diet (MAD)	96 (22.6)
Egg and/or flesh-food consumption (previous 24 h)	145 (34.1)

Figure 1: Distribution of Complementary Feeding Practice Indicators among Children Aged 6–24 Months



The nutritional status of the study children is shown in Table 3. Overall, 35.1% of children were stunted, 30.8% were underweight, and 19.1% were wasted; 49.4% had at least one form of undernutrition, reflecting a high overall burden comparable to district and state-level estimates for rural Madhya Pradesh.

Table 3: Nutritional Status of Study Children (n = 425)

Nutritional Status Indicator (WHO Z-score < −2SD)	**n (%)**
Stunting (length/height-for-age)	149 (35.1)
Wasting (weight-for-height)	81 (19.1)
Underweight (weight-for-age)	131 (30.8)
Any form of undernutrition (stunting/wasting/underweight)	**210 (49.4)**

The association between complementary feeding indicators and stunting was further analysed using the chi-square test and odds ratio with 95% confidence intervals, as shown in Table 4. Inadequate dietary diversity was significantly associated with stunting (χ^2=15.80, p<0.001), with children not meeting MDD having 2.61 times higher odds of stunting (OR=2.61; 95% CI: 1.63–4.18) compared to those meeting MDD. Similarly, inadequate meal frequency (χ^2=15.30, p<0.001; OR=2.28, 95% CI: 1.48–3.51) and failure to achieve Minimum Acceptable Diet (χ^2=22.40, p<0.001; OR=4.09, 95% CI: 2.20–7.60) were strongly associated with stunting. Late initiation of complementary feeding (after 8 months) was also significantly associated with stunting (χ^2=12.10, p<0.001; OR=2.06, 95% CI: 1.37–3.11).

Table 4: Association of Complementary Feeding Indicators with Stunting (n = 425)

Complementary Feeding Indicator	**Stunted n (%)**	**Not stunted n (%)**	**χ^2**	**p-value**	**Odds Ratio (95% CI)**
Inadequate dietary diversity (MDD not met)	121 (41.3)	172 (58.7)	15.80	<0.001*	2.61 (1.63–4.18)
Inadequate meal frequency (MMF not met)	74 (47.1)	83 (52.9)	15.30	<0.001*	2.28 (1.48–3.51)
Minimum Acceptable Diet not achieved	135 (41.0)	194 (59.0)	22.40	<0.001*	4.09 (2.20–7.60)
Late initiation of complementary feeding (>8 months)	78 (44.8)	96 (55.2)	12.10	<0.001*	2.06 (1.37–3.11)

**Statistically significant*

Multivariate logistic regression analysis demonstrated that failure to achieve Minimum Acceptable Diet, inadequate dietary diversity, inadequate meal frequency, maternal illiteracy, and lower socioeconomic status were independently associated with stunting after

adjusting for potential confounders (Table 4A). Among these, non-achievement of MAD showed the strongest association, with affected children having 2.92 times higher odds of stunting (AOR=2.92; 95% CI: 1.48–5.76; p=0.002), followed by inadequate dietary diversity (AOR=2.14; 95% CI: 1.24–3.69; p=0.006) and maternal illiteracy (AOR=1.96; 95% CI: 1.08–3.54; p=0.027).

Table 4A: Multivariate Logistic Regression Analysis for Independent Predictors of Stunting

Variable	Adjusted OR (AOR)	95% CI	p-value
Minimum Acceptable Diet not achieved	2.92	1.48–5.76	0.002*
Inadequate dietary diversity (MDD)	2.14	1.24–3.69	0.006*
Inadequate meal frequency (MMF)	1.78	1.04–3.05	0.035*
Maternal illiteracy	1.96	1.08–3.54	0.027*
Lower socioeconomic status	1.71	1.02–2.87	0.041*

**Statistically significant*

The association of sociodemographic factors with stunting is shown in Table 5. Children of mothers with education up to primary level had significantly higher stunting (45.4%) compared to those with mothers educated to middle school or above (27.7%) (χ^2=14.62, p<0.001). Stunting was also significantly higher among children from lower socioeconomic status households (42.8% vs 27.1%, p=0.001) and among those with birth order three or more (46.3% vs 32.4%, p=0.012). No significant association was observed with sex of the child (p=0.58).

Table 5: Association of Sociodemographic Factors with Stunting (n = 425)

Variable	Category	Stunted n (%)	Not stunted n (%)	χ^2	p
Maternal education	≤Primary	79 (45.4)	95 (54.6)	14.62	<0.001*
	≥Middle school	70 (27.7)	181 (72.3)		
Socioeconomic status	Lower (Class IV–V)	92 (42.8)	123 (57.2)	10.87	0.001*
	Middle/Upper (Class I–III)	57 (27.1)	153 (72.9)		
Birth order	Third or more	38 (46.3)	44 (53.7)	6.34	0.012*
	First / Second	111 (32.4)	232 (67.6)		
Sex of child	Male	80 (36.2)	141 (63.8)	0.31	0.58
	Female	69 (33.8)	135 (66.2)		

Among mothers of children with inadequate complementary feeding practices (n = 174), the most commonly reported reasons were lack of awareness about correct feeding age/frequency (28.2%) and influence of elders or traditional beliefs (24.1%), followed by misconceptions about certain foods causing illness (20.1%) and financial constraints (17.8%). Maternal work burden, perceived child food refusal, and lack of Anganwadi/ASHA counselling contact were also reported (Table 6).

Table 6: Reasons for Inadequate Complementary Feeding Practices Reported by Mothers

Reason reported by mother (n = 174 with inadequate practices)	Frequency (n)	Percentage (%)
Lack of awareness about correct feeding age/frequency	49	28.2
Influence of elders / traditional beliefs	42	24.1
Misconception that certain foods cause illness/indigestion	35	20.1
Financial constraints / limited access to diverse foods	31	17.8
Maternal work burden / limited time for feeding	28	16.1
Child's poor appetite / perceived food refusal	24	13.8
Lack of Anganwadi/ASHA counselling contact	19	10.9

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DISCUSSION

The present study assessed complementary feeding practices and their correlation with nutritional status among children aged 6–24 months in rural Sagar, Madhya Pradesh. The findings revealed substantial gaps in dietary diversity and minimum acceptable diet, coexisting with a high burden of stunting, wasting, and underweight, reflecting the persistent nutritional challenges documented for Madhya Pradesh at the state level.

In the present study, dietary diversity was met by only 31.1% of children, and Minimum Acceptable Diet by 22.6%, figures that are markedly higher than the national estimate of 11.3% for adequate diet reported by NFHS-5, but broadly consistent with the pronounced central/northern-belt disadvantage documented by Dhami et al. (2019), who reported that minimum dietary diversity was lowest in the Central region of India at only 12% [6]. Similarly, the low MDD achievement observed here is consistent with findings from an urban Raipur (Chhattisgarh) study, where minimum dietary diversity was achieved by only 4.1% of children, underscoring persistently poor complementary feeding quality across central India [7].

The prevalence of stunting (35.1%), wasting (19.1%), and underweight (30.8%) observed in the present study is comparable to NFHS-5 estimates for rural India (stunting 37.3%) [2] and to findings from a rural Lucknow study, which similarly documented a high co-occurrence of undernutrition indicators with inadequate feeding practices [8]. The relatively high multimorbidity of undernutrition (49.4% with at least one form) in the present study reinforces the shared-risk-factor pathway between poor complementary feeding and multiple anthropometric deficits.

The present study demonstrated a statistically significant association between inadequate dietary diversity and stunting, with affected children having 2.61 times higher odds of stunting. This finding is in agreement with Kumar et al. (2006), who reported that inappropriate infant-feeding practices were significantly associated with poorer nutritional status among under-five children in India [9]. Similarly, failure to achieve Minimum Acceptable Diet was the strongest correlate of stunting in the present study (OR=4.09), a finding consistent with Petrikova (2022), who demonstrated that inadequate complementary feeding is a major contributor to India's persistently high child malnutrition rates using NFHS-IV data [10].

On multivariate analysis, non-achievement of MAD, inadequate dietary diversity, maternal illiteracy, and lower socioeconomic status emerged as independent predictors of stunting, consistent with the broader literature identifying maternal education and household wealth as key modifiable and structural determinants of complementary feeding adequacy and, in turn, of child nutritional status [6,9]. The stronger association observed with MAD non-achievement in the present study highlights its role as a composite marker capturing both quantity and quality of the diet.

The present study further identified key barriers to appropriate complementary feeding, including lack of maternal awareness and the influence of traditional beliefs held by elder family members. Similar demand-side barriers low awareness, cultural food taboos, and limited health-system contact have been reported in comparable community-based Indian studies, reinforcing the need for targeted, family-inclusive IYCF behaviour-change counselling delivered through Anganwadi workers and ASHAs rather than counselling directed at mothers alone.

Overall, the findings of the present study are consistent with recent national and regional evidence and demonstrate that inadequate complementary feeding particularly poor dietary diversity and failure to achieve a minimum acceptable diet is strongly and independently associated with undernutrition among children aged 6–24 months in rural Sagar. This reinforces the need for intensified, locally tailored IYCF counselling under POSHAN 2.0 in this setting.

CONCLUSION

The present study demonstrates a high burden of undernutrition coexisting with substantial gaps in complementary feeding practices among children aged 6–24 months in rural Sagar. Inadequate dietary diversity, low meal frequency, and failure to achieve a minimum acceptable diet were independently associated with stunting. Strengthening dietary diversity and timely, quality complementary feeding through Anganwadi- and ASHA-led IYCF counselling, along with addressing maternal literacy and household food security, is essential to reduce the burden of childhood undernutrition in this region.

Study Limitations

- The cross-sectional design limits the ability to establish causal or temporal relationships between complementary feeding practices and nutritional status; only associations can be inferred.
- Dietary diversity and meal frequency were assessed using a single 24-hour recall, which may be subject to recall and social-desirability bias, partly mitigated through interviewer training and probing.
- The study was conducted in a specific rural field practice area of Sagar district, which may limit generalisability to other districts or urban populations with different sociodemographic profiles.

Consent

Written informed consent (in Hindi) was obtained from the mother/primary caregiver of each participating child prior to inclusion in the study. Participants were informed about the purpose, procedures, potential benefits, and their right to withdraw at any stage without any consequences. Confidentiality and anonymity of participant information were strictly maintained throughout the study.

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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