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Original Article

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Maternal knowledge on complementary feeding and dietary diversity among peri-urban area children of Gilgit Baltistan

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ABSTRACT

BACKGROUND AND OBJECTIVES: Undernutrition is a major global health challenge, with limited data available from Northern Pakistan regarding mothers' knowledge, attitudes, and feeding practices related to child nutritional status and dietary diversity. This study assessed mothers' understanding of complementary feeding and dietary diversity among children aged 6–23 months in the peri-urban region of Gilgit.

METHODOLOGY: A cross-sectional analytical study was conducted among 313 mothers/caregivers of children aged 6–23 months selected through multistage cluster sampling. Data were collected using a pretested, validated, closed-ended questionnaire administered in the Shina language by trained interviewers from January 2021 to January 2022, following ethical approval from the Research Ethics Committee, HITEC-IMS, NUMS. Associations were determined using the Chi-square test, while multivariable analysis examined relationships between independent and outcome variables. A p-value <0.05 was considered statistically significant.

RESULTS: The mean age of mothers was 23.25±3.49 years, while the mean age of children was 16.72±4.54 months. Among respondents, 171 (54.6%) mothers were aged 21–24 years, and 155 (49.5%) had primary-level education. Infants constituted 65 (20.8%) of the study population. Stunting was observed in 44 (14%) children. A significant association was found between minimum dietary diversity (MDD) and child growth (p≤0.001). Higher MDD was more frequently observed in smaller families, younger mothers, and mothers with higher educational levels.

CONCLUSION: Minimum dietary diversity was significantly associated with improved child growth. Maternal education and family characteristics play an important role in achieving adequate dietary diversity among children aged 6–23 months.

KEYWORDS: Assessment, Knowledge, Maternal, Nutrition.

INTRODUCTION

Childhood undernutrition remains a critical global challenge in low- and middle-income countries (LMIC), with over 145 million children affected by stunting each year, defined as having a 'height-for-age z-score (LAZ)' below -2.0 [1]. Nearly half of all deaths among children under five in 2019 occurred in just a handful of countries, specifically Nigeria, India, Pakistan, and the Democratic Republic of Congo, accounting for 49% of the total under-five mortality [2].

The critical implications of undernutrition for the well-being of young, developing children include stunting and the underweight rate, which increase steadily during the initial two years (from birth to 23 months) and then stabilize [3]. Poor nutrition is one of the most significant challenges to children's survival, growth, development, learning, and overall progression. Infants and young children are at risk of malnutrition, micronutrient deficiencies, morbidity, and mortality due to insufficient meals and non-varied diets [4]. Adequate complementary feeding practices are reported to prevent early deaths of children due to malnutrition [5].

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initial two years (from birth to 23 months) and then stabilize [3]. Poor nutrition is one of the most significant challenges to children's survival, growth, development, learning, and overall progression. Infants and young children are at risk of malnutrition, micronutrient deficiencies, morbidity, and mortality due to insufficient meals and non-varied diets [4]. Adequate complementary feeding practices are reported to prevent early deaths of children due to malnutrition [5].

The /'Minimum Dietary Diversity (MDD)'/ indicator assesses the micronutrient density of diets in children aged 6–23 months [6]. It was developed as part of a broader set of 'IYCF indicators (Infant and Young Child Feeding indicators)' to compare feeding practices across locations and time, identify high-need populations, prioritize interventions, and monitor and evaluate progress. MDD is used in policy and research, including the WHO Global Nutrition Monitoring Framework . Initially, 'MDD' was met if a child consumed a minimum of four out of seven food groups. In 2017, this threshold was revised to 5 out of 8 food groups. However, children with 'MDD' can have varied diets, as the food groups consumed may differ [6,7]. Similarly, regions with similar rates of 'MDD' may exhibit distinct dietary patterns in terms of food diversity.

In Pakistan, stunting Persists as a critical challenge deeply linked to inadequate interventions, low maternal education, limited human capital investment, and a decline in stunting rates. The 2018–2019 Multiple Indicator Cluster Surveys (MICS) reported high stunting rates in Sindh (42%) and Baluchistan (49.6%), whereas Punjab, the wealthiest province, had a lower rate of 31.5% [8]. There is a paucity of data in northern Pakistan on mothers' knowledge/, attitudes, and feeding practices related to child nutritional status and food diversity. The study assessed maternal knowledge of complementary feeding and dietary diversity, and their relationship with adequate diet in children under 2 years (6-23 months old) in the peri-urban area of Gilgit.

METHODOLOGY

The analytical cross-sectional study included 313 mothers and caregivers of children aged 6–23 months, from the peri-urban area of Jaglot tehsil, one of the subdivisions (the second administrative level after district) of Gilgit-Baltistan (the administrative capital). The three divisions of Gilgit Baltistan are Gilgit, Baltistan, and Diamer/Astore. Each of these districts has its local administration but falls under the larger governance structure of the Gilgit Division. The administration of the Gilgit District is further subdivided into tehsils. The survey received ethical clearance from the Research Ethics Committee HITEC-IMS via letter number ERC-19-06. Data collection was carried out after participants had provided individual consent. The duration of the study was from January 2021 to January 2022.

The study used a multistage sampling technique to select union councils, villages and households in the peri-urban area of Gilgit, one of the Tehsils/subdivisions. Jaglot is predominantly rural and is divided into union councils, each comprising several villages. The sample size was determined using an estimated minimum dietary diversity (MDD) prevalence of 26.7% among children in the Gilgit-Baltistan region (MICS Overall Indicators Gilgit-Baltistan) [9]. The margin of error is 5% (D), and the confidence interval is 95 %, for which Z=1.96, inputting the variables in the formula below.

$N = Z^2 \times P(1-P))/D^2$

The calculated sample size was 292. However, 313 participants were enrolled, with an additional 14% included to compensate for non-responses, dropouts, and incomplete questionnaires. The questionnaire was piloted with 35 respondents to collect information on mothers' knowledge of dietary diversity and minimum meal frequency, and on children's measurements. The children's weights were taken with a digital infant weighing scale. Weighing was performed with minimal or no clothing, and the weight was recorded to the nearest 0.1 kg. Their recumbent lengths were taken using an infantometer. Length/height measurements were taken and recorded to the nearest 0.1 cm.

The height-for-age, or stunting, serves as a measure of both "growth delay and accumulated growth shortfalls" in children. According to a 2007 World Health Organization report, the height-for-age Z-score (HAZ) quantifies a child's height in standard deviations (SD) above or below the median height of healthy children in the same age group or reference category [10]. This research focused on children with a height-for-age Z-score below -2 standard deviations (−2 SD) as stunted, while those with a Z-score below -3 standard deviations (−3 SD) are classified as severely stunted.

The target population consisted of mothers and caregivers with children aged 6-23 months. When more than one eligible child was in a single domestic setup, selection was conducted via a lottery to determine which child would participate in the study. An eligible child and their mother were all present at the data collection point for inclusion.

The study employed a multi-stage sampling technique to select communities and households. By lottery, the tehsil was randomly selected from the 23 tehsils/talukas of Gilgit-Baltistan. Then, our study randomly selected 12 villages from a list of three union Councils using computer-generated numbers: Jaglot, Chakarkote, and Damote. In the selected villages, every 3rd house was included in the study; in case of no response or no children under 2 years (between the ages of 6 and 23 months) present in the household, the next house was selected with the desired study population, including mothers/caregivers with children in the age bracket of the study's protocol.

The requirements for inclusion were that children should be between 6 and 23 months old, receiving complementary feeding, and free from serious illness. Caregivers and their children must have resided in the village for the past two years and have no plans to relocate in the coming year. A total of twenty-one children did not fulfil the inclusion criteria. Ultimately, households that completed all the questionnaires were chosen. The head of the household and the child's mother or caregiver were interviewed in each household. More than one child aged 6 to 23 months was

found in the same household, and the interviews focused on the youngest child. We excluded children over 2 years old and twins, as their nutritional status is known to differ from that of singletons.

Two trained interviewers conducted face-to-face interviews in the Shina language to collect representative data on socio-demographic characteristics, nutritional status, past illnesses, and health.

A structured questionnaire on /'IYCF' practices based on previous studies and WHO recommendations to assess dietary diversity by considering the local situation was used to gather data about /'MDD' from mothers with children between 6 months and 2 years of age (between 6 and 23 months). The information collected included IYCF practices and socioeconomic characteristics. The questionnaire, which was in English, was translated into Urdu by a local senior schoolteacher (who was well-versed in both languages) of an army public school in Bunjee, Gilgit-Baltistan. It was then translated back into English. An exclusive questionnaire review was conducted to assess for inconsistencies. The WHO IYCF indicators questionnaire was translated into the Shina language and pretested with five local mothers before use. This was done to improve the language, technical content, and the interview's length.

The participants (mothers) were asked to provide consent. Those who agreed to participate voluntarily underwent the consent process. Oral/verbal informed consent was obtained from those who could not read or write in Urdu, and written informed consent was obtained from those who could read and write in Urdu. The questionnaire was completed within 10–20 minutes.

The study variables were maternal knowledge and the practice of minimum dietary diversity provision, assessment of dietary intake, whereas the social determinants were the age of the mother, educational level, and family size. The chi-square test and multi-variable analysis were performed using IBM SPSS Version 26 to examine the relationship between the independent variables and the outcome variable.

RESULTS

Data was collected from 313 mothers with infants/young children aged 6-23 months. The mean age of mothers was 23.25± 3.49 years. The mean age of the children was 16.72±4.54 months. Among the total, 171 (54.6%) respondents were 21 - 24 years old, and 155 (49.5%) had primary-level education. Most of them, 137(43.6%), had a family size of six or more members. Nearly one-fifth of children, 65 (20.8%), were infants. Details are mentioned in Table-I.

128(40.9%) participants reported exclusively breastfeeding under 6 months. Most participants (n=250, 79.9%) reported feeding the child semi-solids or solids twice in the last 24 hours. All 313(100%) participants thought it was recommended to breastfeed the baby until 12-23 months.

Mothers were interviewed to assess their knowledge of complementary feeding for children. About 217 (69.3%) mothers had good knowledge of complementary feeding for children. All participants were aware of the importance of providing 'diversified foods' to children aged under 2 years (6–23 months). Everyone agreed that complementary feeding should begin at 6 months of age. Almost all (n=312, 99.7%) knew that a child over 6 months should eat four or more food groups (Table-II).

Table-I: Socio-demographic characteristics of study participants (n=313).

Variables	Personal Information Socio-demographic profile	Frequency n (%)
Age of Child	Up to 12 months 13 months - 18 months Above 18 months	65 (20.8) 112 (35.80) 136 (43.5)
Sex of Child	Male Female	125(39.9) 188(60.1)
Family Size	3 4 5 6 and above	58(18.5) 82(26.2) 35(11.2) 138(44.1)
Mother's age in years	Less than 20 21-24 25-29 30 and above	59(18.8) 171(54.6) 62(19.8) 21(6.7)
Mother's Education	No formal education Primary Secondary College and above	5(1.6) 155(49.5) 133(42.5) 20(6.4)

Table-II: Maternal knowledge about dietary diversity and child feeding (n=313).

Variables	Categories	n(%)
Heard about the importance of feeding diversified foods to a /'6–to 23-month-old child'	Yes No	313(100) 0(0)
Complementary feeding should start at 6 months of the child's age	Yes No	313(100) 0(0)
A /'6 –23-month' child should eat at least five or more food groups	Yes No	312(99.7) 1(0.3)
Meat consumption' is advisable for a child under '2 years (/6-23 months)".	Yes No	277(88.5) 36(11.5)
The cause of malnutrition is not having diversified foods	Yes No	277(88.5) 36(11.5)
Not feeling hungry does not mean that a child's nutritional needs are fulfilled.	Yes No	217(69.3) 96(30.7)
Malnutrition results from not starting complementary feeding at 6 months of age.	Yes No	217(69.3) 96(30.7)
Feeding only animal products is not enough/ adequate for 6–23 months child	Yes No	215(68.7) 98(31.3)
A*child under 2 years (6- 23 months) should feed liver and kidney types of organ meat.	Yes No	175(55.9) 138(44.1)
A child under 2 years (*6- 23 months) should be fed an egg*	Yes No	217(69.3) 96(30.7)

In this study, 49.9% of the children aged 6–23 months had fed on four or more food groups, meeting the minimum requirement of a diversified diet. Minimum dietary diversity is more frequently observed in smaller family sizes, mothers ages less than 20, and mothers with higher educational levels. A statistically significant correlation was identified between minimum dietary diversity and factors such as family size, the age of the mother, the mother's level of education, and her knowledge regarding child nutrition (Table-III).

Table-III: Relationship between sociodemographic characteristics and minimum dietary diversity (n=313).

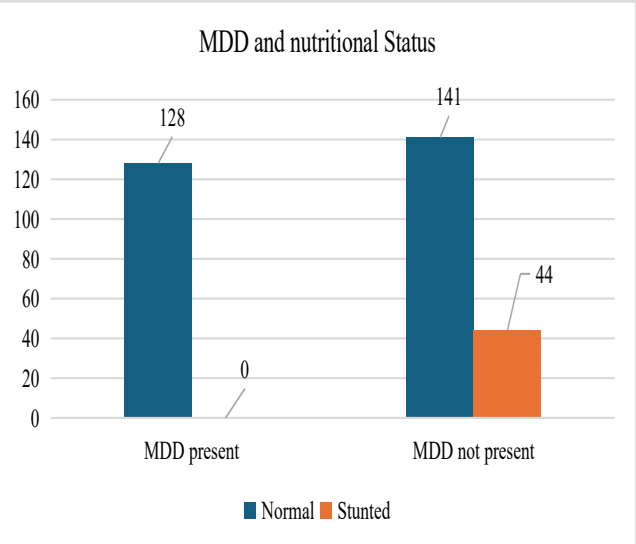
Variables	Categories	Minimum Dietary Diversity			P-value
		Yes n (%)	No n (%)	Total	
Age of child (Months)	0-12 13 - 18 Above 1	30(46.1) 38(33.9) 60(44.1)	35(53.8) 74(66.1) 76(55.9)	65 112 136	0.17
Sex of Child	Male Female	54(43.2) 74(39.4)	71(56.8) 114(60.6)	125 188	0.50
Family Size	3 4 5 6 and above	56(96.6) 60(73.2) 12(34.3) 0(0)	2(3.4) 22(26.8) 23(65.7) 138(100)	8 82 35 138	≤0.001
Mother's age in years	Less than 20 21-24 25-29 30 and above	33(55.9) 74(43.3) 18(29) 3(14.3)	26(44.1) 97(56.7) 44(71) 18(85.7)	59 171 62 21	0.001
Mother's Education	Up to Primary Secondary College and above	25(16.1) 83(62.4) 20(100)	135(83.9) 50(37.6) 0(0)	160 133 20	≤0.001
Maternal knowledge'/ about child feeding	Good Poor	108(49.8) 20(20.8)	109(50.2) 76(79.2)	217 96	≤0.001

The logistic regression analysis shows that the family size ($p < 0.001$) and maternal knowledge about child feeding ($p = 0.001$) significantly increase the odds of the outcome, which is /'Minimum Dietary Diversity'. In contrast, higher maternal education ($p < 0.001$) substantially decreases it. The mother's age is not a significant predictor ($p = 0.193$). The constant is highly significant, indicating a very low likelihood of the outcome occurring in the absence of these factors. The confidence intervals suggest strong associations, especially for family size and maternal knowledge Table-IV.

Table-IV: Multivariate analysis.

Variables	*β*	*S.E*	*Wald*	*Sig*	*Exp(β)*	*95% C.I for *EXP(B)*	
						Lower	Upper
Family size	2.34	0.289	65.431	0.000	10.393	5.894	18.327
Mother's age	0.418	0.321	1.698	0.193	1.518	0.810	2.846
Maternal knowledge about child feeding	1.919	0.575	11.131	0.001	6.815	2.207	21.043
Mother's education	-2.002	0.454	19.445	0.000	0.135	0.055	0.329
Constant	-6.088	1.393	19.091	0.000	0.002	0.001	0.034

Figure-I: Relationship of MDD and nutritional status of child.



Of the 313 children, 44 (14%) had stunted growth, while the rest had a normal nutritional status. Findings revealed a significant association between /'MDD' and child growth (p-value ≤ 0.001), as shown in Figure-I.

DISCUSSION

Undernutrition remains a global challenge, with mortality of more than 35% in children under five years of age [11]. Adequate complementary feeding practices are reported to prevent early deaths of children from malnutrition. A lack of dietary diversity can increase the risk of micronutrient deficiencies, potentially harming a child's physical and mental development . Improving 'MDD'/practices is crucial for tackling childhood malnutrition and promoting better complementary feeding. The study determined the magnitude of 'MDD'/ and its determinants among young infant-mother/caregiver pairs in the peri-urban and rural settings of Gilgit [12,13].

In this study, 49.9% of children aged 6–23 months met the minimum requirement for a diversified diet. This indicates that the problem remains a nutritional concern that requires

due attention for future comprehensive dietary strategies. Cultural norms can influence feeding practices and dietary diversity [14]. Various studies conducted around the globe have uncovered different results. Another study indicates that 78% of Malaysian children between the ages of 6 and 23 months consumed meals from four or more food groups the previous day [15]. In South Africa, the prevalence of minimal dietary diversity was 43.9% . 'MDD'/ was 48.5% in the remote mid-Himalayan region of Sudurpaschim, Nepal [16].

According to a study in Noakhali, Bangladesh, 61% of children aged 6 to 23 months had a minimum dietary diversity [16]. According to a survey conducted in India, children aged 6–23 months had a very low prevalence of 'MDD', with a rate of 25% [6]. Another cross-sectional study conducted in Gujranwala, Pakistan, found that 34% of the children met the minimum dietary diversity criteria [17].

This study found that 96.6% of children in three-person families had MDD, indicating that minimum dietary diversity is more common in smaller families. MDD and family size were significantly associated in our study. Different research in Ethiopia's Chelia District revealed a strong association between smaller family size and greater nutritional diversity among children ages 6 to 23 months. Children from families with fewer than four members were expected to meet the minimal dietary diversity criteria in comparison to children with family size six or more (AOR=5.58, 95%CI, 1.73-17.91) [18].

Additionally, the analysis highlighted a statistically significant association between minimum dietary diversity and the mother's age. In the maternal age group of less than 20 years, 55.9% of children met the criteria for 'MDD'./ A study in Lebanon reported that younger maternal age (15-24 years) was associated with higher odds of meeting 'MDD' [19].

A mother's education significantly impacts the minimum dietary diversity of a child. All (100%) of the children of mothers who had studied at the college level or above had 'MDD'[20]. Sekartaji et al. found that a mother who graduated from university [AOR = 5.16; 95% CI = 2.07–12.89] was significantly related to 'MDD' in 6-23-month-old children in Indonesia [19].

A good 'MDD' index in infants and young children may result from maternal knowledge about child nutrition. According to the current study, 69.3% of mothers were well informed about supplementary feeding for children. Almost half (49.8%) of children whose mothers had good knowledge about child feeding practices met the criteria for 'MDD', whereas this percentage was only 20% in children of mothers who did not have adequate knowledge. In Ghana, 64.8% of children born to moms who knew a lot about childcare fulfilled the 'MDD' requirements [21]. Various study settings could explain this discrepancy.

The findings of the current study revealed that 23.8% of children who did not have adequate 'MDD' were stunted. The results of another study conducted by Jayakumar et al. show that stunting has been associated with the lack of 'MDD' [21].

This research had some limitations. Because this is a cross-sectional study, it is not possible to establish a causal relationship. Moreover, mothers' recall bias may have affected the study's findings. In this study, nearly half (49.9%) of children aged 6–23 months failed to meet the minimum dietary diversity standards, a critical gap with documented consequences for neurodevelopment, immune function, and long-term health trajectories. This finding underscores the urgency of moving beyond awareness campaigns to target the structural barriers, including cultural feeding norms, economic constraints, food system access, and caregiver knowledge gaps, that perpetuate dietary inadequacy in this high-risk age group. Effective interventions must be culturally grounded and address these root drivers to achieve meaningful improvements in dietary diversity.

CONCLUSION

This study indicates that the consumption of minimum dietary diversity is lower than suggested in the peri-urban region of Jaglot. Additionally, factors such as family size, maternal age, education level, and awareness of complementary feeding were significantly correlated with the 'MDD' (minimum dietary diversity). Findings also indicated that the risk of stunting in children increases when dietary diversity is insufficient. This health issue can be solved by raising community awareness of food diversity.

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Authors Contributions:

Hina Shan: Substantial contributions to the conception and design of the work.
Sadia Maqbool: The acquisition and analysis of data for the work.
Ali Kashif : Interpretation of data for the work.
Nasir Javed : Drafting the work.
Muhammad Danyal : Reviewing it critically for important intellectual content
Eman Fatima Sahir : Final approval of the version to be published.

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