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Original Research Article

Effects of Primary Caregivers' Feeding Habits on the Nutrition Status of Pre-schoolers in Rupandehi District of Nepal

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Abstract

Healthy food habits of primary caregivers may contribute to the overall growth, development, and optimal health of the ppreschoolers. This quantitative research aimed to examine the impact of the feeding practices of caregivers on nutritional status of 384 preschoolers (aged 36-71 months) in Rupandehi District of Nepal. The effects of feeding habit were compared with the nutritional status and thus the impact was examined. Information regarding socio-economic standing, demographics, feeding habits, and children's nutrition statuses were collected through direct interviews and anthropometric measurement. The nutritional status of the children, including height-for-age (HAZ), weight-for-height (WAZ), and BMI-for-age z-scores (BAZ), was assessed using WHO Anthro, WHO Anthro Plus, and SPSS version 26 software. Statistical analysis involved Chi-square tests and logistic regression with a significance threshold established at $p<0.05$. The finding indicates that 44.5% of preschoolers had normal nutrition status, whereas 38.8% received sufficient feeding practices from their caregivers. Feeding habits, economic status, fathers' occupation, and family structure appeared as significant predictors of preschoolers' nutrition status. Preschoolers from economically marginalized backgrounds, with fathers in business occupations, and living in joint families were found to be at higher risk of poor nutrition. The findings imply that implementing feeding habit interventions to the children of lower economic backgrounds is desirable to bring the changes in their nutritional status. So, some nutritional strategies should be taken into consideration to take care of the children who are in joint families and whose parents could not give more time due to their occupation.

Keywords: Associated factors, feeding habits, nutritional status, pre-schoolers, primary caregivers

Introduction

Healthy dietary consumption and healthy growth are considered as crucial aspects of improving the quality of life in preschool children (United Nations Children's Fund [UNICEF], 2018). Malnutrition remains a silent emergency and a prevalent cause of illness and death among children globally, particularly in developing nations like Nepal (Bhusal et al., 2023). Approximately 232.9 million children suffer from malnutrition worldwide, comprising approximately 149 million stunted, 45 million wasted, and around 38.9 million overweight with more than half of them from South East Asia (Food and Agriculture Organization [FAO] et al., 2022; Samosir et al., 2023; Bhusal et al., 2023). Therefore, childhood under nutrition stances a significant public health challenge, especially in countries with lower to middle income (Gutiérrez-Camacho et al., 2019).

The dietary habits of primary caregivers significantly influence the nutritional status of pre-schoolers, which is crucial for their growth, development, and long-term health (Mukherjee & Chaturvedi, 2017; Modjadji et al., 2020). Poor diets can lead to malnutrition, obesity, and an increased risk of chronic diseases (Rothman et al., 2019;Marcondes et al., 2022). The rationale

behind parental dietary practices improving children's nutrition is that they have a major guidance on their children's dietary preferences, dietary patterns, and nutritional status, through the food they provide and consume, and on developing lifelong healthy eating habits (Shonkoff et al., 2017). By modelling healthy eating behaviors and providing balanced meals, caregivers can control the food environment and shape attitudes toward the food of their children (Lehto et al., 2019; Albashtawy, 2017). It can be assumed that caregivers often exhibit adequate dietary practices when they are in healthcare institutions, primarily because of availability of assistance, nutritional instruction, and advice provided by medical specialists (Birungi & Ejalu, 2022). Nevertheless, caregivers face challenges in ensuring appropriate feeding practices for pre-schoolers, adhering to recommended dietary requirements and diversification, resulting to hindering the efforts to improve children's health status (Wu et al., 2021).

The developed countries have provision of periodic home visits or phone calls from nurses, midwives, and peers to ensure caregivers can receive appropriate feeding practices and positive attitudes towards it (Masuke et al., 2021) which can be expensive and not consistently accessible to the developing countries like Nepal (FAO et al., 2022). Investigating the relationship among caregivers' feeding practices and the state of nutrition of pre-schoolers in developing nations holds significant potential for informing evidence-based interventions and programs aimed at improving child malnutrition and addressing prevalent micronutrient deficiencies in these regions (Gassmann et al., 2022). However, there is still scarce data regarding the connection between food consumption practices, socio-economic and demographic aspects, and the children's nutritional condition aged 36-71 months in Nepal. Gaining insights into the interplay between caregivers' food consumption practices, the socio-economic and demographic elements, as well as the nutritional state of children who are 36-71 months in Nepal is vital for developing effective strategies for promoting and implementing targeted food practice interventions for the susceptible population. However, there may be a gap in understanding the specific impact of primary caregivers' food habits on the nutritional status of preschoolers in the Rupandehi district of Nepal. Therefore, this study aimed to find out the effect of primary caregivers' food habits on the nutritional status of pre-schoolers 36-71 months in Rupandehi district of Nepal.

Methods and Materials

Study Design and the Participants

This is an analytical cross-sectional study. It examined the current nutritional status of pre-schoolers and the feeding practices of their primary caregivers. The sample included children between the ages of 36 to 71 months who were enrolled in early childhood development (ECD) centres within the district during the survey period. The research was carried out in a culturally diverse district, i.e., Rupandehi district of Nepal, spanning from February 14th to April 12th, 2021. This district, characterized by its multifaceted population, comprises various ethnicities, cultures, and socio-economic backgrounds, with a total population of 1,118,975 as reported in the latest 2021 census. Moreover, the selection of study site was guided by the fact that the Rupandehi district exhibits a relatively high fertility rate, leading to a greater number of children in comparison to other regions (Sharma et al., 2023). The data was extracted from the participants for the academic year 2020. According to the records of the local government unit's

education division, there were 14,358 children between the ages of 36 and 71 months enrolled in 369 government-funded early childhood development centers (Sharma, 2022).

Sample

The necessary sample size was calculated employing Cochran's formula (Cochran, 1977), considering a preferred precision of 5% (margin of error) and a confidence level of 95%. To determine the sample size, the following parameters were employed:

P (proportion) = 0.5, hence q (complement of proportion) = 1 - p = 1 - 0.5 = 0.5

e (margin of error) = 0.05

Z (z-value for a 95% confidence level) = 1.96

The initial sample size for a large population was determined to be 384.16 using the formula $n\_0 = (Z^2 * p*q) / e^2$. However, since the population size was finite, the formula $n = n_0 / (1 + (n_0 - 1) / N)$ was applied. Plugging in the values, the adjusted sample size was calculated as n = 384.16 / (1 + (384.16 - 1) / 14,358) = 374.17, which was rounded to 375. After considering in a 5% non-response rate, the sample size was finalized at 384.

The sample for this study was chosen using a multistage random sampling method, specifically employing the population proportionate sampling (PPS) technique (Sharma et al., 2022). The selection process involved multiple phases. In the initial stage, three local units (comprising one Sub-metropolitan city, one municipality, and one rural municipality) were selected through random process utilizing the lottery method. In the second phase, the population proportionate sampling technique was implemented within each selected unit. Therefore, 138 participants were chosen from sub-metropolitan city, 157 from urban municipality, and 89 from rural municipality to comprise the sample. Furthermore, within each local unit, a systematic order was established to select five schools/ ECD centres. These schools/ECD centres were prioritized and used successively until the desired sample size was achieved (Sharma et al., 2022).

In the cases where two or more children from the same household were identified, a lottery method was employed to randomly select one child. Similarly, if the primary caregiver of the selected child was unable to provide the necessary information due to any form of disorder, a close family member residing nearby was recruited as a substitute. The study included only those children who were present at the school or ECD centre during the anthropometric measurement and their primary caregivers. However, children with any physical or mental conditions that could potentially influence the outcomes were not included in the sample for the study (Sharma et al., 2022).

Data Collection Tools

To collect data from pre-schoolers and their primary caregivers, interview schedules and body measurement instruments were used (Creswell, 2012). Nutritional status assessment tools were utilized for the anthropometric measurement of height and weight. A branded LCD digital weighing scale was employed for measuring bodyweight (UNICEF, 2017). The scale had a maximum capacity of 150kg with a precision of 100g, and a minimum weighing capacity of 0.82kg (Frisancho, 2016; UNICEF, 2017). Similarly, children's height was measured using a

portable wooden measuring board with a range of 0-120 centimeters. The measuring slide exhibited a slight wobble of approximately 0.2 centimeters along its entire length, ensuring consistent and precise measurements (Sharma et al., 2022; UNICEF, 2017). Further, a pair of structured interview questionnaires was administered to main caregivers. One of the interview schedules consisted of a structured, close-ended questionnaire designed to gather information related to economic, demographic, and overall aspects. Additionally, a separate questionnaire was created to evaluate the feeding practices of the primary caregivers (Sharma et al., 2022).

Operationalization of Variables

The anthropometric measurements of pre-schoolers were the dependent variables in this study. The nutrition data of children, including HAZ, WAZ and BAZ were computed by directly measuring body weight and height. These measurements were then computed using World Health Organization [WHO] Anthro (WHO, 2011) and WHO Anthro plus (WHO, 2009) software. The data were further categorized into different levels of nutrition status based on WHO nutrition guidelines and literature to be reviewed (WHO, 2011; Sharma et al., 2022).

The questionnaire of independent variables, especially the feeding habits focusing to meal frequency, serving proportions and types of food offered towards pre-schoolers was formatted using a five-point rating system. The questionnaire comprised 24 items (Creswell, 2012; Beyene et al., 2015). It was divided into three distinct segments, focusing on dietary habits and feeding practices, food preparation and cooking techniques, and food storage and hygiene maintenance (Shrestha et al., 2020; Pries et al., 2016; Karki et al., 2019). However, after pre-testing, the questionnaire was modified to utilize a three-point rating scale, which included options of 'never,' 'sometimes,' and 'always'. The items were assigned ratings to quantify the data on a continuous scale. A rating of 1 represented "never," 2 represented "sometimes," and 3 represented "always" for the positive statements of the items. Conversely, for the negative statements of the items, the ratings were reversed. The scores of all the items were summed to generate a comprehensive score for each participant (Sharma, 2022). The data were then classified into low, medium, and high levels according to the relevant literature (Sharma, 2022).

Additionally, the independent variables encompassed the factors such as age, gender, number of offspring, family structure, religion, caste/ethnicity, parental educational backgrounds and occupations, as well as economic status. The economic ranking tool used in this study was derived from Nepal Demographic Health and Survey [NDHS]-2016. It included the attributes of the household like land possession, ownership of long-lasting properties, water sources, toilet amenities, and building and flooring materials (Ministry of Health[MoH], 2017). It measured the household's wealth based on the presence or absence of certain items such as chairs, beds, radios, televisions, cassette players, mobile phones, cars, motorcycles, bicycles, and land ownership. Similarly, a housing index was created by evaluating the condition of the roof, floor, and walls of the house, the type of fuel used for cooking, the type of latrine, and the availability of water supply. Every item was assigned a score of '1' if it was present and '0' if not (MoH et al., 2017; Sharma, 2022). Scores were assigned to each criterion, and these scores were then summed and calculated using an Excel worksheet. The maximum possible score represented a continuous range, and the scores were also categorized into four quartile of the richest, rich, poor, and poorest (MoH et al., 2017; Sharma, 2022; Sharma et al., 2022; Sharma et

al., 2023). The category of age, sex and number of children, caste/ethnicity, parental education and occupations were contextualized at the time of the pre-test. However, the extended family type was merged into the category of joint families, and Islamic and Christian religions were merged into 'Other' category for frequency adjustment (Sharma et al., 2022).

These tools were pilot-tested with 10% of participants who were not a part of the final study sample (Leavy, 2018). Feedback on content and face validity was obtained from two subject experts. The pre-test was conducted in two government-funded ECD centres to assess comprehensibility, question timing, consistency between variables, and acceptability. Based on the results of the pilot-test, the confusing, misrepresentative, or misunderstood questions were adjusted and refined to ensure clarity and to avoid technical difficulties during data collection in the field (Kothari, 2004). Data collection assistants underwent thorough training on the study's objectives and data collection methods. This included a two-day training session that incorporated a mock session to practice the data collection process. The assistants were educated about potential biases that could arise during data collection and were equipped with procedures like asking clarification questions, employing logical patterns, and developing other necessary skills. To enhance reliability and accuracy, particularly for the Likert scale-based feeding habits tool, Cronbach's alpha test was computed. The Cronbach's alpha reliability coefficient for assessing the nutritional practices of primary caregivers was determined to be 0.737, which was considered acceptable (Kothari, 2004).

Statistical Analysis

Before data entry, a comprehensive check was made to ensure the accuracy and consistency of the ranges of data, thereby minimizing errors. The data, except for nutrition status were inputted into IBM SPSS version 26 for subsequent statistical analysis. For children's nutrition status data (height, weight, and age in months), a multi-step process was followed. First, the data were entered into a Microsoft Excel sheet. Subsequently, the data were converted into a 'new text document' format using a Note-pad and uploaded to the WHO Anthro software for children less than 59 months (WHO, 2011). For children aged 60 months and above, the data were uploaded to the Anthroplus software (WHO, 2009). This process enabled the calculation of z-scores to evaluate the nutritional condition of the pre-schoolers (Sasse et al., 2021; Wick, 2009). The resulting continuous data were then uploaded into SPSS for further analysis. Similarly, tools used to assess economic status were computed in Microsoft Excel, and the results were uploaded into SPSS for analysis (MoH, 2017). Descriptive and inferential statistics were employed (Creswell, 2012), with a p-value deemed significant if it was less than 0.05. Socio-economic and demographic characteristics were presented as numbers (N) and percentage (%) (Sharma et al., 2022).The relationship between the dependent and independent variables was examined using chi-square test to determine their association. Additionally, binary logistic regression analysis was followed to ascertain the adjusted odds ratio, providing insights into the specific influence of the independent variables on the dependent ones (Kothari, 2004).

Ethical Considerations

This study received ethical approval from the Nepal Health Research Council (NHRC: No. 2078-56/2021). Additionally, research permission was obtained from the respective schools/ECD centres. Before they participated in the study, assent consent and informed consent were obtained from the primary caregivers of pre-schoolers (Sobal, 1992).

Results

Background Characteristics

The geometrographic information sought during the study shows that out of the 384 preschool children, 195 (50.8%) of them were males. One hundred and seventy-four (45.3 %) children were found at the age of five. A majority of parents (71.6%) had two or fewer children. By caste/ethnicity, 13.3% Dalit, 28.6% Janjaati, and 23.2 % were non-Dalit Terai castes. Similarly, in terms of religion, the majority of respondents (94.5%) identified as Hindu, and over half of the population (52.3%) lived in joint families (Table 1).

Table 1

Demographic Profile of Pre-schoolers (n=384)

Characteristics	Categories	No.	%
Gender	Male	195	50.8
	Female	189	49.2
Age in months	36-47 months	37	9.6
	48-59 months	173	45.1
	60-71 months	174	45.3
Quantity of offspring	Two or fewer	275	71.6
	Greater than two	109	28.4
Castes/ethnicities	Dalit	51	13.3
	Janajati	110	28.6
	Non-Dalit Terai castes	89	23.2
	Advantages castes	134	34.9
Religions	Hindu	363	94.5
	Buddhist	9	2.3
	Others (Christian and Islam)	12	3.1
Types of families	Nuclear	183	47.7
	Joint	201	52.3
Occupation of father	Jobs*	80	20.8
	Businesses	95	24.7
	Foreign job	89	23.2
	Other occupation*	120	31.3
Occupation of mother	Jobs*	51	13.3
	Businesses	60	15.6
	Agriculture	92	24
	Other occupation*	181	47.1
Education of father	Illiterate	54	14.1
	Basic level	193	50.3
	Secondary and above	137	35.7
Education of mother	Illiterate	88	22.9
	Basic level	176	45.8
	Secondary and above	120	31.3
Economic status	Poorest	96	25
	Poor	93	24.2
	Rich	99	25.8
	Richest	96	25

Note: 'Jobs'= Government/private/self-employed and 'Other occupation'=Labours and household work

Similarly, the result depicts that the majority (31.3 %) of fathers engaged in 'Other' profession than that of the nutrition and health care. In the case of mother's occupation, most of them (47.1 %) were in 'Other' professions. The education levels of 14.1 % of children's fathers were illiterate. Likewise, the education levels of mothers of 22.9 % of children were illiterate. The economic statuses of almost half of the respondents (25 % for the poorest and 24.2 % for the poor) were below the poverty line (Table 1).

The Situation of Nutrition Status and Feeding Habits

Regarding the nutrition status of the study population, [Table-2] presents that 44.5 % of children belonged to normal height for age Z score (HAZ) category, 36.2 % belong to moderate HAZ classification whereas 19.3 % belong to severe (severely stunted) HAZ category. The weights for age Z score (WAZ) of 46.1 % of children belong to a normal category, 36.7% belong to the moderate WAZ classification and 17.2% belonged to the severe WAZ category. The nutrition status of study children was based on body mass index (BMI) for age Z score (BAZ), the majority (59.1%) of children belong to a normal category, 30.7 % belong to the moderate and 10.2 % belong to severe BAZ category. Additionally, the majority of pre-schoolers received below normal levels (Low: 2.6% and moderate: 58.6%) of dietary practices and the remaining 38.8% received normal levels from their primary caregivers.

Table 2

Status of Nutrition and Feeding Habits (n=384)

Variables	Categories	No.	%
	Normal	171	44.5
HAZ/stunted	Moderate	139	36.2
	Severe	74	19.3
	Normal	177	46.1
WAZ/wasted	Moderate	141	36.7
	Severe	66	17.2
	Normal	227	59.1
BAZ/ thinness	Moderate	118	30.7
	Severe	39	10.2
	Low	10	2.6
Feeding habits	Moderate	225	58.6
	Normal	149	38.8

Relationship of Feeding Habits, Socio-demographic Factors and Nutrition Status of Pre-schoolers

Table 3 presents the significant association of the nutritional status [WAZ] of pre-schoolers with the feeding habits of caregivers, as well as demographic and socio-economic factors. A significant relationship has been found among the feeding habits of caregivers and the nutritional status [WAZ] ($\chi2=9.01$, $p=<0.05$) of pre-schoolers. Likewise, a notable correlation has been discovered in the WAZ score with the quantity of offspring at home ($\chi2=8.08$, $p=<0.01$), caste/ethnicity ($\chi2=23.37$, $p=<0.01$), types of family structure (either joint or nuclear) ($\chi2=5.24$, $p=<0.05$), fathers' occupation (WAZ) ($\chi2=13.25$, $p=<0.01$), mother's occupation ($\chi2=14.34$, $p=<0.01$), and economic status ($\chi2=19.53$, $p=<0.01$). No significant correlation was

observed between gender, age, parental education, and the nutritional status [WAZ] of pre-schoolers.

Table 3

Relationship of Socio-demographic Variables, Feeding Habits and Nutrition Status [WAZ]

Characteristics	Categories	WAZ		Chi2/*p*-value
		Normal	Below normal	
		%	%	
Feeding habits	Low	46.6	32.0	9.017*
	Medium	51.7	64.6	
	Normal	1.7	3.4	
Gender	Male	48.3	52.4	0.64
	Female	51.7	47.6	
Age in months	36-47 months	10.1	9.2	1.63
	48-59 months	48.3	42.7	
	60-71 months	41.6	48.1	
Quantity of offspring	Two or fewer	78.7	65.5	8.08**
	Greater than two	21.3	34.5	
	Dalit	12.4	13.6	23.37**
Caste/ethnicity	Janajati	36.0	22.3	
	Non-Dalit Tarai caste	12.9	32.5	
	Advantages caste	38.8	31.6	
Types of family	Nuclear	53.9	42.2	5.24*
	Joint	46.1	57.8	
	Job	21.3	20.4	13.25**
Occupation of father	Business	19.7	29.6	
	Foreign job	30.9	16.5	
	Others	28.1	33.5	
	Job	14.6	11.7	14.34**
Occupation of mother	Business	14.6	16.5	
	Agriculture	15.7	31.1	
	Others	55.1	40.8	
Education of father	Illiterate	16.3	12.1	1.430
	Basic level	48.3	51.9	
	Secondary and above	35.4	35.9	
Education of mother	Illiterate	20.8	24.3	0.79
	Basic level	46.1	45.6	
	Secondary and above	33.1	30.1	
	Poorest	14.6	34.0	19.53***
Economic status	Poor	27.0	21.4	
	Rich	29.8	22.3	
	Richest	28.7	22.3	

Note: Significance levels are indicated as *p<0.05 and **p<0.01.

Table 4 demonstrates the notable correlation between the nutritional status [HAZ] of pre-schoolers and the feeding practices of caregivers, alongside demographic and socio-economic factors. A significant relationship is seen between the feeding habits of caregivers and the nutritional status [HAZ] ($\chi2=12.34$, p=<0.01) of pre-schoolers. Likewise, a noteworthy correlation has been s observed between the nutritional status [HAZ] of pre-schoolers and

ethnicity ($\chi2=7.76$, $p=<0.05$), mother's occupation ($\chi2=7.67$, $p=<0.05$), and their economic status ($\chi2=18.85$, $p=<0.01$). However, no significant correlation has been observed between gender, age, quantity of offspring, family structure, father's occupation, and parental education with the nutritional status [HAZ] of pre-schoolers.

Table 4

Relationship of Socio-demographic Variables, Feeding Habits, and Nutrition Status [HAZ]

Characteristics	Categories	HAZ		Chi2/*p*-value
		Normal %	Below normal %	
Feeding habits	Low	48.3	31.1	12.347**
	Medium	48.8	66.5	
	Normal	2.9	2.4	
Gender	Male	51.7	49.5	0.187
	Female	48.3	50.5	
Age in months	36-47 months	11.0	8.5	0.73
	48-59 months	44.2	46.2	
	60-71 months	44.8	45.3	
Quantity of offspring	Two or fewer	73.8	69.8	0.75
	Greater than two	26.2	30.2	
Caste/ethnicity	Dalit	13.4	12.7	7.76*
	Janajati	30.8	26.9	
	Non-Dalit Tarai caste	16.9	28.8	
	Advantages caste	39.0	31.6	
Types of family	Nuclear	48.3	47.2	0.045
	Joint	51.7	52.8	
Occupation of father	Job	19.8	21.7	2.28
	Business	26.7	23.6	
	Foreign job	25.6	21.2	
	Others	27.9	33.5	
Occupation of mother	Job	15.1	11.3	7.67 *
	Business	17.4	14.2	
	Agriculture	17.4	29.2	
	Others	50.0	45.3	
Education of father	Illiterate	14.5	13.7	0.504
	Basic level	48.3	51.9	
	Secondary and above	37.2	34.4	
Education of mother	Illiterate	20.9	24.1	
	Basic level	46.5	45.3	0.549
	Secondary and above	32.6	30.7	
Economic status	Poorest	14.5	33.5	18.85**
	Poor	25.6	22.6	
	Rich	29.7	22.6	
	Richest	30.2	21.2	

Note: Significance levels are indicated as *p<0.05 and **p<0.01.

As like the earlier ones, , Table 5 illustrates the noteworthy connection between the nutritional status [BAZ] of pre-schoolers and the feeding patterns of caregivers, in addition to demographic and socio-economic factors. A significant relationship has been found between the

feeding habits of caregivers and the nutritional status [BAZ] ($\chi2$=7.14, p=<0.05) of pre-schoolers. Further significant associations have been observed with the quantity of offspring at home ($\chi2$=3.77, p=<0.05), caste/ethnicity ($\chi2$=16.05, p=<0.01), fathers' occupation ($\chi2$=19.54, p=<0.01), mother's occupation BAZ ($\chi2$=18.53, p=<0.01), and economic status ($\chi2$=7.25, p=<0.05). However, no significant correlation has been seen between gender, age, family structure, and parental education with the nutritional status [BAZ] of pre-schoolers.

Table 5

Relationship of Socio-demographic Variables, Feeding Habits, and Nutrition Status [BAZ]

Characteristics	Categories	BAZ		Chi2/*p*-value
		Normal	Below normal	
		%	%	
Feeding habits	Low	43.2	32.5	7.142*
	Medium	55.5	63.1	
	Normal	1.3	4.5	
Gender	Male	52.4	47.8	0.80
	Female	47.6	52.2	
Age in months	36-47 months	10.6	8.3	0.63
	48-59 months	45.4	45.2	
	60-71 months	44.1	46.5	
Quantity of offspring	Two or fewer	75.3	66.2	3.77*
	Greater than two	24.7	33.8	
Caste/ethnicity	Dalit	13.7	12.1	16.05**
	Janajati	32.2	23.6	
	Non-Dalit Tarai caste	16.3	33.8	
	Advantages caste	37.9	30.6	
Types of family	Nuclear	48.9	45.9	0.34
	Joint	51.1	54.1	
Occupation of father	Job	22.5	18.5	19.54**
	Business	19.8	32.5	
	Foreign job	30.0	13.4	
	Others	27.8	35.7	
Occupation of mother	Job	13.7	12.1	18.53 **
	Business	14.1	17.8	
	Agriculture	17.2	33.8	
	Others	55.1	36.3	
Education of father	Illiterate	12.8	15.9	0.79
	Basic level	50.7	49.7	
	Secondary and above	36.6	34.4	
Education of mother	Illiterate	20.7	25.5	
	Basic level	47.6	43.3	1.30
	Secondary and above	31.7	31.2	
Economic status	Poorest	20.3	31.8	7.25*
	Poor	26.4	20.4	
	Rich	27.8	22.9	
	Richest	25.6	24.8	

Note: Significance levels are indicated as *p<0.05 and **p<0.01.

Determinants of Nutritional Status

The adjusted odds ratio (aOR) was derived from multiple regression analysis separately for the nutrition status WAZ, HAZ and BAZ to show the effect of food habits and socio-demographic factors on the nutrition status of preschoolers. All variables that showed notable significance in the bivariate analysis were included for multiple regression analysis (Upreti et al., 2021; Sharma et al., 2022). Binary logistic regression demonstrates that feeding habits of primary caregivers, economic status, fathers' occupation and types of family are the strong predictors for WAZ nutrition status. Similarly, fathers' occupation has been found strong predictor for nutrition BAZ. Finally, the feeding habits of primary caregivers and the economic status of HAZ have also been found as the significant factors (Table- 6).

Table 6

Associated Factors of Nutritional Status

Category	WAZ			BAZ			HAZ		
	aOR	95% CI		aOR	95% CI		aOR	95% CI	
		Lower	Upper		Lower	Upper		Lower	Upper
Feeding habits									
Low (Ref.)									
Moderate	0.656	0.147	2.931	0.385	0.065	1.249	2.266	0.594	8.640
Normal	0.463	0.098	2.186	0.231	0.050	1.069	1.365*	0.339	5.495
Economic ranking									
Poorest (Ref.)							*		
Poor	0.503	0.246	1.028	0.897	0.446	1.807	.455*	0.227	0.912
Rich	0.431*	0.200	0.927	1.052	0.499	2.215	.405*	0.198	0.826
Richest	0.372*	0.170	0.815	1.054	0.483	2.172	.378**	0.182	0.786
Caste/ethnicity									
Dalit (Ref.)									
Janajati	0.626	0.301	1.300	0.996	0.469	2.113	1.154	0.569	2.339
Non-Dalit Tarai caste	1.362	0.585	3.175	1.638	0.740	3.630	1.325	0.600	2.229
Advantages caste	0.896	0.424	1.893	1.041	0.481	2.251	1.310	0.633	2.709
Occupation of mother									
Job (Ref.)									
Business	1.262	0.552	2.885	1.015	0.448	2.666	1.141	0.527	2.441
Agriculture	1.200	0.500	2.882	1.644	0.704	2.730	1.231	0.541	2.802
Other occupation	0.934	0.477	1.829	0.723	0.364	4.093	1.213	0.632	2.328
Occupation of father									
Job (Ref.)	*			**					
Business	1.602	0.831	3.058	1.885	0.990	3.589			
Foreign job	0.588	1.305	1.132	0.553	0.275	1.115			
Other occupation	0.620	0.316	1.218	0.972	0.501	1.887			
Quantity of offspring									
Two or fewer (Ref.)									
Greater than two	1.133	0.660	1.945	0.961	0.563	1.643			
Types of family									
Nuclear (Ref.)									
Joint	1.750*	1.107	2.764						

Note: Significant at *p<0.05 and **p<0.01; aOR= Adjusted Odds Ratio; cOR= Crude Od;
CI: confidence interval
WAZ: Constant= 3.438, -2 Log likelihood = 478.682, Cox & Snell R Square =0.126, Nagelkerke R Square=0.168, Model coefficients: Chi-square=51.612, Sig.=.000
BAZ: Constant= 2.239, -2 Log likelihood = 478.101, Cox & Snell R Square =0.102, Nagelkerke R Square=0.138, Model coefficients: Chi-square=41.404, Sig.=.000
HAZ: Constant= .939, -2 Log likelihood = 502.051, Cox & Snell R Square =0.066, Nagelkerke R Square=0.088, Model coefficients: Chi-square=26.112, Sig.=.006

Based on the feeding habits of primary caregivers, preschoolers who received moderate levels of feeding habits (aOR=2.266) and normal level of feeding habits (aOR=1.365; p=<0.05) were less likely to have stunted as compared to low level of feeding habits. Similarly, based on their economic status, the preschoolers from poor (aOR=0.503), rich (aOR=0.431; p<0.05) and richest (aOR=0.372; p<0.05) family backgrounds were less likely to have stunted as compared to the poorest economic background. It is also found that poor (aOR=0.455; p<0.05), rich (aOR=0.405; p<0.05) and richest (aOR=0.378; p<0.01) family backgrounds were less likely to have wasting as compared to poorest (p<0.05) economic background. Likewise, regarding fathers' occupation, preschoolers whose fathers had a business occupation (aOR=1.602) were more likely to be stunted compared to those whose fathers had job occupations (government/private/self-employed) (p<0.01). On the other hand, preschoolers whose fathers were employed in a foreign country (aOR=0.588) or had "Other" professions such as laborers and household work (aOR=0.620) were less likely to be stunted compared to those with job occupations (government/private/self-employed) (p<0.05). It was also found that preschoolers whose fathers had a business occupation (aOR=1.885) were more likely to have thinness compared to those whose fathers had job occupations (government/private/self-employed) (p<0.01). Additionally, preschoolers whose fathers were employed in a foreign country (aOR=0.553) or had "Other" professions such as laborers and household work (aOR=0.972) were less likely to have thinness compared to those with job occupations (government/private/self-employed) (p<0.01). Finally, based on the family structure, the preschoolers living in the joint family (aOR=1.750) were found more likely to be stunted as compared to living in the nuclear family (p<0.01).

Discussion

Out of a total of 384 pre-schoolers, almost half of them (49.2%) had poorest and poor economic background and more than half of them received below normal (low: 2.6% and moderate: 58.6%) levels of feeding habits from their primary caregivers. Moreover, the majority of them had below normal (Moderate: 36.2% and Severe: 19.3 for HAZ and Moderate: 36.7% and Severe: 17.2 for WAZ) level of nutrition status. The feeding habits of primary caregivers, number of children, caste/ethnicity, and types of family, fathers' occupation, mothers' occupation and economic quartile have been identified as the primary determinants of the nutritional status of pre-schoolers in bivariate analysis. However, the multivariate analysis demonstrates that the feeding habits of primary caregivers, economic status, fathers' occupation, and family structure are recognized as strong factors influencing the nutritional status of pre-schoolers.

The influence of feeding habits of primary caregivers in the nutrition status of children reported in this study is almost similar to other studies conducted in same group children in different countries, such as complementary feeding was found significantly associated with increased HAZ and a decreased possibility of stunting in a national survey of Nepal (Hanley-Cook et al., 2022) and insufficient dietary variety increases the likelihood of stunting between children in Indonesia (Samosir et al., 2023). Likewise, Jessica et al. (2016) in Canada found that parents' food practices were associated with the nutrition status of their children. Similarly, a

Nigerian study found that poor knowledge of nutrition and feeding practices of mothers towards their children is associated with children's nutrition status (Omaghomi Jemide et al., 2016). A study in India's Lucknow district discovered a notab-le association between feeding practices and children's nutritional status (Ahmad & Mishra, 2022). Moreover, the BMI of school children in Ghana showed a considerable change after dietary intervention (Annan et al., 2021). Gebru et al. (2019) in Ethiopia suggested context-specific child-feeding practices to protect against childhood stunting. Hegazi et al. (2015) conducted a cross-sectional study among Saudi pre-school children found that feeding problem harms physical and mental development and suggested the necessity of healthy nutrition practice for the appropriate growth and development. This finding is also supported by the ecosystem model of studying nutrition status, which suggests that social-psychological attributes of primary caregivers/mothers, including nutrition knowledge, attitudes, and practices related to feeding children and food-buying practices, determine the nutrition status of children (Laura et al., 1972).

The finding of the prevalence of economic status in the nutrition status of pre-schoolers also corresponds to a previous study as Ranabhat et al. (2016) conducted a cross-sectional study in the Humla district of Nepal found that economic status was a chief factor of BMI. Likewise, Kafle et al. (2017) appealed from a study in eastern Tarai of Nepal that children belonging to prosperous and wealthier families exhibited a lower likelihood of experiencing malnutrition in contrast to those from economically disadvantaged backgrounds. Further, Alom et al. (2012) found that, in Bangladesh, the economic status of the family stands out as a key contributing factor to child malnutrition among those under the age of five. Similarly, the standard of living was found correlated with child stunting and underweight in a cross-sectional study in Nepal (Ciptanurani & Chen, 2021).

Children whose fathers had business occupations were found to be more vulnerable in terms of their nutrition status, adding to the significance of paternal occupation as a predictor within the scope of this investigation. The finding is similar to the study conducted by Alom et al. (2012) in Bangladesh that the father's occupation was a significant contributing factor to child malnutrition among those under the age of five. However, contrast to this finding, Bbaale (2014) discovered that mothers working in agriculture were more likely to have undernourished childrein Uganda. Similarly, height, weight and BMI were associated among teenagers with their father's occupation in Derna City, Libya (Bmi et al., 2022). This may be attributed to the fact that these parents encourage junk food consumption due to time constraints (Ertz & Le Bouhart, 2022).

Another significant predictor of pre-schoolers' nutrition status is the family structure. Appropriate child nutrition was observed in the nuclear family as compared to joint. A similar result was found in Argentina and rural Indonesia where stunted and wasted cases were higher in the joint families (Novak & Muniagurria, 2017; Ciptanurani & Chen, 2021). Furthermore, the role of the joint family was found a negative contribution to the nutrition status of pre-schoolers which was consistent with the ecosystem model of nutrition status (Laura et al., 1972).

Conclusions

The result of this study suggest that almost half of the children are from the lowest economic background; more than half of them had below-normal levels of nutrition status and received below-normal level feeding practice from their caregivers. Caregivers' feeding habits, economic status, fathers' occupation and family structure were found main determinants of children's nutrition status. The findings reinforce the recommendation for community mobilization and caregivers' awareness programs, with special attention to lower economic backgrounds and living in joint families, aimed at enhancing children's nutritional status by understanding feeding determinants. Additional research with more sustained efforts and resources is recommended to address the root causes of malnutrition in these communities.

Implications

The results of this study emphasize the pivotal role played by primary caregivers' feeding behaviours in shaping the nutritional well-being of pre-schoolers in the Rupandehi district of Nepal. These outcomes bear significant implications for health promotion efforts to enhance the overall nutritional status and welfare of the pre-schoolers. It is crucial to implement focused nutrition education programs that can equip caregivers with evidence-based knowledge and hands-on skills for nurturing healthful feeding procedures. Moreover, early detection of children at risk of malnutrition is imperative for delivering timely interventions and support.

Advocacy for policies fostering healthier food environments, while considering cultural and socioeconomic variables, can strengthen the effectiveness of such initiatives. Strengthening cooperation between caregivers and healthcare providers, alongside cultivating supportive community networks, will foster the propagation of positive feeding practices. By prioritizing these approaches, we can endeavour to guarantee the optimal growth, development, and well-being of pre-schoolers not only in Nepal but also in similar developing country contexts.

Strengths and Limitations

This research has several strengths, one of which is the inclusion of sufficient sample of 384 preschool children and their primary caregivers. The researchers utilized modern software to calculate the Z score of the nutritional status of the pre-schoolers developed by the WHO. Additionally, the study addressed a gap in knowledge regarding child nutrition status and its association with caregiver feeding habits and socio-demographic factors in Nepal and South Asia.

Nevertheless, it is significant to acknowledge certain limitations of this study. Firstly, due to its cross-sectional design, all data were collected on a single day during the survey, which may not fully capture the dynamics of nutrition status over time. Secondly, the study was conducted specifically on children attending government-based ECD centres, potentially limiting the generalizability of the findings to all preschool children. Lastly, the tool used to measure the feeding practices of primary caregivers was developed specifically for the local context of the study area, and its validity may not be supported by strong evidence across all regions and countries of the same context.

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Authors' Contribution

PS created the instruments, gathered data, performed the analyses, and composed the first draft of the manuscript. CBB made contributions to the first conception, draft and both authors subsequently reviewed and provided feedback on the subsequent drafts. Finally, both authors gave their approval for the final version of the manuscript.

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Conflict of Interest

None.

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