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Nutritional Status of Preschool Children at Bharatpur, Nepal

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Running Title: *Nutritional Status of Preschool Children at Bharatpur, Nepal.*

Abstract: ***Background: Early childhood malnutrition remains a significant public health challenge in Nepal, with the 2022 Nepal Demographic and Health Survey reporting a 25% prevalence of stunting, 8% wasting, 19% underweight, and 1% overweight among children under 5 years. This study aimed to assess the nutritional status and associated factors among preschool children aged 3 - 5 years in an urban setting of Nepal. Methods: A descriptive, cross - sectional study was conducted among 115 preschoolers attending two preschools in Bharatpur, Chitwan. Proportionate stratified sampling was used for recruitment. Anthropometric measurements and socio - demographic data were collected through structured interviews and analyzed using WHO Anthro software and SPSS. Chi - square tests examined associations between nutritional status indicators and independent variables. Results: Of the preschoolers, 6.1% were severely wasted, 8.7% moderately wasted, 3.5% severely stunted, 15.7% moderately stunted, 3.5% severely underweight, and 8.7% overweight. Prevalence of severe wasting, stunting and underweight were lower compared to previous rural Nepali studies but overweight exceeded national estimates. Statistically significant associations were observed between wasting/stunting and child's age ($p<0.05$), and between wasting and presence of siblings ($p<0.05$). No significant association was found with underweight status. Conclusion: While nutritional indicators were relatively better than rural settings, the study highlights ongoing concerns regarding undernutrition and overweight/obesity among urban preschoolers in Nepal. Tailored interventions are needed across socioeconomic groups, targeting key determinants like sibling status, dietary patterns and access to maternal/child health services to further improve nutrition outcomes.***

Keywords: Preschool children, nutritional status, wasting, stunting, underweight, overweight

1. Introduction

Early childhood, particularly the preschool years between 3 to 6 years of age, constitutes a critical period for growth and development. This rapid growth phase is highly susceptible to the adverse impacts of malnutrition and infectious diseases prevalent during this life stage. Globally, an estimated 149 million children under 5 were stunted, 45 million were wasted, and 37 million were overweight or obese. Nearly half of all under - 5 mortality is linked to undernutrition, with the burden disproportionately borne by low - and middle - income countries.1

Childhood malnutrition remains a significant public health challenge in Nepal, despite progress in various health indicators.2 The 2022 Nepal Demographic and Health Survey (NDHS) revealed a 25% prevalence of stunting, 8% wasting, 19% underweight, and 1% overweight among children under 5 years.3 While the government aims to reduce stunting to ≤15% and wasting to ≤4% by 2030, [4] achieving these targets necessitates concerted efforts to address malnutrition's multifaceted determinants.

Malnutrition during early childhood can have far - reaching consequences, including stunted growth, wasting, micronutrient deficiencies, and impaired physical and cognitive development. These adverse outcomes not only compromise individual well - being but also hinder socio - economic progress by diminishing productivity and human capital potential.5 Addressing malnutrition is therefore a moral imperative enshrined in international conventions like the Convention on the Rights of the Child, [6] as well as Nepal's constitutional provisions guaranteeing the right to food, health, and nutrition.7

Malnutrition can inflict structural damage and functional impairments on the developing brain, leading to permanent cognitive deficits.8, [9] Investing in improved nutrition, especially for children, is widely recognized as a highly cost - effective strategy for fostering optimal physical growth, cognitive development, and socio - economic advancement.

Against this backdrop, the present study aimed to assess the nutritional status, encompassing stunting, wasting, and underweight, among preschool children aged 3 to 5 years in an urban setting of Nepal. Additionally, the research sought to identify key determinants influencing the nutritional status of this vulnerable population group, with the goal of informing targeted interventions and policies to combat childhood malnutrition in all its forms.

2. Methods

This study utilized a descriptive, cross - sectional design to determine the nutritional status of preschool children aged 3 to 5 years attending two preschools in Bharatpur 11, Chitwan, Nepal. The sample size was calculated using Cochran's (1977) formula, and a proportionate stratified sampling technique was employed to recruit 115 respondents through simple random sampling using a random number table.

Data collection was carried out from 2024/05/12 to 2024/05/31, utilizing a structured interview schedule developed after an extensive literature review and pretesting on 10% of the total sample. The interview schedule, administered in the Nepali language, gathered information on socio - demographic variables and other independent variables. Anthropometric measurements, including height and weight, were also recorded during data collection.

Height measurements were taken with the preschoolers standing barefoot against a wall, with their head positioned straight, and a mark made at the occipital region level. A non - stretchable measuring tape was then used to record the height. For weight measurements, a digital weighing machine was utilized, ensuring a zero error before measurement. Participants were instructed to remove their shoes and heavy clothing.

Ethical approval for the study was obtained from the Chitwan Medical College Institutional Review Committee (Ref: CMC - IRC/080/081 - 140). Administrative approval was also secured from the selected preschools, and informed written consent was obtained from the mothers of the participating preschoolers. Efforts were made to create a comfortable environment for the children during data collection to minimize physical harm and mental stress. The data were collected in the presence of class teachers, and confidentiality was maintained by assigning code numbers to each participant's questionnaire.

The collected data were analyzed using the Statistical Package for Social Sciences (SPSS - 23) and the WHO Anthro version 3.2.2 software for assessing the nutritional status of preschoolers. Anthropometric measurements were evaluated using the WHO recommended reference medians, and the participants were classified into categories of normal (- 1 SD ≤ z ≤ +1 SD), moderate (- 2 SD ≤ z < - 1 SD; or +1 SD < z ≤ +2 SD), and severe (z < - 2 SD or z > +2 SD).[10]

Descriptive statistics, including frequency, percentage, median, and interquartile range, were used to summarize the socio - demographic, personal, family, birth, and nutritional status - related information. Chi - square tests were performed to determine the association between the dependent variables (nutritional status) and independent variables (age, sex, ethnicity, type of family, presence of siblings, primary caregiver, mother's age, age at child birth, employment status, gestational age, birth weight, history of neonatal complications, and NICU stay). The level of significance was set at $p < 0.05$.

3. Results

Table 1: Socio - demographic, Personal and Family Related Information of Preschoolers, n=115

Variables	Frequency (%)
Age	
3 years	48 (41.7)
4 years	36 (31.3)
5 years	31 (27.0)
Sex	
Male	65 (56.5)
Female	50 (43.5)
Ethnicity	
Brahmin	33 (28.7)
Chhetri	17 (14.8)
Dalit	7 (6.1)
Janajati	58 (50.4)
Type of Family	
Nuclear	44 (38.3)
Joint/Extended	71 (61.7)
Presence of Siblings	
Present	69 (60.0)
Absent	46 (40.0)
Primary Caregiver	
Mother	93 (80.9)
Other than mother*	22 (19.1)

**other than mother: Grandparents, Father, and Aunt*

Table 1 shows that among the 115 preschoolers studied, around two - thirds were aged 3 - 4 years, with a slight male predominance. Half belonged to the Janajati ethnic group. A majority (61.7%) lived in joint/extended families, and 60% had siblings present. Mothers were the primary caregivers for most (80.9%) preschoolers.

Table 2: Socio - demographic Information of Mothers, n=115

Variables	Frequency (%)
Age	
≤35 years	100 (87.0)
>35 years	15 (13.0)
Median age (IQR) =29 (33 - 27) years, Min=22 years, Max=40 years	
Age at Childbirth	
<20 years	2 (1.7)
20 - 35 years	111 (96.6)
>35 years	2 (1.7)
Median age (IQR) =25 (28 - 23) years, Min=19 years, Max=37 years	
Education	
No formal education	1 (0.9)
Basic education	14 (12.2)
Secondary education	65 (56.5)
Bachelors and Above	35 (30.4)
Employment Status	
Staying at home	74 (64.3)
Working outside home	41 (35.7)

Table 2 reveals that 87% of the mothers were in the age group of ≤35 years and 96.6% of mothers' childbirth age was between 20 - 35years, 56.5% had completed secondary education, and only 35.7% were working outside home.

Table 3: Birth - related Information of Preschoolers, n=115

Variables	Frequency (%)
Gestational Age at Birth	
Preterm	17 (14.8)
Full term	98 (85.2)
Birth Weight	
Low birth weight (<2500 grams)	13 (11.3)
Normal birth weight (≥2500 grams)	102 (88.7)
History of Neonatal Complications	
Present	8 (7.0)
Absent	107 (93.0)
History of NICU Stay after Delivery	
Present	7 (6.1)
Absent	108 (93.9)

Table 3 illustrates that, 14.8% of preschoolers were born preterm, 11.3% had low birth weight, 7.0% had a history of neonatal complications, and only 6.1% were admitted in NICU.

Table 4: Nutritional Status of Preschoolers, n=115

Variables	Frequency (%)
Weight for Height	
Severely wasted (< - 3 z - score)	7 (6.1)
Moderately wasted (- 3 to < - 2 z - score)	10 (8.7)
Normal (- 2 to +2 z - score)	88 (76.5)
Overweight (>+2 z - score)	10 (8.7)
Height for Age	
Severely stunted (< - 3 z - score)	4 (3.5)
Moderately stunted (- 3 to < - 2 z - score)	18 (15.7)
Normal (- 2 to +2 z - score)	93 (80.9)
Weight for Age	
Severely underweight (< - 3 z - score)	4 (3.5)
Moderately underweight (- 3 to < - 2 z - score)	7 (6.1)
Normal (- 2 to +2 z - score)	104 (90.4)

Table 4 demonstrates the nutritional status of preschoolers based on three anthropometric measures - weight - for - height, height - for - age, and weight - for - age. It was found that 6.1% of preschoolers were severely wasted, 8.7% moderately wasted and 8.7% overweight. Regarding height for age, 3.5% of preschoolers were severely stunted, 15.7% moderately stunted, and 3.5% of preschoolers were severely underweight and 6.1% were moderately underweight for their age.

Table 5: Association between Weight for Height of Preschoolers with Selected Variables, n=115

Variables	Weight for Height		χ^2 value	p - value	
	Wasted	Normal	Overweight		
	No. (%)	No. (%)	No. (%)		
Ethnicity					
Brahmin	5 (15.2)	26 (78.8)	2 (6.1)	2.714€	0.854
Chhetri	1 (5.9)	15 (88.2)	1 (5.9)		
Dalit	1 (14.3)	6 (85.7)	0 (0.0)		
Janajati	10 (17.2)	41 (70.7)	7 (12.1)		
Mother's employment					
Staying at home	9 (12.2)	58 (78.4)	7 (9.5)	1.233€	0.595
Working outside home	8 (19.5)	30 (73.2)	3 (7.3)		
Type of family					
Nuclear	7 (15.9)	34 (77.3)	3 (6.8)	0.370€	0.892
Joint	10 (14.1)	54 (76.1)	7 (9.9)		
Presence of Siblings					
Present	11 (23.9)	29 (63.0)	6 (13.0)	7.655€	**0.022**
Absent	6 (8.7)	59 (85.5)	4 (5.8)		
Child's Age					
3 years	3 (6.3)	39 (81.3)	6 (12.5)	11.729€	**0.026**
4 years	6 (16.7)	30 (83.3)	0 (0.0)		
5 years	8 (25.8)	19 (61.3)	4 (12.9)		
Sex					
Female	7 (14)	37 (74)	6 (12)	1.248€	0.577
Male	10 (15.4)	51 (78.5)	4 (6.2)		
Primary caregiver					
Mother	14 (15.1)	72 (77.4)	7 (7.5)	1.082€	0.590
Other than mother	3 (13.6)	16 (72.7)	3 (13.6)		
Gestational age					
Preterm	4 (23.5)	13 (76.5)	0 (0.0)	2.437€	0.298
Term	13 (13.3)	75 (76.5)	10 (10.2)		
Birth weight					
<2500gm	2 (15.4)	10 (76.9)	1 (1.1)	0.205€	1.000
≥2500gm	15 (14.7)	78 (76.5)	9 (8.8)		
Neonatal complications					
Present	2 (25.0)	6 (75.0)	0 (0.0)		0.662
Absent	15 (14.1)	82 (76.6)	10 (9.3)		
NICU stay after delivery					
Yes	2 (28.6)	5 (71.4)	0 (0. o)	1.394€	0.369
No	15 (13)	83 (76.9)	10 (9.3)		
Mother's age					
≤35 years	16 (16.0)	77 (77.0)	7 (7.0)	3.015€	0.223
>35 years	1 (6.7)	11 (73.3)	3 (20.0)		
Mother's age at child birth					
≤35 years	16 (14.2)	88 (77.9)	9 (8.0)	6.889€	0.054
>35 years	1 (50.0)	0 (0.0)	1 (50.0)		

Significant at p value<0.05, Fisher's exact test=€

Table 5 shows that there was statistically significant association between weight for height of preschoolers and presence of siblings and child's age. Preschoolers with sibling present had a higher proportion of wasting (23.9%) compared to those without siblings (8.7%). The prevalence of wasting increased with age, from 6.3% in 3 - year - olds to 16.7% in 4 - year - olds and 25.8% in 5 - year - olds. No significant associations were found between weight - for - height and other variables.

Table 6: Association between Height for Age of Preschoolers with Selected Variables, n=115

Variables	Height for Age		χ^2 value	p - value
	Stunted	**Normal**		
	No. (%)	**No. (%)**		
Ethnicity				
Brahmin	6 (18.2)	27 (81.8)	0.230€	1.000
Chhetri	3 (17.6)	14 (82.4)		
Dalit	1 (14.3)	6 (85.7)		
Janajati	12 (20.7)	46 (79.3)		
Mother's employment				
Staying at home	16 (21.6)	58 (78.4)	0.833	0.461
Working outside home	6 (14.6)	35 (85.4)		
Type of family			0.596	0.471
Nuclear	10 (22.7)	34 (77.3)		
Joint	12 (16.9)	59 (83.1)		
Presence of Siblings				
Present	7 (15.2)	39 (84.8)	0.759	0.472
Absent	15 (21.7)	54 (78.3)		
Child's Age				
3 years	19 (39.6)	29 (60.4)	22.336	**0.000014**
4 years	2 (5.6)	34 (94.4)		
5 years	1 (3.2)	30 (96.8)		
Sex				
Female	11 (22)	39 (78)	0.471	0.633
Male	11 (16.9)	54 (83.1)		
Primary caregiver				
Mother	19 (20.4)	74 (79.6)		0.561
Other than mother	3 (13.6)	19 (86.4)		
Gestational age				
Preterm	4 (23.5)	13 (76.5)		0.738
Term	18 (18.4)	80 (81.6)		
Birth weight				
<2500gm	3 (23.1)	10 (76.9)		0.712
≥2500gm	19 (18.6)	83 (81.4)		
Neonatal complications				
Present	3 (37.5)	5 (62.5)		0.178
Absent	19 (17.8)	88 (82.2)		
NICU stay after delivery				
Yes	3 (42.9)	4 (57.1)		0.127
No	19 (17.6)	89 (82.4)		
Mother's age				
≤35 years	17 (17)	83 (83)		0.160
>35 years	5 (33.3)	10 (66.7)		
Mother's age at child birth				
≤35 years	21 (18.6)	92 (81.4)		0.347
>35 years	1 (50)	1 (50)		

Significant at p value<0.05, Fisher's exact test=€

Table 6 investigates the association between preschoolers' height - for - age status (stunted or normal) and various independent variables. The only statistically significant association observed was between height - for - age and child's age (p=0.000014). The prevalence of stunting decreased substantially with age, from 39.6% at 3 - year - olds to 5.6% in 4 - year - olds and to 3.2% in 5 - year - olds.

Table 7: Association between Weight for Age of Preschoolers with Selected Variables, n=115

Variables	Weight for Age		χ^2 value	p - value
	Underweight	**Normal**		
	No. (%)	**No. (%)**		
Ethnicity				
Brahmin	3 (9.1)	30 (90.9)	1.706€	0.606
Chhetri	3 (17.6)	14 (82.4)		
Dalit	0 (0.0)	7 (100)		
Janajati	5 (8.6)	53 (91.4)		
Mother's employment				
Staying at home	6 (8.1)	68 (91.9)		0.518
Working outside home	5 (12.2)	36 (87.8)		
Type of family				
Nuclear	4 (9.1)	40 (90.9)		1.000
Joint	7 (9.9)	64 (90.1)		
Presence of Siblings				
Present	5 (10.9)	41 (89.1)		0.753
Absent	6 (8.7)	63 (91.3)		
Child's Age				
3 years	5 (10.4)	43 (89.6)	0.104€	1.000
4 years	3 (8.3)	33 (91.7)		
5 years	3 (9.7)	28 (90.3)		
Sex				
Female	3 (6.0)	47 (94.0)		0.344
Male	8 (12.3)	57 (87.7)		
Primary caregiver				
Mother	10 (10.8)	83 (89.2)		0.688
Other than mother	1 (4.5)	21 (95.5)		
Gestational age				
Preterm	2 (11.8)	15 (88.2)		0.665
Term	9 (9.2)	89 (90.8)		
Birth weight				
<2500gm	1 (7.7)	12 (92.3)		1.000
≥2500gm	10 (9.8)	92 (92.2)		
Neonatal complications				
Present	2 (25.0)	6 (75.0)		0.169
Absent	9 (8.4)	98 (91.6)		
NICU stay after delivery				
Yes	2 (28.6)	5 (71.4)		0.134
No	9 (8.3)	99 (91.7)		
Mother's age				
≤35 years	10 (10.0)	90 (90.0)		1.000
>35 years	1 (6.7)	14 (93.3)		
Mother's age at child birth				
≤35 years	11 (9.7)	102 (90.3)		1.000
>35 years	0 (0.0)	2 (100.0)		

Significant at p value<0.05, Fisher's exact test=€

Table 7 explores the association between preschoolers' weight - for - age status (underweight or normal) and various independent variables. The results did not reveal any statistically significant associations between weight - for - age and the independent variables.

4. Discussion

The present study examined the nutritional status and associated factors among preschool children aged 3 - 5 years in an urban setting of Nepal. The findings revealed relatively better nutritional indicators compared to many previous studies conducted in rural Nepal, as well as some similarities with studies from other regional countries like Kosovo and Turkey.

At 6.1%, the prevalence of severe wasting was lower than the 8% national average for children under 5 reported by the 2022 NDHS.3 Similarly, the rates of moderate wasting (8.7%), severe stunting (3.5%), and severe underweight (3.5%) were also lower than figures from several prior rural Nepali studies which ranged from 13.7% - 36.4% for wasting, 18.5% - 51.9% for stunting, and 9.3% - 31.9% for underweight.1[1, 12, 13, 14, 15] However, the overweight prevalence of 8.7% was higher than the 1% national average.3 This aligns with an increasing trend of overweight/obesity among children in urban areas and may be attributable to factors like unhealthy dietary patterns and sedentary lifestyles. Interestingly, the nutritional status findings were comparable to studies from Kosovo and Turkey, [16, 17] potentially reflecting similar socio - economic and lifestyle patterns in urban regions across these countries.

The study identified statistically significant associations between wasting/stunting and the child's age, as well as between wasting and presence of siblings. These results

corroborate prior evidence[12] on how undernutrition risk increases with age among young children, and having multiple siblings can strain household resources impacting child nutrition. Contrary to some other studies, maternal age at childbirth did not emerge as a significant factor influencing nutritional status. However, child's birth weight has been consistently linked to undernutrition risk across multiple studies, [18, 19] underscoring the importance of optimal maternal nutrition and healthcare during pregnancy.

The relatively better nutritional indicators compared to rural Nepal may be attributable to aspects like higher socioeconomic status, better access to health services, and dietary diversity in the urban study setting. Nonetheless, the prevalence of wasting, stunting, underweight and overweight among these urban preschoolers remains a public health concern requiring targeted interventions across various domains.

This study had certain limitations including the small sample size from one urban location, limiting generalizability. Future research with larger representative samples across urban, rural and regional populations is recommended to gain a comprehensive understanding and effectively address child undernutrition in all its forms in Nepal.

5. Conclusion

This study contributes valuable insights into nutritional status patterns and associated factors specifically among urban preschool children in Nepal. The findings reiterate the need for continued efforts through multi - sectoral policies and programs to further improve maternal and child nutrition across all socioeconomic strata and geographical regions of the country.

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