



## Prevalence of under-nutrition among children (1-5 years of age) and its association with various socio-demographic factors in Rohtak city, Haryana

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### Abstract

**Background:** Under nutrition refers to a pathological state resulting from a relative or absolute deficiency of one or more essential nutrients. The term under nutrition encompasses wasting, stunting and underweight. As per National Family Health Survey IV (2015-16), prevalence of stunting, wasting and underweight among under-five children in India is 38.4%, 21% and 35.7% respectively.

**Methods:** This cross-sectional study was conducted in an urban area of district Rohtak from July 2016 to June 2017 among 400 children (1-5 years of age) which were randomly selected from 14 anganwadi centers. The anthropometric measurement and nutritional status categorization among children was done using WHO guidelines.

**Results:** The prevalence of stunting, wasting and underweight to be 33.8%, 21.5% and 34.5% respectively. Under nutrition rates were found to be significantly higher in children whose mothers were illiterate, children belonging to SC category and children of lower and upper-lower socio-economic class.

**Conclusion:** It was revealed in this study that the prevalence of under nutrition was unacceptably high among the children. Every endeavor should be made to combat the under nutrition in children through multi-sectoral and multipronged approach.

**Keywords:** under nutrition, children, urban, nutrition.

### Introduction

Nutrition is defined as science of food and its relationship to health. It is concerned mainly with the part played by nutrients in body growth, development and maintenance.<sup>1</sup> Nutrition is a basic human need and a prerequisite to a healthy

life. Undernutrition refers to a pathological state resulting from a relative or absolute deficiency of one or more essential nutrients. Undernutrition signifies an imbalance between the supply of calories and the body's demand for them to ensure optimal growth and function.<sup>2</sup> The term

undernutrition encompasses wasting, stunting and underweight. Wasting is inadequate weight for height and it reflects acute undernutrition. Stunting is inadequate height for age and it reflects chronic undernutrition. Underweight is inadequate weight for age and is a composite measure of stunting and wasting. It can result from either acute or chronic or both. It is well acknowledged that investment in human resource development is a prerequisite for any nation to progress. Children of today are citizens of tomorrow, and hence improving nutritional status of children becomes extremely important. Early childhood, that is the first six years constitutes the most crucial period in life, when the foundations are laid for cognitive, social and emotional language, physical/motor development and cumulative lifelong learning.<sup>3</sup>

The United Nations Children Fund (UNICEF) conceptual framework of the determinants of child undernutrition defines the multifactorial causality of undernutrition. Nutritional status is influenced by three broad factors i.e. food, health and care. Food, health and care are affected by social, economic and political factors. The combination and relative importance of these factors differ from country to country.<sup>4</sup>

Globally, prevalence of underweight, stunting and wasting among under-five children is 14.4%, 22.9% and 7.7% respectively.<sup>5,6</sup> One in every three malnourished children of the world lives in India.<sup>7</sup> As per National Family Health Survey IV (2015-16), prevalence of stunting, wasting and underweight among under-five children in India is 38.4%, 21% and 35.7% respectively (corresponding to 48%, 19.8% and 42.5% respectively in NFHS III). In Haryana as per National Family Health Survey IV, 34%, 21.2%, 29.4% and 9% of children below five years suffer from stunting, wasting, underweight and severe wasting respectively (corresponding figure for NFHS III was 45.7%, 19.1%, 39.6% and 5% respectively).<sup>8,9</sup>

## Aim and Objectives

To estimate the prevalence of undernutrition among children (1-5 years) using anthropometric measurements and to determine the socio-demographic factors associated with undernutrition.

## Material and Methods

### Study Area

This study was carried out in urban field practice area of the Department of Community Medicine, Pt. B.D Sharma PGIMS, Rohtak. A total of 14 anganwadi centers were there under this area.

**Study Design:** descriptive study of cross-sectional design.

**Study Period:** July 2016 to June 2017.

**Study Population:** The study population consisted of children 1-5 years of age, registered at respective anganwadi centers and residing in the study area for more than six months, along with their mothers.

**Sample Size Determination:** In Haryana, the prevalence of underweight among under-five children was 29.4% (NFHS-4)<sup>29</sup>. The optimal sample size was 398 on the basis of 30% prevalence (approximate) of underweight children using the following formula,  $n = (1.96)^2 p(1-p) / d^2$ , where  $n$  = sample size,  $p$  = prevalence,  $d$  = allowable error i.e. 15% of  $p$ . [ $n = (1.96)^2 * 0.3 * 0.7 / 0.045^2$ ]. For the purpose of the study, a sample size of 400 subjects was taken.

### Exclusion Criteria

1. Those children whose mothers were not willing to give consent.
2. Children with known congenital anomalies.
3. If the subject could not be contacted on three consecutive visits.

### Sampling Technique

The total population of the study area, as per household survey conducted by MPHWS with assistance of anganwadi workers, was 25077 (as on March 2015). A total of 14 anganwadi centers come under the area being served by the 3 Urban

Health Posts. All the 14 anganwadi centers were selected for the study. From each selected anganwadi center, a list of 1-5 years of age children was prepared using anganwadi registers and 25 to 30 children were picked up from each anganwadi center, by simple random sampling (SRS) technique, to make a sample size of 400.

### Data Collection

A pre-designed, pre-tested and semi-structured interview schedule was used to collect information from the child's mother after taking informed consent. Weight of the children was measured by Salter's weighing scale with minimum clothing and without shoes. Height of the children was measured with the help of a non-flexible measuring tape, by making the child, after removing the shoes to stand on a flat surface with feet parallel and with heels, buttocks, shoulders and back of head touching the wall. The head was placed in Frankfurt's horizontal plane with arms hanging at sides in natural manner. The children were classified according to their nutritional status using WHO Child Growth Standards.

### Under nutrition Indices:<sup>10</sup>

- **Underweight:** If Z-score of children for a given weight for age is less than -2 SD from median of the WHO Child Growth Standards.
- **Stunting:** If Z-score of children for a given height for age is less than -2 SD from median of the WHO Child Growth Standards.
- **Wasting:** If Z-score of children for a given weight for height is less than -2 SD from median of the WHO Child Growth Standards.
- **Moderate undernutrition:** If Z-score of children for a given weight for age or height for age or weight for height are in between -3 SD or below -2 SD of the median of the WHO Child Growth Standards.

- **Severe undernutrition:** If Z-score of children for a given weight for age or height for age or weight for height are below -3 SD of the median of the WHO Child Growth Standards.

### Data Analysis

The data was entered in the MS EXCEL spread sheet, coded appropriately and cleansed for any possible typing error and then the data was analysed by chi-square statistical test using SPSS 20 (Statistical package for social sciences) software as per study objective. If the *P* value in Chi-square test was found <0.05 then the result was considered as significant.

### Results

The present study was carried out in urban field practice area of the Department of Community Medicine, Pt. B.D Sharma PGIMS, Rohtak and a total of 14 anganwadi centers are there under this area. All the 14 anganwadi centers were selected for the study. A sample size of 400 children were selected from these anganwadi centers using simple random sampling.

The present study included 58.8% boys and 41.2% girls, 98.0 % of children belonged to Hindu religion and only 2.0% belonged to Sikh religion. Out of all the children, 43.5% belonged to general caste while 34.2% and 22.3% belonged to OBC and SC category respectively. More than half of children belonged to nuclear family (52.8%) and nearly two-thirds of children (64.5%) belonged to families having family size up to 2.

Nearly three-fourth of the mothers were literate and only 18.5% of mothers were working. More than half of children belonged to Lower-middle and Upper-lower class (25.7% and 37.0% respectively) as per Modified Kuppuswamy scale for socioeconomic status. (table 1)

**Table 1:** Distribution of children by Socio-demographic characteristics

Characteristics	Frequency	Percentage
<b>Sex</b>		
Male	235	58.8
Female	165	41.2
<b>Religion</b>		
Hindu	392	98.0
Sikh	8	2.0
<b>Category</b>		
General	174	43.5
OBC	137	34.2
SC	89	22.3
<b>Type of family</b>		
Nuclear	211	52.8
Joint	135	33.7
3 <sup>rd</sup> generation	54	13.5
<b>Family size</b>		
Up to 2	258	64.5
3 or more	142	35.5
<b>Literacy status of mother</b>		
Illiterate	96	24.0
Primary or middle school	156	39.0
High school or senior secondary	91	22.8
Graduate or diploma or above	57	14.2
<b>Occupation of mother</b>		
Housewife	326	81.5
Working	74	18.5
<b>Socioeconomic status (Modified Kuppuswamy Scale)</b>		
Upper	33	8.3
Upper-middle	90	22.5
Lower-middle	103	25.7
Upper-lower	148	37.0
Lower	26	6.5

The prevalence of stunting was found to be **33.8%** (moderate stunting being 24.8% and severe wasting being 9.0%), prevalence of wasting was **21.5%** (moderate wasting being 13.5% and severe

wasting being 8.0%) and prevalence of underweight was **34.5%** (moderate underweight being 25.3% and severe underweight being 9.2%). (Table 2)

**Table 2:** Prevalence of undernutrition among children using WHO child growth standards

Characteristics	Boys (N=235)	Girls (N=165)	Total(N=400)	
	Frequency(%)	Frequency(%)	Frequency(%)	
<b>Height for age</b>				$\chi^2 = 0.005$ df= 2 p=0.997
No stunting	156 (66.4)	109 (66.1)	265 (66.2)	
Moderate stunting	58 (24.7)	41 (24.8)	99 (24.8)	
Severe stunting	21 (8.9)	15 (9.1)	36 (9.0)	
<b>Weight for height</b>				$\chi^2 = 0.049$ df = 2 p = 0.976
No wasting	185 (78.7)	129 (78.2)	314 (78.5)	
Moderate wasting	31 (13.2)	23 (13.9)	54 (13.5)	
Severe wasting	19 (8.1)	13 (7.9)	32 (8.0)	
<b>Weight for age</b>				$\chi^2 = 1.577$ df = 2 p = 0.454
No underweight	159 (67.6)	103 (62.4)	262 (65.5)	
Moderate underweight	54 (23.0)	47 (28.5)	101 (25.3)	
Severe underweight	22 (9.4)	15 (9.1)	37 (9.2)	

The present study showed that prevalence of stunting, wasting and underweight was higher in case of children belonging to SC category (39.3%,

28.1% and 46.1% respectively). This distribution was statistically significant. (Table 3)

**Table 3:** Association of nutritional status of children and caste-based categories

	No Stunting(n=265)	Moderate (n=99)	Severe (n=36)	$\chi^2= 13.674$ df = 4 p = 0.008
	Frequency (%)	Frequency (%)	Frequency (%)	
General (n=174)	116 (66.7)	43 (24.7)	15 (8.6)	
OBC (n=137)	95 (69.3)	37 (27.0)	5 (3.6)	
SC (n=89)	54 (60.7)	19 (21.3)	16 (18.0)	
	No wasting(n=314)	Moderate (n=54)	Severe (n=32)	$\chi^2= 11.597$ df = 4 p = 0.021
General (n=174)	140 (80.5)	21 (12.1)	13 (7.4)	
OBC (n=137)	110 (80.3)	22 (16.1)	5 (3.6)	
SC (n=89)	64 (71.9)	11 (12.4)	14 (15.7)	
	No underweight(n=262)	Moderate (n=101)	Severe (n=37)	$\chi^2= 14.970$ df = 4 p = 0.005
General (n=174)	116 (66.7)	42 (24.1)	16 (9.2)	
OBC (n=137)	98 (71.6)	34 (24.8)	5 (3.6)	
SC (n=89)	48 (53.9)	25 (28.1)	16 (18.0)	

The prevalence of stunting, wasting and underweight among children was found to be higher who had illiterate mothers (41.6%, 28.1% and 52.1% respectively) and lowest in mothers

having graduate degree or above (21.1%, 10.5% and 21.1% respectively). This distribution was found to be statistically significant. (Table 4)

**Table 4:** Association between nutritional status of children and education of mother

	No Stunting (n=265)	Moderate (n=99)	Severe (n=36)	$\chi^2=15.680$ df = 6 p = 0.016
Illiterate (n=96)	56 (58.4)	25 (26.0)	15 (15.6)	
Primary/middle(n=156)	101 (64.7)	47 (30.2)	8 (5.1)	
High/Sr. Sec.(n=91)	63 (69.2)	18 (19.8)	10 (11.0)	
Grad./dip./above(n=57)	45 (78.9)	9 (15.8)	3 (5.3)	
	No wasting(n=314)	Moderate (n=54)	Severe (n=32)	$\chi^2=15.084$ df = 6 p = 0.020
Illiterate (n=96)	69 (71.9)	13 (13.5)	14 (14.6)	
Primary/middle(n=156)	125 (80.2)	25 (16.0)	6 (3.8)	
High/Sr.Sec.(n=91)	69 (75.8)	12 (13.2)	10 (11.0)	
Grad./dip./above(n=57)	51 (89.5)	4 (7.0)	2 (3.5)	
	No underweight (n=262)	Moderate(n=101)	Severe (n=37)	$\chi^2=26.903$ df = 6 p = 0.000
Illiterate (n=96)	46 (47.9)	34 (35.4)	16 (16.7)	
Primary/middle(n=156)	104 (66.7)	44 (28.2)	8 (5.1)	
High/Sr.Sec. (n=91)	67 (73.6)	14 (15.4)	10 (11.0)	
Grad./dip./above(n=57)	45 (78.9)	9 (15.8)	3 (5.3)	

The prevalence of stunting, wasting and underweight was found to be higher in children of working mothers (40.5%, 24.3%, 39.2% respectively) as compared to children whose

mothers were housewives (32.2%, 20.9% and 33.4% respectively) but this difference was not found to be statistically significant. (Table 5)

**Table 5:** Association between nutritional status of children and occupation of mother

	No Stunting (n=265)	Moderate (n=99)	Severe (n=36)	
Housewife (n=326)	221 (67.8)	77 (23.6)	28 (8.6)	$\chi^2 = 1.873$ df = 2 p = 0.392
Working (n=74)	44 (59.5)	22 (29.7)	8 (10.8)	
	No wasting (n=314)	Moderate (n=54)	Severe (n=32)	
Housewife (n=326)	258 (79.1)	43 (13.2)	25 (7.7)	$\chi^2 = 0.459$ df = 2 p = 0.795
Working (n=74)	56 (75.7)	11 (14.9)	7 (9.4)	
	No underweight (n=262)	Moderate(n=101)	Severe (n=37)	
Housewife (n=326)	217 (66.6)	80 (24.5)	29 (8.9)	$\chi^2 = 0.896$ df = 2 p = 0.639
Working (n=74)	45 (60.8)	21 (28.4)	8 (10.8)	

The prevalence of stunting and underweight was found to be higher in children belonging to joint family (36.3% and 35.6% respectively) and prevalence of wasting was higher in children

belonging to 3<sup>rd</sup> generation family (27.8%). But this distribution was not found to be statistically significant for any of the three prevalence rates. (Table 6)

**Table 6:** Association between nutritional status of children and type of family

	No Stunting (n=265)	Moderate(n=99)	Severe (n=36)	
Nuclear (n=211)	138 (65.4)	55 (26.1)	18 (8.5)	$\chi^2 = 6.857$ df = 4 p = 0.144
Joint (n=135)	86 (63.7)	38 (28.1)	11 (8.2)	
3 <sup>rd</sup> gen. (n=54)	41 (75.9)	6 (11.1)	7 (13.0)	
	No wasting (n=314)	Moderate(n=54)	Severe (n=32)	
Nuclear (n=211)	165 (78.2)	29 (13.7)	17 (8.1)	$\chi^2 = 2.181$ df = 4 p = 0.703
Joint (n=135)	110 (81.5)	15 (11.1)	10 (7.4)	
3 <sup>rd</sup> gen. (n=54)	39 (72.2)	10 (18.5)	5 (9.3)	
	No underweight(n=262)	Moderate(n=101)	Severe (n=37)	
Nuclear (n=211)	138 (65.4)	55 (26.1)	18 (8.5)	$\chi^2 = 2.172$ df = 4 p = 0.704
Joint (n=135)	87 (64.4)	36 (26.7)	12 (8.9)	
3 <sup>rd</sup> gen. (n=54)	37 (68.5)	10 (18.5)	7 (13.0)	

The prevalence of stunting, wasting and underweight was found to be highest in children belonging to lower class SES (57.7%, 53.8% and 65.4% respectively), followed by children

belonging to upper-lower class SES (48.0%, 30.4% and 51.3% respectively). This distribution was found to be statistically significant. (Table 7)



**Table 7:** Association between nutritional status of children and socioeconomic status (Modified Kuppuswamy Scale)

	No	Moderate(n=99)	Severe (n=36)	$\chi^2= 61.989$ df = 8 p = 0.000
Upper (n=33)	29 (87.9)	4 (12.1)	0 (0.0)	
Upper-middle (n=90)	79 (87.8)	10 (11.1)	1 (1.1)	
Lower-middle (n=103)	69 (67.0)	27 (26.2)	7 (6.8)	
Upper-lower (n=148)	77 (52.0)	52 (35.2)	19 (12.8)	
Lower (n=26)	11 (42.3)	6 (23.1)	9 (34.6)	
	No wasting (n=314)	Moderate(n=54)	Severe (n=32)	$\chi^2= 49.418$ df = 8 p = 0.000
Upper (n=33)	32 (97.0)	1 (3.0)	0 (0.0)	
Upper-middle (n=90)	83 (92.2)	7 (7.8)	0 (0.0)	
Lower-middle (n=103)	84 (81.5)	14 (13.6)	5 (4.9)	
Upper-lower (n=148)	103 (69.6)	26 (17.6)	19 (12.8)	
Lower (n=26)	12 (46.2)	6 (23.1)	8 (30.7)	
	No underweight (n=262)	Moderate(n=101)	Severe (n=37)	$\chi^2= 82.372$ df = 8 p = 0.000
Upper (n=33)	31 (93.9)	2 (6.1)	0 (0.0)	
Upper-middle (n=90)	83 (92.2)	5 (5.6)	2 (2.2)	
Lower-middle (n=103)	67 (65.0)	29 (28.2)	7 (6.8)	
Upper-lower (n=148)	72 (48.7)	57 (38.5)	19 (12.8)	
Lower (n=26)	9 (34.6)	8 (30.8)	9 (34.6)	

The prevalence of stunting, wasting and underweight was found to be higher in children belonging to families having family size 3 or more (37.3%, 25.4% and 37.3% respectively) as

compared to children belonging to family having family size up to 2 (31.8%, 19.4% and 32.9% respectively) but this difference was not found to be statistically significant. (Table 8)

**Table 8:** Association between nutritional status of children and family size

	No Stunting (n=265)	Moderate (n=99)	Severe (n=36)	$\chi^2=1.382$ df = 2 p = 0.501
Up to 2 (n=258)	176 (68.2)	61 (23.7)	21 (8.1)	
3 or more (n=142)	89 (62.7)	38 (26.8)	15 (10.5)	
	No wasting (n=314)	Moderate (n=54)	Severe (n=32)	$\chi^2=2.015$ df = 2 p = 0.365
Up to 2 (n=258)	208 (80.6)	32 (12.4)	18 (7.0)	
3 or more (n=142)	106 (74.6)	22 (15.5)	14 (9.9)	
	No underweight (n=262)	Moderate (n=101)	Severe (n=37)	$\chi^2=1.294$ df = 2 p = 0.524
Up to 2 (n=258)	173 (67.1)	64 (24.8)	21 (8.1)	
3 or more (n=142)	89 (62.7)	37 (26.1)	16 (11.2)	

## Discussion

Prevalence of stunting in the present study was found to be 33.8% which was comparable with the studies of NFHS-4 (2015-16, Haryana)<sup>9</sup> (33.4%) and DLHS-4 (2012-13, Haryana)<sup>11</sup> (31.8%). The prevalence of wasting was found to be 21.5%.

Similar findings were observed in NFHS-4 (2015-16, Haryana)<sup>9</sup> (21.0%) but prevalence of wasting was found higher in DLHS-4 (2012-13, Haryana)<sup>11</sup> (30.3%). Prevalence of underweight was found to be 34.5% which was similar as found in DLHS-4 (2012-13, Haryana)<sup>11</sup> (32.9%)

but was higher as compared in NFHS-4 (2015-16, Haryana)<sup>9</sup> (28.5%).

Undernutrition rates were slightly higher among girls than the boys in the study. This difference might be due to presence of gender bias towards girls in the community. Similar results were found in the studies conducted by Yadav et al (2016, Haryana)<sup>12</sup> in which prevalence of underweight among girls and boys was 42.9% and 41.3% respectively and Ashok et al (2015, Karnataka)<sup>13</sup> in which prevalence of stunting, wasting and underweight among girls was 42.2%, 13.3% and 32.1% respectively and among boys, it was 42.1%, 15.1% and 30.5% respectively.

Prevalence of stunting, wasting and underweight was found to be higher in case of children belonging to SC category (39.3%, 28.1% and 46.1% respectively). The higher prevalence of undernutrition in the above mentioned social class might be due to poor socioeconomic conditions leading onto less awareness regarding food requirements among mothers belonging to this social class. Similar results were observed in the studies conducted by Sarkar (2016, West Bengal)<sup>14</sup>, Meshram et al (2016, Gujarat)<sup>15</sup> and Pant et al (2013, Uttar Pradesh)<sup>16</sup>. Prevalence of stunting, wasting and underweight was found to be highest in children belonging to lower class SES (57.7%, 53.8% and 65.4% respectively), followed by children belonging to upper-lower class SES (48.0%, 30.4% and 51.3% respectively). The literacy status, food habits and awareness about food requirements along with poor environmental conditions were the factors that might be responsible for these findings. Similar results were reported in the studies of Yadav et al (2016, Haryana)<sup>12</sup>, Purohit et al (2017, Maharashtra)<sup>17</sup> and Pant et al (2013, Uttar Pradesh)<sup>16</sup>. Prevalence of stunting, wasting and underweight was found to be highest among children whose mothers were illiterate (41.6%, 28.1% and 52.1% respectively). The higher education of mothers increased their awareness about the nutritional needs of children and enhanced their capability to adequately look after

their nutritional and health needs. Similar results were reported in the studies of Purohit et al (2017, Maharashtra)<sup>17</sup> and Pant et al (2013, Uttar Pradesh)<sup>16</sup>. Prevalence of stunting, wasting and underweight was found to be higher in children of working mothers (40.5%, 24.3%, 39.2% respectively). The study conducted by Damor et al (2013, Gujarat)<sup>18</sup> showed similar findings in which, prevalence of undernutrition was higher in the children of working mothers (57.8%). This might be due to lack of time for adequate care and feeding practices among working mothers.

Prevalence of stunting and underweight was found to be higher in children belonging to joint family (36.3% and 35.6% respectively) and prevalence of wasting was higher in children belonging to 3<sup>rd</sup> generation family (27.8%). This difference might be due to the reason that in joint families, less attention is given towards younger children for feeding them and their food requirements. Similar findings were observed in the studies conducted by Sengupta et al (2010, Punjab)<sup>19</sup>, Purohit et al (2017, Maharashtra)<sup>17</sup> and Mamulwar et al (2014, Maharashtra)<sup>20</sup>. Prevalence of undernutrition was increasing with the family size i.e. family size of 3 or more had higher prevalence of stunting, wasting and underweight (37.3%, 25.4% and 37.3% respectively). This might be due to less attention given to individual child by mother in a family with increased family size. Similar results were obtained in the studies conducted by Ashok et al (2015, Karnataka)<sup>13</sup>, Meshram et al (2016, Gujarat)<sup>15</sup> and Bhavsar et al (2012, Maharashtra)<sup>21</sup>.

### Limitation

In the present study, children aged 1-5 years were included to improve the participation of study subjects and reduce non-response rate, as participation of recently delivered mothers including infants in the study was difficult.

### Conclusion and Recommendation

It is the health status of children that represents the overall health status of the people of country.



Since this growing generation is going to be the future working citizens of the country, they should be healthy enough to make use of the full potential of their productive age.

It was revealed in this study that the prevalence of undernutrition was unacceptably high among the children. Every endeavor should be made to combat the undernutrition in children through multi-sectoral and multipronged approach such as nutritional education of mothers, growth monitoring, nutritional supplementation, nutritional rehabilitation and early diagnosis and treatment of morbidity besides providing environment conducive to health. A collective attempt by the government, non-governmental organizations and the community is crucial to decrease the load of undernutrition among children. There is urgent need for strengthening of the existing public health interventions and programs to tackle this problem of under nutrition amongst the most vulnerable population of our country.

**Conflict of interest:** None declared

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