

## Original Research Article

# Nutritional status of under- five children in a city of Maharashtra: a community based study

Laxmikant Purohit<sup>1</sup>, Priyanka Sahu<sup>2\*</sup>, Lata B. Godale<sup>3</sup>

<sup>1</sup>Department of Community Medicine, National Institute of Medical Sciences, Jaipur, Rajasthan India

<sup>2</sup>Department of Community Medicine, Raipur Institute of Medical Sciences, Raipur, India

<sup>3</sup>Department of Community Medicine, Malla Reddy Medical College for Women, Hyderabad, Telangana, India

**Received:** 01 February 2017

**Accepted:** 03 March 2017

### \*Correspondence:

Dr. Priyanka Sahu,

E-mail: piyusahu13@gmail.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## ABSTRACT

**Background:** Children are considered to be the backbone of any nation. Nutritional problems among children cause major morbidity and mortality in India. India is home to the largest number of underweight and stunted children in the world. Aim and objectives: 1) To assess prevalence of underweight, stunting and wasting among under-five children 2) To study factors associated with underweight, stunting and wasting among under-five children

**Methods:** It was community based descriptive cross sectional study conducted during January 2010 to December 2011 at Urban Health Center of the Department of Preventive and Social Medicine catering approximately 27000 populations. 650 under- fives residing in urban field practice area were included in the study with the help of Stratified random sampling technique. Data was analyzed using SPSS software 16 version and OpenEpi Software Version 2.3.

**Results:** 40.46% under five children were stunted, 38.15% were underweight, and 16% were wasted. The difference observed between stunted and normal study subjects with reference to type of family, education of mother, birth weight and birth order were statistically significant. The proportion of under- five children with underweight showed significant association with their age, socioeconomic status, education mother, birth weight and birth order. Proportion of under-five children with SAM and MAM decreased significantly with increase in education status of mother. Significantly higher proportion of under-five children with birth weight less than 2.5 kg and higher birth order were grouped as SAM and MAM.

**Conclusions:** Maternal education, birth weight and birth order of children were significantly associated with all three types of under nutrition i.e. underweight, stunting and wasting. Proportion of children with underweight increases significantly with increase in age and decrease in socioeconomic status. There was no religion wise or gender wise variation in proportion of children with under nutrition was reported among study subjects.

**Keywords:** Stunting, Underweight, Wasting

## INTRODUCTION

Malnutrition in India has been called 'The Silent Emergency'.<sup>1</sup> This is reflected by the fact that the prevalence of under-weight children in India is among the highest in the world, and is nearly double that of Sub-Saharan Africa. Each year approximately 2.3 million deaths among 6-60 months aged children in developing

countries are associated with malnutrition, which is about 41% of the total deaths in this age group.<sup>2</sup>

India is committed to halving the prevalence of underweight children by 2015 as one of the key indicators of progress towards the Millennium Development Goal (MGD). In spite of unprecedented economic growth, improvements in childhood nutritional status in India over the last decade have been slow.<sup>1</sup> Still

in India, the prevalence of stunting among under five is 48% and wasting is 19.8% and with an underweight prevalence of 42.5%.<sup>3</sup>

Nutrition is a key determinant of good health and is critical for survival, good quality of life and well-being.<sup>4</sup> Adequate nutrition is essential in early childhood to ensure healthy growth, proper organ formation and function, a strong immune system, and neurological and cognitive development. Child malnutrition impacts cognitive function and contributes to poverty through impeding individuals' ability to lead productive lives.<sup>5</sup>

Maternal nutritional status has a direct relation to the child's nutritional status. An undernourished mother gives birth to a low birth weight baby who grows up with compromised feeding and infections to a stunted child and adolescent and carries this vicious life cycle approach by giving birth to an underweight child. Undernutrition is more common in the lower income groups and even if malnutrition is present in the upper income group, it is limited to the milder forms. Appropriate child feeding behaviour goes a long way in preventing and overcoming malnutrition and determining a child's growth.<sup>3</sup>

Nutritional status plays a vital role in deciding the health status particularly in children. Accurate assessment of nutritional status is indispensable to planning, implementation and evaluation of nutrition interventions. So the present study to assess nutritional status of under-fives was planned.

The objectives of the study *was* to assess prevalence of underweight, stunting and wasting among under-five children and to study factors associated with underweight, stunting and wasting among under-five children

## **METHODS**

### ***Study design***

It was community based descriptive cross sectional study.

### ***Study period***

January 2010 to December 2011.

### ***Study area and study population***

The study was undertaken in Urban Health Training Centre of the Department of Preventive and Social Medicine, located in Guru Nanak Chowk opposite to Sadhu Vaswani Garden which is 2 kms away from medical college. It caters approximately 27000 population having 16,600 slum population and 10,276 non-slum population. 400 under-fives residing in slum areas and 250 under-fives residing in non-slum areas in urban field practice area were included in the study.

### ***Sample size calculation***

The sample size 650 was estimated by using formula at 95% Confidence interval,  $N = (Z_{1-\alpha/2})^2 PQ / L^2$  with prevalence of Underweight Children<sup>7</sup> 43%, 10% allowable error with addition of 20% non-response rate.

### ***Sampling technique***

Stratified random sampling technique was used to select 650 under-fives from slum and Non-slum area proportionately (i.e. 400 from slum & 250 from Non-slum area) Simple random sampling was used to select an individual for the study among eligible family members.

### ***Inclusion criteria***

Children under the age of 5 years accompanied by mothers and are living in the same area for past 1 year or more.

### ***Exclusion criteria***

Children living in the study area for less than 1 year

### ***Pilot study***

A pilot study was done on 50 respondents. Some necessary modifications were made after analyzing the responses. The questionnaire was thus finalized. The data obtained in the pilot study was not included in the final analysis.

### ***Data collection***

Institute Ethical committee approval was taken prior to the study. Data was collected using a semi structured and pre-designed questionnaire schedule by personal interview method. Written informed consent was obtained prior to the study which was signed by the mothers and interviewer. For identification and initial contact, the help of medical social worker and anganwadi workers was obtained to minimize the non-response.

Children with length/Height-for-age below -2 standard deviations (SD) of the WHO standards<sup>8,9</sup> were labelled as stunted and children with weight-for-age below -2 standard deviations (SD) of the WHO standards were identified as underweight.<sup>9,10</sup> Weight-for-height of below -3 standard deviations (SD) of the WHO standards was used to identify infants and children as having severe acute malnutrition (SAM)<sup>11</sup> and weight-for-height between -2 and -3 standard deviations (SD) of the WHO standards is used to identify infants and children as having moderate acute malnutrition (MAM).<sup>12</sup>

### ***Study tools***

a) Pre-designed interview schedule consisting of standard questions related to socio-demographic factors,

environmental conditions and birth history. In addition, questionnaire also included questions on past and present medical history, followed by general and systemic examination and investigations.

b) The weight measurements were recorded to the nearest 100 g using Salter’s weighing apparatus and standard weighing machine.

c) The height of the children was recorded to the nearest 0.1 cm using anthropometric height rod. For children below 24 months of age, length was measured using infantometer.

**Data analysis**

Data was analyzed using SPSS software 16 version and OpenEpi Software Version 2.3.

**Reference citing**

Vancouver system of listing and citing of references is used. As per this system, the references are numbered and

listed consecutively in the order in which they are first cited in the text.<sup>13</sup>

**RESULTS**

**Socio-demographic profile of under-five children**

Among 650 children, 405(62.31%) were under 36 months ago while 245 (37.69%) were from 36 – 60 months age group. 345(53.08%) were male while 305(46.92%) were females. Majority 317(4.79%) children were Hindu by religion followed by 27(42.76%) Muslims. Around 60% children were very poor belonging to Class V (BG Prasad classification) socioeconomic status. Majority 392(60.32%) mothers interviewed had taken education up to SSC. Out of 638 children 188(29.47%) were low birth weight babies while 450 (70.53%) children had normal birth weight. History of birth weight of 12 children could not be elicited. Maximum i.e. 324(49.85%) children were of first birth order and minimum i.e.3 (0.46%) children of birth order five as shown in Table 1.

**Table 1: Socio-demographic profile of under five children (n – 650).**

Variables	No. of under five	Percentages (%)	
<b>Age (months)</b>	0-12 months	133	20.46
	12-24 months	140	21.54
	24-36 months	132	20.31
	36-48 months	112	17.23
	48-60 months	133	20.46
<b>Gender</b>	Male	345	53.08
	Female	305	46.92
<b>Religion</b>	Hindu	317	48.79
	Muslim	278	42.76
	Buddhist	45	06.92
	Christian	10	01.53
<b>Type of family</b>	Nuclear	383	58.90
	Joint	262	40.30
	Broken	5	00.80
<b>Socioeconomic status</b>	Class I	8	01.23
	Class II	6	00.92
	Class III	30	04.61
	Class IV	170	26.15
	Class V	436	67.09
<b>Education of parent</b>	Illiterate	44	06.77
	Primary	51	07.84
	Secondary	392	60.32
	Higher-secondary	80	12.30
	Graduate	52	08.00
	Post-graduate	31	04.77
<b>Birth weight</b>	<2.5 Kg	188	29.47
	≥2.5 Kg	450	70.53
<b>Birth order</b>	First	324	49.85
	Second	255	39.23
	Third	58	08.92
	Fourth	10	01.54
	Fifth	3	00.46

**Table 2: Factors associated with stunting among under five children.**

Variables	Nutritional status		Total	Chi square	p value
	Stunted	Normal			
Age (Months)	0-12	47(35.34)	86(64.66)	2.38	> 0.05
	12-24	59(42.14)	81(57.86)		
	24-36	57(43.18)	75(56.82)		
	36-48	48(42.86)	64(57.14)		
	48-60	52(39.10)	81(60.90)		
Type of family	Nuclear	140(36.55)	243(63.45)	6.32	< 0.05
	Joint	120(45.80)	142(54.20)		
	Broken	3(60.00)	2(40.00)		
Education of parents	Illiterate	25(56.82)	19(43.18)	13.57	< 0.05
	Primary	28(54.90)	23(45.10)		
	Secondary	155(39.54)	237(60.46)		
	Higher sec.	28(35.00)	52(65.00)		
	Graduate	19(36.54)	33(63.46)		
	postgraduate	8(25.81)	23(74.19)		
Birth Weight	<2.5 Kg	88(46.81)	100(53.19)	4.04	<0.05
	≥2.5 Kg	172(38.22)	278(61.78)		
Birth order	First	112(34.57)	212(65.43)	20.19	<0.01
	Second	109(42.75)	146(57.25)		
	Third	31(53.45)	27(46.55)		
	Fourth	8(80.00)	2(20.00)		
	Fifth	3(100.00)	0(00.00)		

**Table 3: Factors associated with underweight among under five children.**

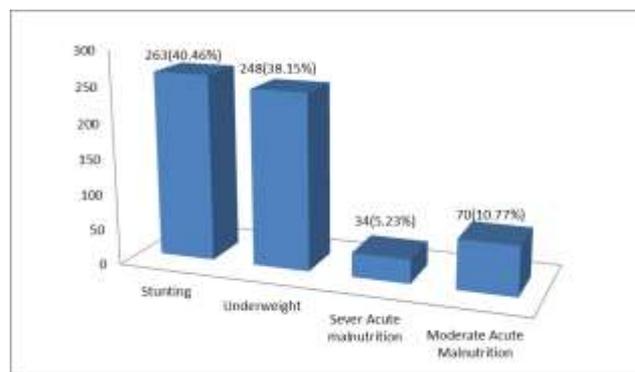
Variables	Nutritional status		Total	Chi square	p value
	Underweight	Normal			
Age (Months)	0-12	41(30.83)	92(69.17)	14.1	< 0.01
	12-24	41(29.29)	99(70.71)		
	24-36	54(40.91)	78(59.09)		
	36-48	52(46.43)	60(53.57)		
	48-60	60(45.11)	73(54.89)		
Socioeconomic status	I	1(12.50)	7(87.50)	15.54	<0.01
	II	1(16.67)	5(83.33)		
	III	7(23.33)	23(76.67)		
	IV	51(30.00)	119(70.00)		
	V	188(43.12)	248(56.88)		
Education of parent	Illiterate	23(52.27)	21(47.73)	14.5	<0.05
	Primary	24(47.06)	27(52.94)		
	Secondary	156(39.80)	236(60.20)		
	Higher sec.	21(26.25)	59(73.75)		
	Graduate	17(32.69)	35(67.31)		
	postgraduate	7(22.58)	24(77.42)		
Birth weight	<2.5 Kg	89(47.34)	99(52.66)	9.33	< 0.01
	≥2.5 Kg	155(34.44)	295(65.56)		
Birth order	First	101(31.17)	223(68.83)	19.34	< 0.01
	Second	107(41.96)	148(58.04)		
	Third	31(53.45)	27(46.55)		
	Fourth	7(70.00)	3(30.00)		
	Fifth	2(66.67)	1(33.33)		

**Table 4: Factors associated with SAM and MAM among under five children.**

Variables	Nutritional status			Total	Chi square	p value
	SAM	MAM	Normal			
Age (months)	0-12	4(3.01)	11(8.27)	118(88.72)	7.52	>0.05
	12-24	6(4.29)	12(8.57)	122(87.14)		
	24-36	6(4.55)	15(11.36)	111(84.09)		
	36-48	8(7.14)	14(12.50)	90(80.36)		
	48-60	10(7.52)	18(13.53)	105(78.95)		
Education of parents	Illiterate	5(11.36)	6(13.64)	33(75.00)	19.15	<0.05
	Primary	5(9.80)	7(13.73)	39(76.47)		
	Secondary	22(5.62)	48(12.24)	322(82.14)		
	Higher sec.	2(2.50)	4(5.00)	74(92.50)		
	Graduate	0(00.00)	3(5.77)	49(94.23)		
	Postgraduate	0(00.00)	2(6.45)	29(93.55)		
Birth weight	<2.5 Kg	15(7.98)	25(13.30)	148(78.72)	6.14	<0.05
	≥2.5 Kg	19(4.22)	43(9.56)	388(86.22)		
Birth order	First	11(3.40)	28(8.64)	285(87.96)	18.5	<0.05
	Second	16(6.27)	32(12.55)	207(81.18)		
	Third	4(6.90)	7(12.07)	47(81.03)		
	Fourth	2(20.00)	2(20.00)	6(60.00)		
	Fifth	1(33.33)	1(33.33)	1(33.34)		

**Under nutrition among under-five children**

Among 650 study subjects, 263 (40.46%) under five children were stunted, 248 (38.15%) were underweight, 104 (16.00%) were wasted i.e. 34(5.23%) were having Severe acute malnutrition (SAM) and 70(10.77%) were having Moderate acute malnutrition (MAM) as shown in Figure 1.



**Figure 1: Distribution of under nutrition among under-five children (n – 650).**

**Factors associated with stunting among under five children**

The difference observed between stunted and normal study subjects with reference to type of family, education of interviewed parents, birth weight and birth order were statistically significant. There was no significant association between age, gender, religion and

socioeconomic status and stunting among study subject as shown in Table 2.

**Factor associated with underweight among under five children**

The proportion of under five children with underweight showed statistically significant association with their age, socioeconomic status, education of interviewed parent, birth weight and birth order. Gender, religion and type of family were not significantly associated with underweight among under five children as shown in Table 3.

**Factor associated with SAM and MAM among under five children**

Proportion of underfive children with SAM and MAM decreased significantly with increase in education status of interviewed parents. Significantly higher proportion of under five children with birth weight less than 2.5 kg and higher birth order were grouped as SAM and MAM. Age, gender, religion, socioeconomic status and type of family in underfive children were not significantly associated with SAM and MAM as shown in Table 4.

**DISCUSSION**

India accounts for more than 3 out of every 10 stunted children in the world. More than one third of the world’s children who are wasted live in India.<sup>14</sup>

In present study, we tried to explain child malnutrition in terms of underweight status, stunting, and wasting, aiming to evaluate the association of these indicators with

their socio-demographic characteristics. The study findings revealed that the prevalence of underweight status, stunting, and wasting among under five children were 38%, 40%, and 16% respectively, which were slightly less than the national average (i.e., 42%, 48% and 20%) established by NFHS-3.<sup>7</sup> In line with the findings observed by existing research carried out in India, present study also concluded stunting as the most common form of malnutrition among children under the age of five, followed by underweight status and wasting.<sup>7, 15-18</sup>

### **Stunting**

Stunting indicating chronic malnutrition accounted for around 40.46% of total undernutrition among under five children residing in study area. Different studies conducted by Mittal et al, Dey I and Chaudhuri, Bisai et al, Rao et al Bhandari and Choudhary in urban areas of various places in India also reported prevalence of stunting ranging from 40 – 50% among under five children.<sup>15,19-22</sup> This creates a picture of concern and need of immediate attention to reduce burden of a nutritional problem country is facing from long way.

### **Underweight**

The percentage of children who were underweight (38.15%) is less as compared to similar studies carried out at slums of other parts of the country (Delhi 61.83%, Wardha 58.8%). In few studies conducted by Harishankar et al and Das et al, the prevalence of underweight children was lower as compared to the present study.<sup>23-26</sup>

### **Wasting**

Wasting was prevalent in 16% of our study subjects, among which 5.23% were suffering from severe acute malnutrition (SAM) and 10.77% were with Moderate acute malnutrition. Two similar studies conducted at Maharashtra (Mamulwar et al at Pimpri area of Pune, and Das et al at Mumbai) also reported that 17 percent of under five children were victim of wasting and labelled as SAM and MAM.<sup>26,27</sup> Prevalence of wasting higher than our study was reported in studies by Bisai et al (24%) and Dey and Choudhary (38.8%).<sup>20,21</sup>

### **Factors associated with under nutrition**

#### **Age**

In present study, as age increased, proportion of children with underweight also increased and the association was statistically significant. In contrast, stunting and wasting were not significantly related with age of children. A community based study by Sanjit Sarkar at Bankura district of West Bengal reported positive association between age of children and stunting, wasting and underweight. Harishankar et al observed no significant

relationship between age and underweight, which goes in favour of our study.<sup>17,25</sup>

#### **Gender and religion**

The present study failed to report any significant gender differentials in the prevalence of underweight status, stunting, and wasting among children which was similar to the findings revealed by certain studies<sup>17,19,28</sup> concluded positive significance of gender with stunting while no significance with wasting while studies by Banarjee B and Bandyopadhyay & Swami reported statistically significant association of gender and underweight status in contrast to our study.<sup>29,30</sup> Prevalence of underweight status, stunting, and wasting among children did not differ with respect to religion. Sanjit Sarkar and Deshpande et al also revealed no religion wise difference in prevalence of undernutrition supporting the result of present study.<sup>17,31</sup>

#### **Education & Socioeconomic status of parent**

Proportions of children with stunting, wasting and underweight were significantly more among parents who were less educated. This finding of present study is supported by Kumar D. in case of stunting and underweight, Mittal and Giashuddin in relation to stunting and Swami and Deshpande in association with underweight.<sup>19,30-32</sup> Megha Mamulwar revealed findings in contrast with present study.<sup>27</sup> A statistically significant association between low socioeconomic status and underweight in present study goes in hand in hand with various studies carried out in different part of India.<sup>28,31,32</sup>

#### **Birth weight and birth order**

Children with birth weight less than 2.5 kg and higher birth order were significantly more stunted, underweight and wasted. Among stunted children, similar significant associations were revealed by Sayed and Megha Mamulwar with birth order and Paul et al and Hien et al with birth weight.<sup>27,33-35</sup> Certain studies also quoted findings in favour of association of underweight with birth weight and birth order.<sup>20,25,27</sup>

Thus this paper concludes that prevalence of underweight, stunting and wasting were (38.15%), (40.46%) and (16.00% respectively). 5.23% children were suffering from Severe Acute Malnutrition while 10.77% were having moderate acute malnutrition.

Maternal education, birth weight and birth order of children were significantly associated with all three types of under nutrition i.e. underweight, stunting and wasting. Proportion of children with underweight increases significantly with increase in age and decrease in socioeconomic status. There was no religion wise or gender wise variation in proportion of children with under nutrition was reported among study subjects.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

1. USAID India. Factsheet on Child and Maternal Nutrition in India. Available at: [http://pdf.usaid.gov/pdf\\_docs/Pnadm627.pdf](http://pdf.usaid.gov/pdf_docs/Pnadm627.pdf) Assessed on 12th January 2017.
2. Sahu SK, Kumar SG, Bhat BV, Premarajan KC, Sarkar S, Roy G, et al. Malnutrition among under-five children in India and strategies for control. *J Nat Sc Biol Med*. 2015;6:18-23.
3. Bhutia BT. Protein Energy Malnutrition in India: The Plight of Our Under Five Children. *J Family Med Prim Care*. 2014;3(1):63-7.
4. Jayachandran U. Maharashtra Human Development Report, towards inclusive Human Development. New Delhi, India: SAGE Publication; 2012. Available at: [http://niti.gov.in/writereaddata/files/humandevlopment/Maharashtra%20State%20Hum an%20Development%20Report%202012.pdf](http://niti.gov.in/writereaddata/files/humandevlopment/Maharashtra%20State%20Human%20Development%20Report%202012.pdf) Assessed on 12 January 2017.
5. United Nations Children's Fund, World Health Organization. Levels and trends in child malnutrition: UNICEF-WHO-The World Bank joint child malnutrition estimates. (UNICEF, New York; WHO, Geneva; The World Bank, Washington, DC; 2012). Available at: <http://www.who.int/nutgrowthdb/cover.pdf>. Assessed on 12 January 2017.
6. Lwanga SK, Lemeshow S, A practice manual of sample size determination in health studies. Geneva: World Health Organization. 1991: 25-26.
7. International Institute for Population Sciences. (2005-2007). National Family Health Survey (NFHS-3). International Institute for Population Sciences, Mumbai.
8. Training course on child growth assessment: WHO child growth standards, A-introduction:8. Available at [http://whqlibdoc.who.int/publications/2008/9789241595070\\_A\\_eng.pdf](http://whqlibdoc.who.int/publications/2008/9789241595070_A_eng.pdf). Assessed on 12 January 2017.
9. WHO Child Growth Standards Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age Methods and development. Available from [http://www.who.int/childgrowth/publications/technical\\_report\\_pub/en/index.html](http://www.who.int/childgrowth/publications/technical_report_pub/en/index.html) Assessed on 22 January 2017.
10. Training course on child growth assessment: WHO child growth standards, A-introduction:9. Available from: URL: [http://whqlibdoc.who.int/publications/2008/9789241595070\\_A\\_eng.pdf](http://whqlibdoc.who.int/publications/2008/9789241595070_A_eng.pdf) Assessed on 7 January 2017.
11. WHO child growth standards and the identification of severe acute malnutrition in infants and children. A Joint Statement by the World Health Organization and the United Nations Children's Fund: 2. Available at: URL: <http://www.unicef.org/nutrition/files/stmtchild growth sam final.pdf>. Assessed on 12 January 2017.
12. Taking action nutrition for survival, growth and development: Available at <http://www.who.int/pmnch/topics/child/acf whitepaper.pdf>. Assessed on 2 January 2009.
13. Raghuvver CV, Ramnarayan K. The Art and Science of Writing Post Graduate Dissertation. *J Assoc Physicians India*. 1997;45(5):400-3.
14. UNICEF, India, Nutrition Introduction. Available from: URL: <http://www.unicef.org/india/nutrition.html>. Assessed on 19 January 2017.
15. Bhandari D, Choudhary SK. An epidemiological study of health and nutritional status of under five children in semi-urban community of Gujarat. *Indian J Public Health*. 2006;50(4):213-9.
16. Bhadoria AS, Sareen N, Kapil U. Prevalence of underweight, stunting and wasting among children in urban slums of Delhi. *Int J Nutrition Pharmacol, Neurol Dis*. 2013;3(3):323-4.
17. Sarkar S. Cross-sectional study of child malnutrition and associated risk factors among children aged under five in West Bengal, India. *Int J Population Studies*. 2016;2(1):89-102.
18. Singh MB, Fotedar R, Lakshminarayana J, et al. Studies on the nutritional status of children aged 0-5 years in a drought affected desert area of western Rajasthan. India. *Public Health Nutrition*. 2006;9(8):961-7.
19. Mittal A, Singh J, Ahluwalia SK. Effect of Maternal Factors on Nutritional Status of 1-5-Year-Old Children in Urban Slum Population. *Indian J Community Med*. 2007;32(4):264-7.
20. Dey I, Chaudhuri RN. Gender Inequality in Nutritional Status among under Five Children in a Village in Hooghly District, West Bengal. *Indian J Public Health*. 2008;52(4):218-20.
21. Bisai S, Bose K, Ghosh A. Nutritional Status of Lodha Children in a Village of Paschim Medinipur District, West Bengal. *Indian J Public Health*. 2008;52(4):203-6.
22. Rao VG, Yadav R, Dolla CK, Kumar S, Bhoneley MK, Ukey M. Undernutrition & childhood morbidities among tribal preschool children. *Indian Journal of Medical Research*. 2005;122(1):43-7.
23. Aggarwal OP, Indrayan A, Rao SS, Gupta P, Grover V, Chuttani CS. Weight pattern of pre-school children in a rural area of Delhi. *Indian J Pediatr*. 1983;50(405):367-70.
24. Sinha N, Deshmukh PR, Garg BS. Epidemiological correlates of nutritional anemia among children (6-35 months) in rural Wardha, Central India. *Indian J Med Sci*. 2008;62(2):45-54.
25. Harishankar, Dwivedi S, Dabral SB, Walia DK. Nutritional status of children under 6 years of age. *Indian J Prev Soc Med*. 2004;35(3&4):156-62.
26. Das S, Bapat U, More NS, Alcock G, Fernandez A, Osrin A. Nutritional status of young children in Mumbai slums: A follow-up anthropometric study. *Nutr J*. 2012;11:100.

27. Mamulwar MS, Rathod HK, Jethani S, Dhone A, Bakshi T, Lanjewar B, et al. Nutritional status of under-five children in urban slums of Pune. *Int J Med Public Health*. 2014;4:247-52.
28. Kumar D, Goel NK, Poonam C. Mittal, Misra P. Influence of Infant-feeding Practices on Nutritional Status of Under-five Children. *Indian J Pediatr*. 2006;73(5):417-21.
29. Banerjee B, Bandyopadhyay L. Gender Differences in Nutritional Status. *Indian Pediatr*. 2005;42(4):400.
30. Swami HM, Thakur JS, Bhatia SPS, Singh K, Bhan VK, Bhatia V. National Immunization Day to Assess Nutritional Status of Underfives in Chandigarh. *Indian J Pediatr*. 2000;67(1):15-7.
31. Deshpande JD, Giri PA, Phalke DB, Phalke VD, Kalakoti P, Syed MMA. Socio-cultural practices in relation to breastfeeding, weaning and child rearing among Indian mothers and assessment of nutritional status of children under five in rural India. *Australasian Med J*. 2010;3(9):618-24.
32. Giashuddin MS, Kabir M, Rahman A, Hannan MA. Exclusive Breastfeeding and Nutritional Status in Bangladesh. *Indian J Pediatr*. 2003;70(6):471-5.
33. Sayed NE, Mohamed AG, Nofal L, Mahfouz A, Zeid HA. Malnutrition among Pre-school Children in Alexandria, Egypt. *J Health Population Nutr*. 2001;19(4):275-80.
34. Paul VK, Sachdev HS, Mavalankar D, Ramachandran P, Sankar MJ, Bhandari N, et al. Reproductive health, and child health and nutrition in India: meeting the challenge. *Lancet*. 2011;377(9762):332-49.
35. Hien NN, Hoa NN. Nutritional Status and Determinants of Malnutrition in Children under Three Years of Age in Nghean, Vietnam. *Pak J Nutr*. 2009;8(7): 958-64.

**Cite this article as:** Purohit L, Sahu P, Godale LB. Nutritional status of under- five children in a city of Maharashtra: a community based study. *Int J Community Med Public Health* 2017;4:1171-8.