Original Research Article

Assessment of prevalence and epidemiological determinants of undernutrition in children of 6-60 months of the age in an urban slum of Mumbai, India

Pankaj Kumar, R. Kembhavi, Prahatheeswaran G.*

Department of Community Medicine, Seth G.S. Medical College & K. E.M. Hospital, Parel, Mumbai, Maharashtra, India

*Correspondence:
Dr. Prahatheeswaran G.,
E-mail: drprahath@gmail.com

ABSTRACT

Background: In urban slums, several socio-demographic factors contribute for the occurrence of undernutrition in children of 6-60 months of the age, this study aims at Assessment of prevalence of undernutrition in children of 6-60 months of the age in an urban slum of Mumbai and to study associated factors.
Methods: A cross-sectional study was conducted in Urban Slum which is a field practice area of institution. Children of 6-60 months of the age were included in the study and information was gathered by interviewing parents/caretakers and anthropometric measurement of all children confirming to the inclusion criteria were recorded. Data was analysed with SPSS v.22.0 with suitable tests.
Results: Prevalence of undernutrition was found 50.6%, more per cent of undernutrition was found in 25-60 months age 100 (54.1%), 90 (53.3%) girls, 132 (51%) nuclear family dwellers, in 43 (64.2%) children whose mothers got married <18 years age. 88 (71.5%) children with undernutrition belonged to Class IV, (B.G Prasad classification), statistically significant association of undernutrition was found with the factors age of child, mother's education, birth order, birth weight, immunisation status, mother's age at marriage, exclusive breast feeding, history of acute respiratory infection (ARI) and diarrhoea, and socio-economic status.
Conclusions: Study found certain socio-demographic factors like age, gender and birth order of child, type of family, age of mother during marriage and her literacy level, exclusive breast feeding, immunisation and frequency of ARI and diarrhoea associated with undernutrition.

Keywords: Children of 6-60 months of the age, Mumbai, Undernutrition, Urban slum

INTRODUCTION

Health is the basic requirement of any society to develop and progress. Growth and development of any country is reflected by growth and development of its children. Health of children is most important for nation's future development.[1]

It is now being recognized that the great majority of malnourished children (other than those born with low birth weight) become malnourished within from 6 months to 2 years of age. There is evidence from all over India suggests that growth curve of many infants begin to falter as early as the four months of life. This coincides with the time when foods other than breast milk are generally introduced into the diet.[2]

Malnutrition at the early stages of life can lower child resistance to the infections, increase child morbidity and mortality. It also decreases mental development and

cognitive achievement, and nutritional status is the best global indicator as well as being in the children. Malnutrition is largest single underlying cause of death worldwide and is associated with over one third of childhood deaths.[3,4]

The WHO cites malnutrition as the gravest single threat to world's public health.[5] In children malnutrition is synonymous with growth failure.[6] Globally, Malnutrition has been responsible, directly or indirectly for 60% of 10.9 million deaths annually among under-5 children. Well over two thirds of these deaths, which are often associated with inappropriate feeding practices, occur during the first year of life. Malnourished children who survive are more frequently sick and suffer the life-long consequences of impaired development.

Malnutrition is major public health problem throughout the world, mainly in southern Asia and sub-Saharan Africa. Malnutrition is more common in India than in sub-Saharan Africa. One in every three malnourished children in the World, lives in India. The prevalence of child malnutrition in India is highest in the World, nearly double that of sub-Saharan Africa. Each year approximately 2.3 million deaths amongst 6-60 months aged children in developing countries are associated with malnutrition and which is about 41% of total deaths in above age group.[7,8]

Malnutrition among urban children particularly the economically vulnerable slum population, has been almost completely neglected. The problems of urban slums are generally evaluated from point of view of non-slum urban population, which see slums as a "problem" to be solved rather than as an integral and necessary part of urban population. Even if the extent of urban malnutrition is somewhat lower than its rural incidence, the absolute numbers could be very high because they fall prey to different communicable diseases like waterborne diseases, respiratory infections, that can spread easily due to high population density, poor hygiene, illiteracy and poor socioeconomic status in these areas.[9]

The NFHS-IV, 2015-16 reports show an improvement in all 3 nutritional indicators for Maharashtra for the period following 2005-06 (NFHS-III) with significant reduction in proportion of underweight children. Some of the observations of malnutrition reported include higher prevalence of malnutrition in rural areas and their counterpart in urban areas (that is an urban slums). SAM is most extreme form of acute under nutrition, is reported to afflict 9.4% of children in Maharashtra. The percentage of children suffering from SAM is slightly higher in rural area, in slums and amongst SC/ST and in the population belonging to second lowest wealth index category.[10,11]

In 2013, two thirds of malnourished lived in Asia and about one third in Africa. Almost half of children under five years of age (48 per cent) are stunted and 43 per cent are underweight, under-nutrition peaks at age 20 months.

That's why a detailed study of different etiological factors affecting the health of preschool children in its milieu, i.e. in the community where they belong, becomes a necessity.[12]

Environmental factors, infectious diseases, inadequate diet and the poverty appear to be far more important than genetic predisposition as socioeconomic determinants of childhood malnutrition. No more than 35.0% of infants worldwide are exclusively breastfed during the first four months of life and complementary feeding frequently begins too early or too late, and foods are often nutritionally inadequate and unsafe. Malnourished children who survive are more frequently ill and suffer the life-long consequences of impaired development.[13]

The nutritional status of under-five children in urban slums is very important because this is a vulnerable group which may fall prey to different communicable diseases that can spread easily due to high population density, poor hygiene, illiteracy and poor socioeconomic status in slum areas. Multiple and interrelated determinants are responsible for under nutrition.[14]

Various studies which have been done in India, have shown that respiratory and gastrointestinal tract infections are the leading cause of morbidity in children. These infectious diseases are affected by several factors such as birth weight, gestational age, socio-economic status, ethnicity, immunization status, nutritional status of infants, number of siblings, day care attendance and parental smoking. Breastfeeding has been suggested as a modifiable influencing factor, given exclusively, breastfeeding reduces the risk of infectious diseases in infants in developing countries.[15]

Maternal and child health indicators among slum population show that their health is two to three times worse than people living in better areas. Children of the urban poor suffer accentuated vulnerability to illnesses as outbreaks of vaccine-preventable diseases are more common in urban slums owing to high population density and continuous influx of infective agents with immigrating population.[16] Undernutrition among children depends on complex interactions of various factors like: socio-demographic, environmental, reproductive, institutional, cultural, political and regional factors.[17]

METHODS

Study design and study area

A descriptive cross-sectional, observational study conducted at urban slum of Mumbai has total population around 1,37,000 which is the field practice area of Department of Community Medicine of parent medical college. It consists of mainly migrant population from different parts of India, Uttar Pradesh, Bihar, Tamil Nadu. Residents are engaged in small scale industrial jobs like Zari work, bag making, mat weaving, tailoring etc. Most

of the men are self-employed and females are housewives, maid servants or vegetable vendors.

Study period

Study was conducted for the period of one year i.e. 1st October 2018 to November 2019 in the health post area having population of 84,783 within the slum.

Inclusion criteria

All the children in the age group of 6-60 months, and children living in above mentioned locality were included.

Exclusion criteria

Children having any congenital deformities or genetic disorders, children born prematurely, children whose parent does not want to participate in the study were excluded.

Sample size

Total population of under-five children in above area was around 6800.Taking a prevalence of 36% underweight (As stated by NFHS 4) children, A sample size (n) was derived by using the formula n= Z²pq\e²*N÷Z²pq/e²+(N-1). where, N=6800, p=Prevalence =36%, q=100-P=64%, e= sampling error= 5%. After putting values in the formula, n=350.

Sampling method

Simple random sampling had been used for the study. Simple random table had been used for selection of sample population.

Data collection

Data was collected using preformed questionnaire, which includes general information, anthropometry and socio-demographic factors. Voluntary consent form was prepared in English, Hindi and Marathi and consent was taken from parents or care takers. The age of child was confirmed either by parents or as per birth certificate. An anthropometric measurement like weight, was recorded with minimum clothes, using weighing machine, the height was recorded by the non-stretchable measuring tape. Head circumference and chest circumference was measured using a narrow, flexible and non-stretchable tape. Mid upper arm circumference was measured to the nearest millimetre at exact midpoint of the left arm using flexible and non-stretchable tape. The indices of nutritional status like weight for age, height for age and weight for height was compared with the WHO growth charts for age and sex. Three commonly used under nutrition indicators namely stunting, underweight and wasting were used to evaluate the growth status of children.

Statistical analysis

The data obtained was compiled and entered in Microsoft-excel 2013 and analysed by using SPSS (22.0) software for appropriate statistical tests, 95% confidence level was used for the study and p≤0.05 was considered significant.

RESULTS

Prevalence of undernutrition as per present study is 50.6%

Table 1 shows the association of age group of children with nutritional status maximum percentage of undernourished was found in 25-60-month age group 100 (54.1%), followed by 13-24-month age group showing undernourished in 57 (52.8%), minimum undernourished was in 20 (35.1%) children of 6-12-month age group, and the difference was found statistically significant.

Table 1: Association of age group with nutritional status.

Age group (in months)	Nutritional status, N (%)		Total
	Normal	Undernourished	
6-12	37 (64.9)	20 (35.1)	57 (100.0)
13-24	51 (47.2)	57 (52.8)	108 (100.0)
25-60	85 (45.9)	100 (54.1)	185 (100.0)
Total	173 (49.4)	177 (50.6)	350 (100.0)

*Rows pooled and chi square test applied. Chi-square value: 6.57 and 'p' value: <0.001

Table 2 shows the association of socio-economic status with nutritional status, maximum undernourished 88 (71.5%) was found in Class IV, which is statistically significant, followed by 58 (40%) of Class III, and minimum undernourished n was found in 31 (37.8%) children Class II (B. G Prasad classification).

Table 2: Association of socioeconomic status with nutritional status.

Socio-economic status scale	Nutritional status, N (%)		Total
	Normal	Undernourished	
Class II	51 (62.2)	31 (37.8)	82 (100.0)
Class III	87 (60.0)	58 (40.0)	145 (100.0)
Class IV	35 (28.5)	88 (71.5)	123 (100.0)
Total	173 (49.4)	177 (50.6)	350 (100.0)

*Rows pooled and chi square test applied. Chi-square value: 33.47 and 'p' value: <0.001

Table 3 shows association of various socio-demographic factors with nutritional status, study detected more undernourished among girls than boys in i.e. 90 (53.3%)

boys were found undernourished ,while among boys it was in 87 (48.1%), but the study was not able to find a statistically significant difference (p=0.33), 45 (49.5%) children living in non-nuclear families that is joint family or extended family had undernourished while 132 (51.0%) children belonging to nuclear family showed undernourished, but there was no significant difference (p=0.804), 43 (64.2%) children were undernourished whose mothers got married before the age of 18 years, while only 134 (47.3%) children showed undernourished whose mothers got married at or after 18 year age, and there was statistically significant difference (p value=0.013). 88 (72.1%) children of illiterate mothers while 89 (39.0%) children of literate mothers showed undernourished, and it was statistically significant (p=<0.001). Only 66 (45.8%) children of birth order less than or equal to 2 suffered from undernourished while 99 (51.6%) children of birth order 2-4 and ≥5 12 (85.7%) had undernourished, p<0.013, that was statistically significant. 13 (59.1%) children were found undernourished who had not taken colostrum, while only

164 (50.0%) children were found undernourished who received colostrum, but the study failed to find statistically significant association (p=0.51). 37 (94.9%) of children who were not given exclusive breast feeding were found undernourished, while only 140 (45.0%) of children were undernourished who received exclusive breast feeding, and the association was also found statistically significant with p=<0.001. 30 (65.2%) children who were incompletely immunized, not immunised 3 (75%) found undernourished, while only 144 (48%) children with complete or up to date immunisation were undernourished, it is statistically significant (p=0.045), (immunization coverage was: 85.7% children were fully immunized, 13.1% were partially immunized and 1.14% were unimmunized). 90 (84.9%) children with more than 3 episodes of illnesses (ARI/diarrhoea) were undernourished while 87 (35.7%) children with <3 illnesses (ARI/diarrhoea) episodes were undernourished. association of undernourished and illnesses (ARI/diarrhoea) was found statistically significant with p<0.001.

Table 3: Association of socio-demographic factors with nutritional status.

Particulars		Nutritional status, N (%)		P value
		Normal	Undernourished	
Sex of child	Female	79 (46.7)	90 (53.3)	0.33
	Male	94 (51.9)	87 (48.1)	
Type of family	Non-nuclear	46 (50.5)	45 (49.5)	0.804
	Nuclear	127(49.0)	132 (51.0)	
Age of mother at marriage in years	<18	24 (35.8)	43 (64.2)	0.013
	≥18	149 (52.7)	134 (47.3)	
Mothers' education	Illiterate	34 (27.9)	88 (72.1)	<0.001
	Literate	139 (61.0)	89 (39.0)	
Birth order	≤2	78 (54.2)	66 (45.8)	0.013
	2-4	93 (48.4)	99 (51.6)	
	≥5	2 (14.3)	12 (85.7)	
Colostrum	Yes	164 (50.0)	164 (50.0)	0.51
	No	9 (40.9)	13 (59.1)	
Exclusive breastfeeding	Yes	171 (55.0)	140 (45.0)	<0.001
	No	2 (5.1)	37 (94.9)	
Immunization status	Complete	156 (52)	144 (48)	0.045
	Incomplete	16 (34.8)	30 (65.2)	
	Unimmunized	1 (25)	3 (75)	
Illnesses (ARI/diarrhoea) episodes in past one year	≤3	157 (64.3)	87 (35.7)	<0.001
	>3	16 (15.1)	90 (84.9)	

DISCUSSION

Prevalence of protein energy malnutrition (stunting and wasting) as per present study is 56%, according to NFHS-4, children under five years of age (38 percent) are stunted and 36 percent are underweight.

Association of age with nutritional status

In the present study was found that 108 out of 350 children were in the age group 13-24 months, in which 57

(52.8%) were undernourished and 185 out of 350 children were in the age group of 25-60 months, in which 100 (54.1%) were stunted. Statistically significant relation was found between age of the child and nutritional status. Similar findings was noted in the study which was conducted by Tiwari et al that means as age of child increases, the undernourishment of the children tends to increase., their study showed the association of age group of children with PEM, maximum percentage of malnutrition was found in 13-24 months age group 64 (66.7%), followed by 25-36 months age group showing

PEM in 70 (66%), minimum malnutrition was in 40(43%) children of 49-60 months age group, and the difference was found statistically significant.[12]

Critical age at which under-nutrition starts is around 6 months and growth flattering is at peak in second year of life. Up to 6 months, the babies thrive well on breast milk, which is adequate for normal growth and development, thereafter the baby needs supplementary feeds in addition to breastfeeding. Most mothers delay the weaning in young children and secondly the quantities of foods given are quite inadequate for normal growth and development.

Association of socio-economic status with undernutrition

In the present study found that, according to Modified B. G. Prasad socio-economic scale, out of total 350 children, 145 children belonged to class III, in which 58 (40%) and 123 children belonged to class IV, in which 88 (71.5%) were undernourished. It was statistically significant. That means children belonged to lower socio-economic class are more undernourished as compared to children belonged to upper socio-economic status. Similar results were found in Tiwari et al, the association of socio-economic status with PEM, maximum malnutrition 86 (82.7%) was found in Class V, which is statistically significant, followed by 128 (55.9%) of Class IV (B. G Prasad classification).[12] Nale et al, this study found that poor the social class of family more the chances of child being malnourished. Out of 22 children from class IV socioeconomic class 19 (86.36%) were detected malnourished compared to 4 (33.33%) of class I. Significant association was seen between nutritional status and socioeconomic status of the family.[13]

Association of socio-demographic factors with undernutrition

Study finds slightly undernutrition in males, 87 (48.1%) were malnourished, compared to 90 (53.3%) of females, but the difference was not statistically significant. Demissie et al, in their study child sex showed a significant association with wasting, stunting and underweight in this study. All three forms of malnutrition (wasting, stunting and underweight) were more prevalent among boys than girls, which is incongruent with present study.[18]

in the present study found that 259 children, in total 350, belonged to nuclear family. Out of total 259 children, 132 (51%) were undernourished. 91 children belonged to joint family, in total 350 children and out of total 91, 45 (49.5%) were undernourished. Statistically significant relation was not found between type of family and nutritional status of children. Sengupta et al, the type of family, nuclear or joint, was also observed not to significantly affect child nutrition (p value 0.665).[19]

Undernutrition was more common in children whose mother 's age of marriage was less than 18 years 43 (64.2%) compared to mothers age of marriage, 18 years and above 134 (47.3%). The association between mother's marriage at less than 18 years and undernutrition was statistically significant (p=0.013). Similar findings were found in study conducted by Raj et al in 2005-06, which showed undernutrition was more common in children, whose mothers were married before the age of 18 years.[20]

Undernutrition was more common in illiterate mothers 88 (72.1%) of illiterate mothers compared to literate mothers 89 (39%) of literate mothers, and the difference was statistically significant (p=<0.001). Similar findings were found in studies conducted by Goel et al, in their study literacy status of the mother was statistically significantly associated with grades of undernutrition (p value<0.05).[21]

Association with birth order was found as undernourished was more common in birth order ≥5 12 (85.7%) followed by birth order two to four 99 (51.6%), and one 66 (45.8%). The association between higher birth order and undernutrition was statistically significant (p<0.001). Similar findings were reported by Harishankar et al. While Farooq et al found no significant association between nutritional status and birth order.[22,23]

Association of undernutrition and certain social rearing practices like giving colostrum, exclusive breastfeeding, immunisation was found as 13 (59.1%) children were found undernourished who had not taken colostrum, while only 164 (50%) of children were found undernourished who received colostrum, but the difference was not found statistically significant (p=0.51), 37 (94.9%) of children who were not given exclusive breast feeding were found malnourished, while only 140 (45%) of children were malnourished who received exclusive breast feeding, and the difference was statistically significant (p=<0.001) which is less, when compared with the NFHS-4 data (55% of children in India are exclusively breastfed. This may be due to the variation in the social and cultural practices in that area, and undernutrition was more common in partially unimmunised children 3(75%) and incompletely immunized children 30 (65.2%), compared to completely immunized children 144 (48%). The association between children who were not completely immunized, and undernutrition was statistically significant (p=0.045). Similar findings were found in studies conducted by Ray et al a significantly higher (p<0.05) prevalence of undernourished children was observed amongst incompletely immunized and unimmunized children (81.25% and 88.23% respectively) in comparison to fully immunized children (62.07%). Undernutrition was also significantly higher (p<0.05) among partially immunized and non-immunized children (12.5% and 11.76% respectively) in comparison to the fully immunized children (6.89%).[24]

Association of number of episodes of illnesses per year (respiratory tract infection/diarrhoea) with undernutrition can be described as- 90 (84.9%) children with more than 3 episodes of ARI were undernourished while 87 (35.7%) children with ≤3 ARI episodes were undernourished. It was statistically significant (p<0.001). Similar findings were found in studies conducted by, Tiwari et al, association of h/o respiratory tract infection and diarrhoea with PEM can be described as- 122 (55%) children with more than 3 episodes of ARI were malnourished while 100 (45%) children with 3 episodes of diarrhoea, while only 80(36%) were found undernourished who had <3 episodes of diarrhoea and in both cases the difference was statistically significant (p value <0.001).[12]

Unclean food, utensils and dirty hands, unsafe water and unsafe excreta disposal leads to infections and most common being diarrhoea and worm infestation. Repeated attacks of diarrhoea and acute respiratory infections lower the nutritional status. Continuing feeding during illness and more diet during convalescence period is essential for catch up growth. Adequate eating during illness reduces the severity of illness and gives energy to the body.

This study has few limitations. The present study was conducted in urban slum area so findings may not be applicable to Rural or tribal areas. The information on factors influencing undernutrition can't be generalized to entire country due to the influence of local cultural practices. The present study was based on interviewing the mothers of study participants, the data could have been affected by recall bias. As the present study is a cross- sectional study, so the association between socio-environmental factors and prevalence of malnutrition can't establish causal association between the two.

CONCLUSION

Mumbai's urban slums continue showing a higher prevalence of undernutrition, worse during the weaning age of the child and low socioeconomic status, and is significantly influenced by age of mother at marriage, mother's education, birth order of child, child rearing practices like giving colostrum, exclusive breast feeding, immunisation status of child, and history of ARI and Diarrhoea during past one year, and with the improvement in these socio-demographic factors, enhancement in the nutritional state of the child is expected.

Recommendations

Primary health workers, social workers, and other staff members in the public health system can be trained to perform street play on nutrition and importance of exclusive breast feeding. Trained Urban Primary Health Centre workers should take periodic visits and sessions on the consequences of under-nutrition, and simultaneously mothers and care takers can be to taught, how to use locally available traditional food items which are more nutritious, cheaper, and easily available, through lectures by primary health workers in the community, and mothers and care takers can be taught about the importance of exclusive breast feeding, hygiene, immunisation, periodic deworming, and how to take care of minor illness of childhood at home, health seeking behaviour, the importance of family planning. Adequate quantity and frequency of meals is recommended to be known to each mother and care taker, she should be capable of generating interest in the baby by coupling feeding with story or rhyme reciting and using attractive feeding cups, and usage of different coloured vegetables and fruits.

REFERENCES

1. Child Nutrition in India. Issue 14 of National family health survey subject reports, ISSN 1026-4736- Vinod K. Mishra, Subrata Lahiri, Norman Y. Luther- International Institute for Population Sciences, 1999. Available at: https://scholarspace.manoa.hawaii.edu/bitstreams/eb 666df0-bc39-4e22-a56d-9696d34e52c6/download. Accessed on 14 June 2024.
2. Ramalingaswami V, Jonsson U, Rhode J. Malnutrition: A South Asian Enigma. In: Malnutrition in South Asia: A regional profile. Eds, Gillespie S. Rosa Publication No. 5, Regional Office for South Asia, UNICEF; 1997.
3. Crosby L, Davis A, Garde M, Jayasinghe D, Mason F, Pizzini, Maria R, et al. A life free from hunger: Tackling Child Malnutrition. Save the children International, Geneva. 2012. Available at: https://resourcecentre.savethechildren.net/pdf/5580.pdf/. Accessed 01 March 2024.
4. Rodríguez L, Cervantes E, Ortiz R. Malnutrition and gastrointestinal and respiratory infections in children: a public health problem. Int J Environ Res Publ Heal. 2011;8(4):1174-205.
5. Malnutrition – the starvelings: hunger has a bigger impact on children's health than was thought. The Economist, Jn24 2008, from print edition. Available at: https://www.economist.com/briefing/2024/07/11/sm all-investments-in-nutrition-could-make-the-world-brainier. Accessed on 14 June 2024.
6. Aykroyd R. The Indian journal of social work volume ii December 1941 number 3 economic

aspects of the problem of nutrition in India. Available at: https://ijsw.tiss.edu/greenstone/cgi-bin/linux/library.cgi?e=d-01000-00---off-0ijsw--00-1----0-10-0---0---0direct-10----4-------0-0l--11-en-50---20-preferences---00-3-1-00-00--4--0--0-0-11-10-0utfZz-8-00&a=d&c=ijsw&cl=CL1.1&d=HASH01390cb7a9599571ccb62059. Accessed 01 March 2024.

7. Martorell R. The nature of child malnutrition and its long-term implications. Food Nutrition Bullet. 1999;20(3):288-92.

8. United nations Children's fund (UNICEF). Children in India, 2010. Available at: https://www.unicef.org/india/children-in-india. Accessed 01 March 2024.

9. Hatekar N, Rode S. Truth about hunger and disease in Mumbai: Malnourishment among slum children. Economic and Political weekly. 2003;5:4604-10.

10. Maharashtra human development report/health and nutrition: imperative for capability enhancement/under nutrition in Maharashtra. 2012;97:141.

11. Dudala SR , Arlappa N. An updated Prasad's Socio-economic status classification for 2013. Int J Res Dev Health. 2013;1(2):26-8.

12. Tiwari SR, Bandi JR, Awasthi SR, Sharma AK. Assessment of prevalence of protein energy malnutrition in under 5 year children in an urban slum of Mumbai, India and to study associated factors. Int J Commu Med Publ Heal.. 2017;3(5):1129-34.

13. Nale TU, Chavan MK, Mahajan HE, Velhal GD. Disentangling the influence of maternal factors on nutritional status of children: community based study in an urban slum of India. Int J Gen Medi Pharm. 2013;2(1):45-54.

14. 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 Medi Publ Heal. 2014;4(3).

15. Joseph N, Naik VA, Mahantshetti NS, Unnikrishnan B, Mallapur M, Kotian SM. Factors associated with morbidities among infants in three sub centre areas of belgaum district of South India: a longitudinal study. Ind J Commu Med. 2013;38(3):168-74.

16. Kadri AM, Singh A, Jain S, Mahajan RG, Trivedi A. Study on immunization coverage in urban slums of Ahmedabad city. Health and population: Perspect Issues. 2010;33(1):50-4.

17. Asfaw M, Wondaferash M, Taha M, Dube L. Prevalence of undernutrition and associated factors among children aged between six to fifty nine months in Bule Hora district, South Ethiopia. BMC Publ Health. 2015;15:41.

18. Demissie S, Worku A. Magnitude and factors associated with malnutrition in children 6-59 months of age in pastoral community of Dollo Ado district, Somali region, Ethiopia. Sci J Public Health. 2013;1(4):175-83.

19. Sengupta P, Philip N, Benjamin AI. Epidemiological correlates of under-nutrition in under-5 years children in an urban slum of Ludhiana. Health Population: Perspecti Issues. 2010;33(1):1-9.

20. Raj A, Saggurti N, Winter M, Labonte A, Decker MR, Balaiah D, et al. The effect of maternal child marriage on morbidity and mortality of children under 5 in India: cross sectional study of a nationally representative sample. BMJ. 2010;340:b4258.

21. Goel MK, Mishra R, Gaur DR, Das A. Nutrition surveillance in 1-6 years old children in urban slums of a city in northern India. Internet J Epidemiol. 2007;5(1):1-3.

22. Harishankar DS, Dabral SB, Walia DK. Nutritional status of children under 6 years of age. Indian J Prev Soc Med. 2004;35(3&4):156-62.

23. Farooq A, Calcutti R, Bakshi S. Nutritional status of under-fives on national immunization day in Srinagar. JK Science. 2002;4(4):177-80.

24. Ray SK, Roy P, Deysarkari S, Lahiri A, Mukhopadhaya BB. A cross sectional study of undernutrition in 0-5 yrs. age group in an urban community. Indian J Matern Child Health. 1990;1(2):61-2.