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Dietary Diversity and its Associated Factors among Children Aged 6-59 Months in Madhyapur Thimi Municipality, Nepal

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ABSTRACT

Background: Minimum dietary diversity for children (MDD-C) is a benchmark developed by the World Health Organization (WHO) to assess diet diversity in infants and young children worldwide. The lack of such diet diversity among growing children, which often leads to malnutrition, has been considered a significant public health concern in Nepal. This study aims to assess the dietary diversity and associated factors among children aged 6-59 months in wards 2 and 3 of Madhyapur Thimi Municipality.

Methods: A cross-sectional study was carried out by measuring the research variables among the residents of wards number 2 (Jatigaal) and 3 (Kaushaltar) of Madhyapur Thimi Municipality. The survey was created and administered by the researchers themselves. The sample size of the study was 385. The survey included a structured questionnaire to assess dietary diversity and associated factors among children aged 6-59 months. The association between the factors was measured by using Fisher's Exact test

Results: 73.5% of the study population fulfilled the minimum requirement of dietary diversity. Factors such as the mother's educational status (p=0.002), mother's ethnicity (p=0.015), monthly expenditure on food (p=0.001), awareness of communicable diseases (p=0.001), feeding times a day (p=0.001), basic hygiene practices status (p=0.004), and awareness of ultra-processed food (p=0.001) showed a significant association with minimum dietary diversity for children.

Conclusion: Increasing mothers' awareness about ultra-processed food, communicable diseases, and the importance of their basic hygiene practices via formal or informal education campaigns is necessary to increase the proportion of children meeting the MDD-C benchmark and prevent malnutrition.

Keywords: Children, minimum dietary diversity, Nepal

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BACKGROUND

Dietary diversity is a method of including a balanced and healthy diet. WHO has defined minimum dietary diversity for children (MDD-C) as the consumption of four or more food groups out of the seven food groups, which include grains, roots, and tubers (Group A), legumes and nuts (Group B), dairy products (Group C), flesh foods like meat (Group D), eggs (Group E), Vitamin A-rich fruits and vegetables (Group F), and other fruits and vegetables (Group G).(1) Breastfeeding has been recently added to these food groups, but our study was in progress before the addition. Lack of dietary diversity results in malnutrition, leading to long-term impairments in children's physical and mental development (2,3), and is also associated with children's behavioral problems.(4)

Despite the importance of MDD-C, not all children can meet this minimum requirement. A cross-sectional national-level study shows that only 49% of children aged 6 to 59 meet

MDD-C in Nepal.(5) Providing multiple food options may not always be feasible for various reasons; therefore, understanding the secondary factors associated with diet diversity can help mitigate this issue. A study in Madagascar concluded that socioeconomic status and maternal education are highly associated with diet diversity among infants and young children aged 6 to 59 months.(6) Identifying the association between MDD-C and various other factors can help concerned authorities in Nepal to take necessary steps to promote dietary diversity and reduce malnutrition. A careful study of diet diversity among children of this age group and the associated factors is lacking in Nepal.

In this study, we explore the diet diversity among children and the socioeconomic factors associated with it in Madhyapur Thimi Municipality.

METHODS

This was a cross-sectional study conducted between May 2023 to July 2023. Data was collected from the residents of wards 2 (Jatigaal) and 3 (Kaushaltar) of Madhyapur Thimi Municipality. The researcher created a survey based on WHO's minimum dietary diversity for children (MDD-C) benchmark.(1) Madhyapur Thimi is considered a 'bulwark' between one of the three most developed districts (Kathmandu, Lalitpur, and Bhaktapur) of Nepal.(7) There are a total of 9 wards in this municipality.(8) According to the Census 2021, Madhyapur Thimi has a population of 119,756, a population density of 10,777/km^2, and 7243 young children aged 6 to 59 months.(9)

Survey and study variables

The survey questionnaire was classified into four sections: socio-demographic characteristics, awareness and status of communicable diseases, feeding practices, and dietary diversity. The socio-demographic section collected characteristics such as the gender of the child, the age of the child, the mother's ethnicity, the mother's educational status, and the family's monthly expenditure on food.

The second section measured mothers' awareness of communicable diseases by assessing the respondents' knowledge about names, causes, and preventative measures of some common communicable diseases like dysentery and the common cold. The section also asked for information on whether their child was suffering from any communicable disease at the time of the survey. The third section consisted of general feeding practices such as daily feeding times, washing foods before cooking and eating, basic hygiene practices, awareness of ultra-processed foods, and consumption status of ultra-processed foods. Basic hygiene practices were evaluated through respondents' self-reported adherence to direct questions concerning routine practices such as handwashing before meals, regular bathing, and daily tooth brushing. If they responded yes to all three, we classified them as following basic hygiene practices. Awareness of ultra-processed foods was based on the responder's ability to explain and identify ultra-processed foods such as potato chips. Specifically, respondents were asked about their idea of ultra-processed food and to provide at least one example of ultra-processed food (e.g., packaged snacks, instant noodles, or sugary beverages). If their idea and example matched the common ultra-processed foods found in Nepal, they were classified as aware, and not aware if not. Finally, the last part of the questionnaire was based on food groups per WHO's recommendations regarding the consumption of different food groups.

Sampling method

Data was collected by administering the survey by the researchers themselves in 2023. The sampling unit was guardians/mothers of children aged 6 to 59 months, and residential homes were the primary study area for data collection. The sample size(n) was obtained to be 385 by using the formula: $n = (Z^2 * p * (1 - p)) / (a^2)$, where Z= 1.96 (Z-score at a confidence interval of 95%), p= 0.49 (from a study conducted on factors associated with micronutrient deficiencies in Nepal) (2), and a = significance level = 0.05. Data collection was stopped once 385 responses were obtained.

Stratified random sampling was used during data collection. First, the required total sample size of 385 was divided into two sample stratum sizes, one for each of the two wards, and then residential homes were randomly selected for data collection. The total population of both wards, the population of each ward, and the total sample size were used to calculate the sample stratum size for each ward using the formula sample stratum size = (total sample size/ total population) x population of one ward. The sample stratum sizes were obtained to be 134 and 251 (Total: 385) for wards number 2 and 3, respectively.

Participation was voluntary, and the liberty to resign from the study at any time or skip any question was guaranteed. An average of 20 minutes was required for one participant to complete the survey. Information from children with any physical disability, neurologic disorders, or illness that prevents ingestion of a regular diet was excluded.

The data collected in paper from the field was entered into the Statistical Package for Social Sciences (SPSS). The raw data was scrutinized for duplicate and missing data. The data was analyzed using descriptive statistics such as mean, percentage, frequency, and standard deviation for diet diversity. Fisher's exact test with a significance level of 0.05 measured the association between independent variables and MDD-C.

Ethical approval

The ethical approval for the study was obtained from the Institutional Review Committee (IRC) of Nobel College, Nepal. Additional permission was also obtained from the respective wards before the research. To receive the participant's consent at the data collection stage, the researchers first introduced themselves and explained the study's objective. The mothers/guardians were then told that participation was voluntary and they could decline or withdraw without consequence. Once their verbal agreement was received, a signature or tick mark (from people who could not sign) was collected. During data collection, privacy, and sentiments of the respondents were respected. After the data collection, data was securely stored and transferred to SPSS upholding the respondents' confidentiality and anonymity.

RESULTS

The mean ages of mothers and children in years were 30.03 and 3.49, respectively. Most mothers were homemakers (44.7%) by occupation with formal education up to high school (30.6%). 48.8% of respondents had a monthly income of more than Rs.50,000, and 53.5% of respondents spent more than Rs.20,000 on food monthly. Further, 96.1% of the respondents were Hindu, and the leading ethnic group was Brahmins (35.3). Most of the respondents had joint families (50.1%). The mean family size of the respondents was 5.31 (Table 1). 80.8% of children were unaffected by any communicable disease during the study (Table 2). Most mothers fed their children more than 3 times a day. The majority of the mothers washed food before cooking and practiced basic hygiene practices. Similarly, 78.4% of respondents were aware of ultra-processed foods. Out of 75 breastfeeding mothers, 56 breastfed their kids more than three times a day (Table 3).

The study found that at least 83% of the respondents consumed foods of Group A (100%), Group B (83.6%), and Group C (90.1%). However, no more than 66% of the respondents consumed food belonging to Group D (36.6%), Group F (44.2%), and Group G (66%). Notably, only 26.5% of respondents consumed Group E foods such as chicken, mutton, buffalo, etc. Overall, 73.5% of the respondents achieved the minimum dietary diversity (MDD) requirement by consuming at least one item from four of the seven food groups (Table 4).

Table 1. Distribution of socio-demographic characteristics of the study population(n=385)

Variables	Category	Frequency	Percentage (%)
Mother's Age	20-24	14	3.6
(In completed years)	25-29	178	46.2
	30-34	146	37.9
	35-39	43	11.2
Child's Age	1.0-1.9	75	19.5
(In completed years)	2.0-2.9	51	13.2
	3.0-3.9	75	19.5
	4.0-4.9	107	27.8
	5.0-5.9	77	20
Educational Status of Mother	Uneducated	6	1.6
	Informal Education	2	0.5
	Up to Grade 8	3	0.8
	SLC/SEE	88	22.9
	High School	118	30.6
	Bachelors	103	26.8
	Masters and above	65	16.9
Mother's Occupation	Agriculture	11	2.9
	Service	119	30.9
	Labor	5	1.3
	Business	76	19.7
	Housewife	172	44.7
Family's Monthly Income (In NPR)	Less than 15000	4	1.0
	15000 to 30000	61	15.8
	31000 to 49000	132	34.3
	Above 50000	188	48.8
Mother's Religion	Hinduism	370	96.1
	Buddhism	8	2.1
	Christianity	7	1.8
Mother's Ethnicity	Brahmin	136	35.3
	Janajati	114	29.6
	Madhesi	18	4.7
	Chhetri	117	30.4
Monthly Expenditure on Food (In NPR)	Less than 10000	2	0.5
	10000 to 20000	169	43.9
	More than 20000	206	53.5
	Not aware	8	2.1
Family Type	Nuclear	156	40.5
	Joint	193	50.1
	Extended	36	9.4
Family Size (In Numbers)	1-4	156	40.5
	5-8	209	54.3
	9-12	19	4.9
	13-16	1	0.3

Table 2. Awareness of communicable diseases in mothers and status of communicable diseases in children (n=385).

Variables	Category	Frequency	Percentage (%)
Awareness of Communicable Diseases	Aware	256	66.5
	Not Aware	129	33.5
Status of Communicable Diseases	No	311	80.8
	Yes	74	19.2

Among socio-demographic factors such as the child's gender, child's age, mother's age, mother's occupation, monthly income of the family, mother's religion, family type, family size, mother's educational status, mother's ethnicity, and monthly expenditure explored in this study, the Fisher's exact test indicated that only mother's educational status (p= 0.002), mother's ethnicity (p=0.015), and monthly expenditure on food (p = 0.001) were associated with MDD at the significance level of 0.05 (Table 5). General awareness of communicable diseases among mothers was also significantly associated with MDD (p=0.001) (Table 6). Other factors such as feeding times a day (p=0.001), basic hygiene practices status (p=0.004), and awareness about ultra-processed foods (p=0.001) were significantly associated with MDD at 0.05 level (Table 7). Further, the association between cleaning foods before cooking and dietary diversity status was not significant at the 0.05 level.

Table 3. Feeding practices (n=385)

Variables	Category	Frequency	Percentage (%)
Washing Foods Before Cooking and Eating	Yes	375	97.4
	No	10	2.6
Basic Hygiene Practices	Yes	375	97.4
	No	10	2.6
Awareness of Ultra-processed Foods	Aware	302	78.4
	Not Aware	83	21.6
Ultra-processed Foods Consumption Status	Yes	305	79.2
	No	80	20.8
Extended Breastfeeding Status(n=75)	Yes	75	100
	No	0	0
Times of Breastfeeding per day(n=75)	Once a day	0	0
	Twice a day	0	0
	Thrice a day	19	25.4
	More than 3 times a day	56	74.6

Table 4. Dietary diversity 24 hours recall (n=385)

Variables	Category	Frequency	Percentage (%)
Group A Consumption Status: Grains, Roots, Tubers	Yes	385	100
	No	0	
Group B Consumption Status: Nuts and Legumes	Yes	322	83.6
	No	63	16.4
Group C Consumption Status: Milk and Milk Products	Yes	347	90.1
	No	38	9.9
Group D Consumption Status: Eggs	Yes	141	36.6
	No	244	63.4
Group E Consumption Status: Meat Products	Yes	102	26.5
	No	283	73.5
Group F Consumption Status: Vitamin A Rich Foods	Yes	170	44.2
	No	215	55.8
Group G Other Fruits and Vegetables	Yes	254	66
	No	131	34
Minimum Dietary Diversity Status	Yes	283	73.5
	No	102	26.5

DISCUSSION

The study's main objective was to assess dietary diversity and associated factors among children aged 6-59 months. We found that more than 25% of children aged 6-59 months were deprived of minimum diet diversity and have a high likelihood of developing malnutrition-related issues. We also found that factors like awareness of ultra-processed foods, awareness of communicable diseases, mother's education level, mother's ethnicity, and basic hygiene status were significantly associated with dietary diversity.

While increasing accessibility to foods with varied nutrition is the primary way to prevent such a lack of diet diversity, identifying associated factors can also help promote dietary diversity. For example, awareness of ultra-processed foods allows the mothers/guardians to replace ultra-processed foods with other, more nutrient-rich foods that increase diet diversity. Similarly, awareness of communicable diseases motivates feeders to include foods that can prevent such diseases. For example, knowing that including Vitamin C-rich foods can increase immunity power and prevent infectious diseases could encourage mothers to include Vitamin C-rich foods in their children's diet. Moreover,

an educated mother/feeder can make an informed choice of foods, leading to better dietary diversity for their children. Moreover, good hygiene practices like personal cleanliness are directly associated with less food contamination and increased nutrition intake from those foods. As such, the factors identified to be related with dietary diversity in this study can help promote dietary diversity in children.

Table 5. Association between socio-demographic characteristics and minimum dietary diversity status (n=385)

Independent Variables	Minimum Dietary Diversity		p-Value
Mother's Educational Status	Yes (%)	No (%)	
Uneducated	5 (1.8%)	1 (1.0%)	
Informal Education	1 (0.4%)	1 (1.0%)	0.002
Up to Grade 8	2 (0.7%)	1 (1.0%)	
SEE/SLC	49 (17.3%)	39 (38.2%)	
High School	92 (32.5%)	26 (25.5%)	
Bachelors	83 (29.3%)	20 (19.6%)	
Masters and Above	51 (18.0%)	14 (13.7%)	
Mother's Occupation	Yes (%)	No (%)	
Agriculture	9 (3.2%)	2 (2.0%)	
Service	95 (33.6%)	24 (23.4%)	0.247
Labor	3 (1.1%)	2 (2.0%)	
Business	50 (17.7%)	26 (25.5%)	
Housewife	126 (44.5%)	48 (47.1%)	
Monthly Income of the Family (In NPR)	Yes (%)	No (%)	
Less than 15000	2 (0.7%)	2 (2.0%)	
15000 to 30000	40 (14.1%)	21 (20.6%)	0.100
31000-49000	94 (33.2%)	38 (37.3%)	
50000 and above	147 (51.9%)	41 (40.2%)	
Mother's Religion	Yes (%)	No (%)	
Hinduism	271 (95.8%)	99 (97.1%)	
Buddhism	6 (2.1%)	2 (2.0%)	0.900
Christianity	6 (2.1%)	1 (1.0%)	
Mother's Ethnicity	Yes (%)	No (%)	
Brahmin	110 (38.9%)	26 (25.5%)	
Chettri	88 (31.1%)	29 (28.4%)	0.015
Janajati	75 (26.5%)	39 (38.2%)	
Madhesi	10 (3.5%)	8 (7.8%)	
Family's Monthly Expenditure on Food (In NPR)	Yes (%)	No (%)	
Less than 10000	2 (0.7%)	0 (0.0%)	
10000 to 20000	108 (38.2%)	61 (59.8%)	0.001
More than 20000	168 (59.4%)	38 (37.3%)	
Do not know	5 (1.8%)	3 (2.9%)	
Family Type	Yes (%)	No (%)	
Nuclear	112 (39.6%)	44 (43.1%)	
Joint	140 (49.5%)	53 (52.0%)	0.195
Extended	31 (11.0%)	5 (4.9%)	
Family Size	Yes (%)	No (%)	
1-4	108 (38.2%)	48 (47.1%)	
5-8	157 (55.5%)	52 (51.0%)	0.193
9-16	18 (6.04%)	2 (2.0%)	

Table 6. Association between awareness and status of communicable diseases and minimum dietary diversity status (n=385)

Independent Variables	Minimum Dietary Diversity		p-Value
Awareness of Communicable Diseases	Yes (%)	No (%)	
Aware	209 (73.5%)	48 (47.1%)	0.001
Not Aware	75 (26.5%)	54 (52.9%)	
Status of Communicable Diseases	Yes (%)	No (%)	
Yes	49 (17.3%)	25 (24.5%)	0.114
No	234 (82.7%)	77 (77.5%)	

Table 7. Association between feeding practices and minimum dietary diversity status (n=385)

Independent Variables	Minimum Dietary Diversity		p- Value
Feeding times a day	Yes (%)	No (%)	
Once a day	4 (1.4%)	1 (1.0%)	0.001*
Twice a day	5 (1.8%)	4 (3.9%)	
Thrice a day	75 (26.5%)	58 (56.9%)	
More than 3 times a day	199 (70.3%)	39 (38.2%)	
Washing Foods before Cooking and Eating Status			
Yes	278 (98.2%)	97 (95.1%)	0.138
No	5 (1.8%)	5 (4.9%)	
Basic Hygiene Practices Status			
Yes	280 (98.9%)	95 (93.1%)	0.004
No	3 (1.1%)	7 (6.9%)	
Awareness of Ultra-Processed Foods			
Aware	234 (82.7%)	68 (66.7%)	0.001
Not Aware	49 (17.3%)	34 (33.3%)	

Additionally, the research corroborates the existing literature's conclusion about a strong association of dietary diversity with maternal education (10) we aimed to identify the nutritional statuses and current patterns of DDS among children between 6–59 months old and their associations with different individual and household level factors in rural Bangladesh. Methods The Nobokoli programme of World Vision Bangladesh was implemented in Mymensingh, Sherpur, Rangpur, Dinajpur, Thakurgaon, Panchagar, and Nilphamari districts of Bangladesh between 2014 and 2017. A

cross-sectional community household survey was administered between July and October 2014 to collect baseline data to evaluate the Nobokoli programme. A total of 6,468 children between 6–59 months old were included in the final analysis. Anthropometric data was collected following WHO guidelines on using wooden height and digital weight scales. We collected food intake information for the past 24 hours of the survey. The WHO's child growth standard medians were used to identify the nutritional indices of stunting, wasting, and underweight. Food items consumed were categorized into nine food groups and the DDS was constructed by counting the consumption of food items across these groups during the preceding 24 hour period. The association of DDS and nutritional status (stunting, wasting and underweight. Furthermore, our findings show that children belonging to ethnic groups such as Brahmin/Chhetri are more likely to maintain MDD than other ethnic groups, supporting another study conducted in Nepal (11) there is limited evidence on factors associated with consumption of various food groups. This study aimed to identify the sociodemographic factors associated with inadequate food group consumption and not meeting the minimum dietary diversity (MDD. Further, our results align with the conclusion of another national-level study in Nepal, which showed a high consumption of roots, tubers, and grains and a lower consumption of meat and eggs.(5) Moreover, a cohort study in the Mugu district of Nepal concluded that 51.7% did not consume a minimum acceptable diet.(12) Locally, the population of the two wards of our study had a higher proportion of children meeting the requirement than the national average and the average of the Mugu district.

CONCLUSION

This study assesses dietary diversity among residents of wards 2 and 3 of the Madhyapur Thimi municipality. Approximately 74% of the children aged 6-59 months met the WHO benchmark of MDD-C. Factors like the mother's basic hygiene, awareness about ultra-processed foods, general understanding of communicable diseases, educational status, and the family's monthly food expenditure were significantly associated with MDD-C.

Conducting public awareness campaigns and programs related to ultra-processed foods, providing nutritional education to mothers and everyone, in general, to enable them to make informed decisions about nutrient inclusion in diet, and ensuring the affordability and accessibility of nutrient-rich foods might help increase the proportion of children meeting dietary diversity requirements as these factors were significantly associated with dietary diversity.

A limitation of this study is that it uses data collected from a 24-hour cycle only. The data may be biased as people do not eat the same food daily and tend to exclude the foods eaten the day before. An extension of this study could collect repeated data from the same sampling units over an extended period to make a robust conclusion. The current survey and data will be made available upon reasonable request.

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Conflict of Interest

The authors declare no conflict of interest.

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