

## Original Research Article

# Nutritional status and its correlates in under five slum children of Kanpur Nagar, India

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## ABSTRACT

**Background:** In Kanpur, overall there were an estimated 43.6% stunted, 24.1% wasted and 41.8% underweight under-five children. There is a critical window of opportunity to prevent undernutrition by taking care of the nutrition of children in the first two years of life. With this background the present study was undertaken with the aim to assess the nutritional status in under five children in the slum area of Kanpur Nagar.

**Methods:** The present study was conducted in 30 slums of Kanpur Nagar selected through 30 cluster sampling technique. The sample size was calculated as 390. From each cluster, approximate 13 study subjects aged 0-60 months were studied. Mothers of study subjects were interviewed to illicit the requisite information, using a predesigned and pretested questionnaire. Anthropometric measurements were taken using standard technique for each study subject. Data collected was analyzed using statistical tool.

**Results:** Based on WHO classification, the prevalence of stunting and severe stunting was observed to be 31.28% and 13.59%. 14.62% study subjects were wasted while 6.15% subjects had severe wasting. 40.51% had mild-moderate malnutrition and 7.95% had severe malnutrition as per the criteria of mid upper arm circumference. Malnutrition was significantly associated with the age of the study subjects ( $p < 0.05$ ). The prevalence of malnutrition decreased significantly with higher maternal education and among those whose mother's were housewives ( $p < 0.05$ ). Lower birth order and middle socio-economic class was associated with decreased prevalence of malnutrition ( $p < 0.05$ ).

**Conclusions:** The nutritional status of children is dependent on maternal education and occupation and socioeconomic status. Nutrition education can have a significant effect in its reduction.

**Keywords:** Children, Nutritional status, Slums

## INTRODUCTION

Globally, about one in four children under 5 years old are stunted (26% in 2015). 90% of the developing world's chronically undernourished (stunted) children are living in Asia and Africa. In India, 61 million children under-five years are stunted, which constitutes 28% of stunted children in the world. In terms of numbers about 54 million children under-five years in India are

underweight which constitutes about 37% of the total underweight children in the world.

The highest prevalence of wasting is in South Asia, where approximately one in six children (16%) are moderately or severely wasted. The burden of wasting is highest in India, which has more than 25 million (20%) wasted children. This exceeds the combined burden of the next nine high-burden countries.<sup>1</sup>

As per NFHS-4 (2015-16), 38.4% of the children below five years are stunted, 35.7% are underweight and 21% are wasted in India. India accounts for more than 3 out of every 10 stunted children in the world. Thus, more than one third of the world's children who are stunted live in India.<sup>2</sup>

Globally under five mortality rates is 43 per 1000 live birth in 2015. Undernutrition contributes to nearly half of all death in children under five.<sup>3</sup>

Also, there are wide variations in nutritional status of children across India. In 2015, the under-five mortality rate in Uttar Pradesh was 78 per 1,000 live births. Also, the prevalence of stunting, wasting and underweight in children under 5 years was 46.3%, 17.9% and 39.5% respectively.

In Kanpur, overall there were an estimated 43.6% stunted, 24.1% wasted and 41.8% underweight under-five children.<sup>2</sup>

There is a critical window of opportunity to prevent undernutrition by taking care of the nutrition of children in the first two years of life, when proven nutrition interventions offer children the best chance to survive and reach optimal growth and development.

With this background the present study was undertaken with the aim to assess the nutritional status in under five children in the slum area of Kanpur Nagar.

## METHODS

This one-year cross-sectional community-based study was conducted from July 2016 to June 2017 among 390 children in the age group 0-60 months residing in slum area of Kanpur Nagar. The child who are seriously ill and whose parents refuse to participate in study were excluded.

The minimum sample size was calculated taking the prevalence of underweight in children under five years as 42.4% (NFHS-III, Uttar Pradesh, 2005-2006) using the following formula<sup>4</sup>

$$\text{Minimum sample size (n)} = Z^2 PQ / d^2$$

where

Z = Standard normal variate having value 1.96 at 95% confidence interval.

P = Prevalence % (42.4)

Q = (100 - P) % (57.6)

d = Margin of error (5)

Sample size was rounded off to obtain a number completely divisible by 30, thus giving a sample size of 390. The study included 30 clusters from 380 identified slums of district Kanpur Nagar.

30 cluster sampling technique was used to study the requisite sample size in the allocated population.

During door-to-door survey, mother of study subjects was briefed about the study and their informed consent was obtained. Approximate 13 children aged 0-60 months were studied from each cluster. The first house in a cluster was selected by simple random sampling technique. Each next household was selected sequentially until a total of 13 eligible children in the age group 0-60 months were covered. If there were more than one sibling in a house, then the youngest sibling was chosen for the study. A predesigned and pre-tested questionnaire was used to elicit the information from mother of study subjects.

## Anthropometric examination

The height/length, weight and Mid Upper Arm Circumference (MUAC) were recorded for each study subject. Every effort was made to get high order of accuracy in measurements. The indices of nutritional status namely, height for age and weight for height were expressed in standard deviation units from the median using the international reference populations as per WHO Child Growth Standards. Malnutrition in the study subjects was assessed on the basis of WHO classification, which is based on height for age, weight for age and weight for height.

## Statistical analysis

Data was compiled and analyzed using SPSS 20.0. Analysis was done using appropriate statistical tools like percentages, chi square test etc. and conclusions were drawn accordingly. P values <0.05 were considered statistical significant.

## RESULTS

Mean age of study population was 35.33±16 month. There were 48.46% males and 51.54% females. Maximum 28.46% study subjects were in the age group 48-60months while minimum 10.77% were in the age group of 0-12 months (Figure 1).

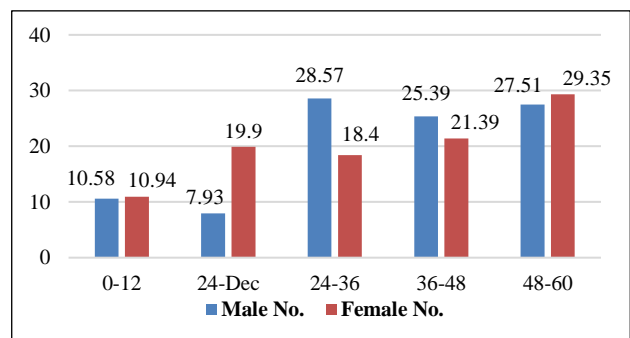
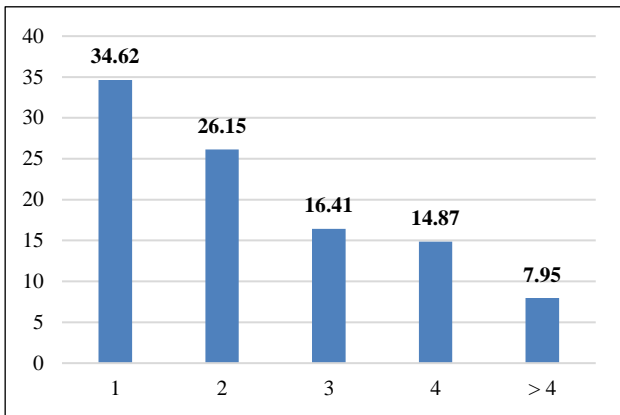


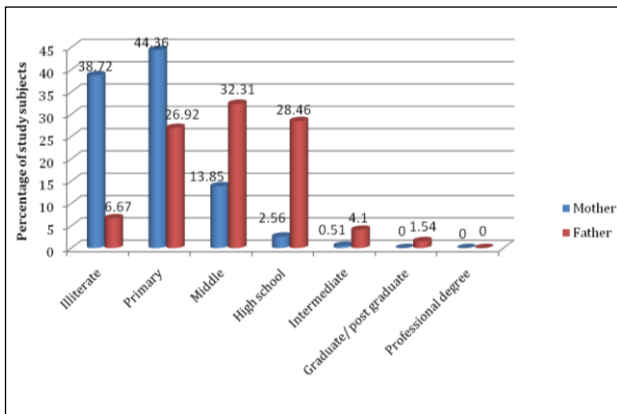
Figure 1: Age and gender distribution of study participants.

Most (64.36%) study subjects belonged to nuclear family. 26.15% study subjects belong to extended family. Only 9.49% study subjects belong to joint family. Most study subjects were of birth order 1 (34.62%) (Figure 2).



**Figure 2: Distribution of study subjects according to their birth order.**

Mothers of maximum study subjects (44.36%) were educated up to primary while 38.72% mothers were illiterate. Fathers of maximum study subjects (32.31%) were educated up to middle school while 6.67% fathers were illiterate (Figure 3).

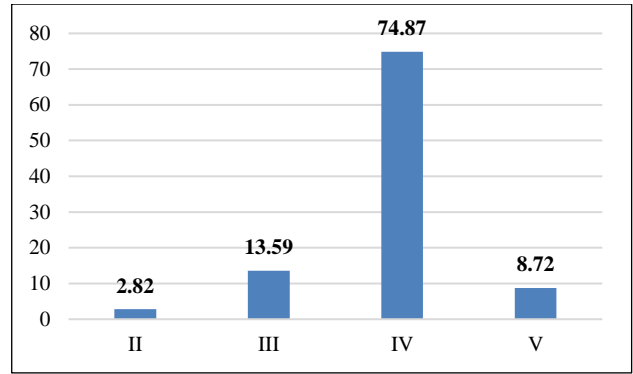


**Figure 3: Distribution of study subjects according to educational status of their parents.**

Mothers of maximum study subjects (50.52%) were unemployed/housewives. 74.87% study subjects belonged to Social class IV as per Modified Kuppaswamy socioeconomic classification.

44.87% subjects had low height for age. The prevalence of stunting and severe stunting was 31.28% and 13.59% respectively. Males (32.28%) had a higher prevalence of stunting than females (30.35%).

Severe stunting was also found to be more among males (14.81%) than females (12.44%). The association between gender and height for age was not found to be significant ( $p > 0.05$ ) (Table 1).



**Figure 4: Distribution of study subjects according to social class.**

Low weight for height was reported in 20.76% subjects. Wasting as well as severe wasting was found to be more prevalent among males (15.34% and 6.35% respectively) than females (13.93% and 5.97% respectively). The association of weight for height with respect to sex was found to be statistically significant ( $p < 0.05$ ) (Table 2).

**Table 1: Distribution of study subjects according to height for age.**

Sex	Study subjects No. (%)			Total (no.)
	Normal	Stunting	Severe stunting	
Male	100 (52.91)	61 (32.28)	28 (14.81)	189
Female	115 (57.21)	61 (30.35)	25 (12.44)	201
Total	215 (55.13)	122 (31.28)	53 (13.59)	390

**Table 2: Distribution of study subjects according to weight for height.**

Sex	Study subjects no. (%)			Total (no.)
	Normal	Wasting	Severe wasting	
Male	148 (78.31)	29 (15.34)	12 (6.35)	189
Female	161 (80.10)	28 (13.93)	12 (5.97)	201
Total	309 (79.23)	57 (14.62)	24 (6.15)	390

More females (43.52%) were found to be malnourished than males (37.01%). Mid upper arm circumference was found to be significantly associated with gender of study subjects ( $p < 0.05$ ) (Table 3). The association between nutritional status and age of study subjects was found to be statistically significant ( $p < 0.05$ ).

As per WHO classification, more females (53.73%) were found to be malnourished than males (53.44%). Significant association was found between nutritional

status of children and their maternal education ( $p < 0.05$ ). Malnutrition among study subjects was significantly

associated with the occupation of their mother ( $p < 0.05$ ) (Table 4).

**Table 3: Distribution of study subjects according to mid upper arm circumference.**

Sex	Study subjects no. (%)			Total (no.)
	Normal	Mild-moderate malnutrition	Severe malnutrition	
Male	102 (56.35)	67 (37.01)	12 (6.63)	181
Female	90 (46.63)	84 (43.52)	19 (9.84)	193
Total	192 (51.33)	151 (40.37)	31 (8.29)	374

**Table 4: Distribution of study subjects with malnutrition according to demographic variables.**

Age (months)	Total (n=390)		Malnourished (n=209)		P value
	No.	%	No.	%	
0-12	42		17	40.48	P < 0.05
12-24	55		44	80.00	
24-36	91		63	69.23	
36-48	91		39	42.85	
48-60	111		46	41.44	
<b>Sex</b>					P > 0.05
Male	189		101	53.44	
Female	201		108	53.73	
<b>Education of mother</b>					P < 0.05
Illiterate	151		96	63.58	
Literate	239		113	47.28	
<b>Education of father</b>					P > 0.05
Illiterate	26		16	61.54	
Literate	364		193	53.02	
<b>Occupation of mother</b>					P < 0.05
Unemployed	197		85	43.15	
Employed	193		124	64.25	

Among study subjects with birth order  $\geq 4$ , almost 70.97% children were malnourished while 29.63% children with birth order 1 were found to be malnourished. There was statistically significant association between nutritional status and birth order of the child ( $p < 0.05$ ) (Table 5).

**Table 5: Nutritional status in relation to birth order.**

Birth order	Total		Malnourished	
	No.	%	No.	%
1	135		40	29.63
2	102		54	52.94
3	64		43	67.19
4	58		50	86.21
> 4	31		22	70.97
Total	390		209	53.59

P < 0.05

Among subjects of joint family, 51.35% were malnourished. The prevalence of malnutrition among nuclear and extended family subjects were 57.77% and 44.12% respectively.

**Table 6: Nutritional status in relation to type of family and socioeconomic status.**

Type of family	Total		Malnourished		p-value
	No.	%	No.	%	
Nuclear	251		145	57.77	p > 0.05
Joint	37		19	51.35	
Extended	102		45	44.12	
Total	390		209	53.59	
<b>Social class</b>					p < 0.05
	<b>Total</b>		<b>Malnourished</b>		
	No.	%	No.	%	
Middle	356		185	51.96	
Lower	34		24	70.59	
Total	390		209	53.59	

As per modified Kuppaswamy classification 70.59% study subjects of lower social class were observed to be malnourished in contrast to 51.96% malnourished among subjects of middle social class. Malnutrition was

significantly associated with the social class of study subjects ( $p < 0.05$ ) (Table 6).

## DISCUSSION

### *Bio-social profile of study subjects*

A total of 390 under five children was studied. Out of these, there were 189 (48.46%) males and 201 (51.53%) females. Maximum (28.46%) study subjects were in the age group 48-60 months while minimum (10.77%) were in the age group of 0-12 months. In a study by Mohammed et al in Bangalore, out of the total study subjects, 49.4% were boys and 50.6% were girls.<sup>5</sup>

The majority (64.36%) of the study subjects belonged to nuclear family in our study. This was almost similar to the findings of Gupta et al, who reported that 57.28% subjects belonged to nuclear families.<sup>6</sup> In the present study, maximum (34.62%) study subjects had birth order 1 followed by 26.15% subjects with birth order 2.

Mothers of maximum study subjects (44.36%) were educated upto primary school, 38.72% mothers were illiterate, and 13.85% mothers were educated up to middle school. Fathers of maximum study subjects (32.31%) were educated up to middle school while 6.67% fathers were illiterate. Mohammed et al in Bangalore also reported similar findings as fathers of 10.2% study subjects were illiterate.<sup>5</sup>

### *Malnutrition-magnitude and pattern*

In the present study, 44.87% subjects had low height for age (31.28% stunting and 13.59% severe stunting), which is almost similar to the findings (46.06%) of Mittal A et al in a study in Patiala.<sup>7</sup>

This observation in the present study is also corroborated by Tushar et al in Mumbai and Singh et al in Bareilly, who respectively reported 43.68% and 43.22% children as stunted. In the present study the association between gender and height for age was not found to be significant.<sup>8,9</sup>

In the present study, according to WHO classification, low weight for height was reported in 20.76% subjects. Among these, 14.62% subjects were wasted while 6.15% had severe wasting. The findings of the present study are corroborated by NFHS-4 (2015-16), with 17.9% wasting in Uttar Pradesh.<sup>2</sup>

In the present study, 48.46% were malnourished as per the criteria of Mid Upper Arm Circumference (MUAC). Among these, 40.51% study subjects had mild to moderate malnutrition while 7.95% were severe malnutrition. Similar trend was reported in Agra by Chaturvedi et al with 53.2% malnourished subjects.<sup>10</sup> However, Fahmina et al in Varanasi and Mangala S et al

in Karnataka found malnutrition to be 42.9% and 42.2% respectively as per MUAC criteria.<sup>11,12</sup>

### *Malnutrition-correlates*

In the present study, the prevalence of malnutrition was highest (80%) in the age group of 12-24 months followed by 69.23% subjects in the age group of 24-36 months. This may be due to the reason that children in the study area might not have been given complementary food appropriately in terms of age, quantity and quality of food substances. Children in the age group of 0-12 months were least malnourished. Our findings are supported by Narkhede et al with maximum PEM in 13-24 months.<sup>13</sup> Studies by Kalia M et al in Punjab, Srivastava et al in Bareilly and Pant et al in Meerut also support the present result.<sup>14-16</sup>

In this study, as per WHO classification, no significant association was seen between sex of the child and nutritional status, though percentage of malnutrition was slightly more in female (53.73%) children as compared to males (53.44%). Similarly, no significant association was found by Narkhede et al in Nagpur and by Mohammed et al in Bangalore.<sup>13,5</sup> Almost similar figures were reported in Meerut by Singh et al who reported PEM to be 56.9% and 58.1% in males and females respectively.<sup>17</sup>

In the present study, among the children of illiterate mothers, 63.58% subjects had malnourished. No malnourished child was reported among subjects whose mothers were educated upto intermediate or above. This may be because of practice of favorable practice and behaviors among educated mothers with regard to child health and nutrition which ultimately affect the nutritional status of children. Mallik S et al and Singh A K et al found prevalence of PEM to be 60% and 63% among illiterate mothers.<sup>18,17</sup> Findings of Mittal A et al and Ahmad et al further supported the present result.<sup>7,19</sup>

In the present study, the association between education of father and malnutrition was not found to be statistically significant. Among subjects with illiterate fathers, 61.54% were malnourished while among graduate/post graduate fathers, only 16.67% subjects had malnourished. Similar association was also reported by Mallik S et al in Kolkata.<sup>18</sup>

In the current study, the prevalence of malnutrition was higher (64.25%) when the mothers were employed than among subjects whose mother were housewives (43.15%).

Thus, mother's engagement in some occupation adversely affected child's growth. This finding of our study compares well with the findings of Mittal A et al in Patiala who reported higher prevalence of PEM among study subjects with working mothers (46.15%) as compared to those with non-working mothers i.e. housewife (37.8%).<sup>7</sup> Similar figures were also reported



by Prasot et al in a study among 1-6 year children in Lucknow.<sup>20</sup> The risk of malnutrition was significantly higher among children with working mothers in a community based study conducted in urban slums of Bareilly.<sup>21</sup> Present study reveals that the prevalence of malnutrition was least (29.63%) with the first birth order and maximum (86.21%) with birth order 4 and above. Among children with birth order three 67.19% had malnourished. Thus, malnutrition tends to increase with increase in birth order.

The studies of Mohammed et al in Bangalore, Nale et al in Nashik and Prasot et al in Lucknow also revealed high prevalence of malnutrition, i.e. 53%, 58.7% and 45.4% PEM respectively in subjects of birth order  $\geq 3$ , thus corroborating the findings of the present study.<sup>5,8,20</sup>

The present study shows that malnutrition was most common (57.77%) among subjects of nuclear family and least common (44.12%) among subjects of extended family. This could be attributed to the fact that the children in our study area are nutritionally better cared for and looked after in joint family. Similar trend was reported by Srivastava et al in Bareilly and Prasot et al.<sup>15,20</sup> In Meerut, Singh et al also reported higher (63.8%) PEM among subjects of nuclear family.<sup>17</sup>

In the present study, the assessment of socioeconomic status was done on the basis of modified Kuppaswamy classification. It was observed that majority of the subjects (70.59%) of social class V had malnourished. Among subjects of class II, only 9.09% were malnourished. This distribution of malnutrition across socioeconomic strata in our study was found to be statistically significant. Mohammed et al, Pant et al and Prasot et al also reported significant association between the two.<sup>5,16,20</sup>

The reason for malnutrition being more prevalent among lower socioeconomic groups may be due to unavailability of food, insufficient purchasing power, inappropriate distribution and inadequate utilization which might make the children vulnerable to malnutrition in a deprived community.

## CONCLUSION

The nutritional status of children is dependent on maternal education and occupation and socioeconomic status. Nutrition education can have a significant effect in its reduction.

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