Comparative Study of Malnutrition among Schoolchildren of Rural and Urban Territories of Bareilly District, Uttar Pradesh, India

Anuj Singh (MD)[1], Ashish Kumar Sharma (MD)[2], Amit Kumar (MD)[1],
Ankit Singh (MSc, PhD)[1*], Swati Khan (MD)[3], Neha Singh Chauhan (DNB Ophthalmology)[4]

[1]Assistant Professor, Department of Community Medicine, United Institute of Medical Sciences, Prayagraj, Uttar Pradesh, India.
[2]Assistant Professor, Department of Community Medicine Goverment Medical College, Badaun, Uttar Pradesh, India.
[3]Professor, Department of Community Medicine, Rohilkhand Medical College and Hospital, Bareilly, Uttar Pradesh, India.
[4]Senior Resident, Department of Ophthalmology, United Institute of Medical Sciences, Prayagraj, Uttar Pradesh, India.

ARTICLE INFO

ABSTRACT

Introduction: Despite an agricultural country, India confronting malnutrition as a major public health challenge, where every second child is at risk of malnutrition. The nation ranking second in population with disproportionate rural and urban demography, further poor penetration of government assisted programs in remote, underserved areas fuelling the malnutrition in rural areas.

Methods: This cross-sectional study was conducted in Department of Community Medicine of Rohilkhand Medical College and Hospital. Total 465 schoolchildren in rural and urban areas of Bareilly district were screened for malnutrition and their socio-demographic profiles were studied.

Results: Overall, the prevalence of malnutrition in schoolchildren of Bareilly district was 40.2 %. Fraction contributed by urban and rural territories was 35.2 % and 43 % respectively. The prevalence of malnutrition was found higher in rural area as compared to urban area and the difference was statistically significant (P<0.001).

Conclusion: The study shows 43 % prevalence of malnutrition in rural areas and under nutrition was the main cause of malnutrition attributed by poverty and illiteracy. However, urban areas reported 7.8 % lower prevalence of malnutrition, but alarming trends of overweight and obesity 15.2 %.

Introduction

Malnutrition is a well-known public health problem in India, owing to a lack of appropriate nutrients in the diet, both in terms of quality and quantity. The nutritional status of children under 5 years of age are source of concern among policy makers these days, because the school children is the primary victim of the interaction of nutritional, social, economic, and health-related factors that contribute to malnutrition. According to research from over the globe, millions of children are still suffering from malnutrition (1,2). WHO defines malnutrition as deficiency, excess, or imbalance in one's energy intake and or nutrients (3). The term malnutrition comprises 3 broad conditions namely:

I.Undernutrition, denotes wasting (low-weight for height), stunting (low height for-age) and underweight (low weight for age).

II. Micronutrient-related malnutrition includes micronutrient deficiency (deficiency of essential

---

Corresponding author: Ankit Singh,
Assistant Professor, Department of Community Medicine, United Institute of Medical Sciences, Prayagraj, Uttar Pradesh, India.
E-mail: ankitbiostat@gmail.com
Tel: 7831839434

vitamins and minerals) or excess of micronutrient. **III.** Obesity, obesity and lifestyle diseases (such as heart disease, stroke, diabetes and cancers).

It is estimated that around the world, 27 percent of children under the age of five are underweight for their age, with the majority of these children living in developing countries (4). Thus, malnutrition is silent public health emergency worldwide, with catastrophic effects in low and middle income countries like India. Where, malnutrition accounts for 69% mortality among children below the age of 5 years, leaving every second child at risk of malnutrition.

India being an agricultural and second most populous country, with two-third population stake in rural territories, where poor penetration of Government assisted schemes further fuels the malnutrition. UNICEF, in the year 2006, reported the causes of childhood malnutrition as insufficient diet, frequent infections, poor breastfeeding practices, delayed introduction of complementary foods and inadequate protein in the diet.

Other factors that influence food intake include health status, food taboos, growth and personal choice related to diet (5). Malnutrition can also develop due to neglect, abnormal mealtimes, insufficient quantities of food and insufficient parental knowledge. Though nutrition is important irrespective of age, it has crucial role in younger age group.

As, complication of malnutrition in either form under nutrition or over nutrition affects lifelong health of the individual. School age is nutritionally, critical phase of life, as the body buildup nutritive store to meet rapid growth and development of adolescence (6).

Therefore, growth of school children must be monitored closely to detect early deviation and timely intervention, through joint efforts of institution and family as well. Malnourished children are more likely to grow up to be malnourished adults, with greater morbidity and mortality risks. It's critical to pay more attention to the link between a child's nutritional status and his or her ability to achieve the necessary physical and mental development (7,8).

Several researches on malnutrition have been undertaken in this region, but none of them compare the rural and urban factors of malnutrition (9).

The nutritional status does not only indicate the socioeconomic condition of the country, but also the efficiency of the health-care system, and the influence of the surrounding environment. In an attempt to preserve national future asset of healthy human resource.

The present study was conducted to provide an overview of socio-demographic correlates with geographic variation of malnutrition among school going children of Bareilly district of Uttar Pradesh, India.

OBJECTIVES
1. To estimate the prevalence of malnutrition among schoolchildren for Bareilly district.
2. To compare malnutrition among school children of rural and urban territories of Bareilly district and to assess their socio-demographic profile.

INCLUSION CRITERIA
1. Schoolchildren in the age group of 5–14 years
2. Parents willing to participate and give informed consent.

EXCLUSION CRITERIA
1. Children suffering from acute or chronic diseases
2. Children not present on the day of survey.

Materials and Method
This cross-sectional study was undertaken at the Department of Community Medicine, Rohilkhand Medical College and Hospital in Bareilly district between November 2016 to January 2019.

On the basis of a reference study whose prevalence was found to be 48% (10), sample size was computed using the n-master software.

Using the proportion formula, a sample size of 465 people was calculated based on prevalence. According to the population proportions based on the census report of Bareilly district (11), 300 of the 465 study respondents were from rural areas and 165 from urban areas.

The study included school children aged 5 to 14 years old whose parents were willing to participate and give written informed consent. In addition, children with acute or chronic illnesses who were not present on the day of the survey were excluded from the study. The research followed the tents of the Declaration of Helsinki.

The Ethics Committee of Rohilkhand Medical College & Hospital affiliated to Bareilly International University, approved this study. The institutional ethical committee at Rohilkhand Medical College & Hospital approved the study protocols (IEC/IRB No. IEC/16/16/SEP). Accordingly, written informed consent taken from all participants before any intervention.

Data was collected using a pre- tested, pre-validated routine, which was then compiled and analysed using EpiInfo software version 7.2. This study was extracted from M.D. thesis of Community Medicine at this university (Postgraduate session 2016-19).

Anthropometric Measurements
Nutritional status of students was estimated by using Body mass index formula as per the WHO classification of Malnutrition: 2007 (12).

Weight

Body weight of the subject was measured without any footwear and with minimal clothing to the nearest 0.1 kg using a standard portable weighing machine and the scale was zeroed before each session.

Height

Height was measured without any footwear using a standard calibrated bar. The person stood straight and looking straight with heels, buttocks, and back touching the vertical limb of the instrument. The horizontal movable limb was then lowered until it touched the head firmly and height was recorded to the nearest 0.1 cm. Body mass index = Weight (in kg)/Height (in meter2).

Data analysis

Data entry, coding and recoding was done in Microsoft Excel 2010. After collection, data was entered, checked, verified and analysed with the help of computer software Epi-Info (version 7.2).

Appropriate statistical tests were applied to find the association of the determinants with malnutrition. The results were displayed with the help of tables according to the aim and objectives of the study. Valid information were drawn and discussed with the other studies.

Result

Table 1 shows the distribution of study participants residing in urban and rural areas according to their socio demographic profile.

Out of 465 study participants, in both urban and rural areas, majority of participants 56.4 % and 59.3 % were in the age group of 14–10 years and majority of participants were Hindu by religion 64.8 % and 57.7 %, followed by Muslim, Sikh, and Christian religion, respectively.

In urban area, majority of participants 47.2 % were from general category, followed by other backward class (OBC) 35.8 % and scheduled caste (SC) 10.3 %, and scheduled tribe (ST) 6.7%.

However, rural area reported majority of participants in OBC category (40.7%) followed by general category (40 %), SC (13.3 %), and ST (6 %). Urban area reported higher percentage of nuclear family (54.5 %), however, 52.7% joint family reported from rural area.

Urban and rural areas denoted that 50% of participants were from semi-pucca house, followed by pucca house 44 %,46.7 % , and kutcha house 3.6 %,5.7 %.

Table 2 shows the distribution of study participants according to their socioeconomic class in relation to their place of residence. According to modified BG Prasad Socioeconomic status classification (2017), urban area shows majority of participants 28.5 % in upper middle class while in rural area, majority of participants 25.7 % were from lower middle class.

Distribution of study participants according to socioeconomicclass in urban and rural areas was statistically not similar($P<0.05$).

Table 3 shows the prevalence of malnutrition in rural and urban area of Bareilly district, in urban area, normal nutrition was 64.8 % followed by under nutrition and over nutrition 20 % and 15.2 %, respectively.

However, rural area reported 57 % normal nutrition followed by under nutrition and over nutrition 37.3 % and 5.7 %, respectively. Prevalence of malnutrition was found higher in rural area in respect to urban area and the difference was statistically significant ($P < 0.001$).

The overall prevalence of malnutrition among school children of Bareilly district was 40.4 %.

Table 1: Distribution of study participants according to their socio-demographic characteristics and residence(n=465)

Characteristics	Residence		Total (%)
	Urban (%)	**Rural (%)**	
Age group			
5–9 years	72 (43.6)	122 (40.7)	194 (41.7)
10–14 years	93 (56.4)	178 (59.3)	271 (58.3)
Religion			
Hindu	107 (64.8)	173 (57.7)	280 (60.2)
Muslim	41 (24.8)	106 (35.3)	147 (31.6)
Sikh	13 (7.8)	12 (4)	25 (5.4)
Christian	4 (2.4)	9 (3)	13 (2.8)
Category			
General	78 (47.2)	120 (40)	198 (42.6)
OBC	59 (35.8)	122 (40.7)	181 (38.9)

SC	17 (10.3)	40 (13.3)	57 (12.3)
ST	11 (6.7)	18 (6)	29 (6.2)
Type of family			
Joint	75 (45.5)	158 (52.7)	233 (50.1)
Nuclear	90 (54.5)	142 (47.3)	232 (49.9)
Type of residence			
Kuchha	6 (3.6)	17 (5.7)	23 (4.9)
Semi-pucca	82 (49.7)	151 (50.3)	233 (50.1)
Pucca	77 (46.7)	132 (44)	209 (44.9)
Total	165 (35.5)	300 (64.5)	465 (100)

Table 2: Distribution of study participants according to socioeconomic class and place of residence (n=465)

Socioeconomicclass	Residence		Total(%)	Chi- square test, df (p-value)
	Urban(%)	Rural(%)		
Upper class	46	39	85	
	(27.8)	(13)	(18.3)	
Upper middle class	47	73	120	
	(28.5)	(24.3)	(25.8)	χ^2=20.774,
Middle class	23	67	90	df=4,
	(13.9)	(22.3)	(19.4)	
Lower middle class	31	77	108	p = 0.0028
	(18.8)	(25.7)	(23.2)	
Lower class	18	44	62	
	(10.9)	(14.7)	(13.3)	
Total	165	300	465	
	(35.5)	(64.5)	(100)	

Table 3: Distribution of malnutrition according to urbanand rural areas (n=465)

Area	Under nutrition (%)*	Normal nutrition (%)*	Over nutrition(%)*	Total(%)**	Chi- square test, df (p-value)
Urban	33 (20)	107 (64.8)	25 (15.2)	165(35.5)	χ^2=21.956,
Rural	112 (37.3)	171 (57)	17 (5.7)	300(64.5)	df=2,
Total	145 (31.2)	278 (59.8)	42 (9)	465(100)	P =0.000017

in rows, (**): % in columns % :(*)

Discussion

The study shows 40.4% prevalence of malnutrition among school going children of Bareilly district. However, similar study by Kumawat R et al reported 24.17% prevalence of malnutrition in Bikaner of Rajasthan. The observed difference in malnutrition prevalence between these two states, call for urgent action to prioritize the Government food assistance efforts in Uttar Pradesh, to meet the nutritional requirement of huge population residing large geographic region (13).

In the present study, the prevalence of malnutrition in urban and rural areas was 35.2% and 43%,

respectively. However, the same study series in 2018 reported slightly lower prevalence of malnutrition 35.4% in rural area of Bareilly district, due to smaller sample size (14). The study reported 17.3 % higher prevalence of under nutrition among school children of rural territories.

However urban area shows 9.5% higher prevalence of overweight, obesity. Similar trend have been observed in various studies conducted in different areas over the globe (18-15).Another study conducted by Goyal et al.(19) found malnutrition among Ahmednagar school children to be 20 % only,

with 6.8% having severe malnutrition, which showed similar results with the present study and amongst school children of Madras, as found by Sunderam et al (20).

Malnutrition is prevalent in almost all the states of India; children in rural areas are more susceptible than urban counterparts. Findings reveal that under nutrition is the main cause of malnutrition in rural areas, the reason could be lack of basic amenities. However, urban area possesses the double edge of malnutrition, i.e.

under nutrition accompanied with over nutrition due to high calorie intake through energy dense food and sedentary life style. This geographical variation malnutrition requires regional specific approach of Integrated Child Development Services (ICDS) (21) scheme of the country to combat malnutrition in different parts of India.

The war against malnutrition needs to primarily concentrate on improving the suboptimal coverage of pertinent ongoing interventions and ensure equitable access to underserved population. To win over war against malnutrition, community health education and awareness about low cost nutritive diet along with genuine selection of food assistance programs beneficiaries are solicited.

Conclusion

The study shows 40.21% prevalence of malnutrition in rural territories, under nutrition was the main cause of malnutrition in rural areas, attributed to poverty and illiteracy. However, urban areas reported 7.8% lower prevalence of malnutrition, but alarming trends of overweight and obesity 15.2% observed due to high calorie intake and sedentary lifestyle.

Acknowledgment

Conflict of interest

Authors declare that have no competing interest.

References

1. Senthilkumar SK, Chacko TV, Suvetha K. Nutritional status assessment of children aged 0 5 years and its determinants in a tribal community of Coimbatore district. Int J Community Med Public Health 2018;5:2835-2845.
2. World Health Organization. Infant and young child nutrition. Geneva, Switzerland: World Health Organization, 2000.
3. Fact sheets - malnutrition [Internet]. World Health Organization. World Health Organization; 2021 .
4. World Development Report 2003: Sustainable development in a dynamic World. World Bank, New York, 2003.
5. Pti. Malnutrition behind 69% deaths among children below 5 in India: UNICEF report [Internet]. Hindu. The Hindu; 2019 [cited 2022Feb12].
6. Progress for children, A Report Card on Nutrition, Number 4, Unicef (Online); 2006 May.
7. Haq MN. Age at menarche and the related issue: A pilot study on urban school girls. J Youth Adolesc. 1984;13:559-567.
8. Gaur A, Singh A, Pandey S. Status of Child Immunizations and Vitamin A Supplementation in Uttarakhand, India. Int J of Current Advanced Research,(2018);07,pp.15131- 15133.
9. Pandey. S, Singh. A, Gaur. A. Utilization of Maternal Health Care Services In Uttarakhand: Comparative Study between Two Divisions: Kumaun and Garhwal. Int J Intg Med Sci 2019;6:760-764.
10. Arnold F, Parasuraman S, Arokiasamy P, Kothari M. Malnutrition among Children Under Five Years. Nutrition in India. National family health survey-3; 2009. p.6-8.
11. Census-2011. Bareilly District: Census 2011 data. [accessed Sep 2016]
12. World Health Organization. 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. Geneva, Switzerland: World Health Organization; 2006.
13. Kumawat. R et al. A descriptive cross-sectional study to assess prevalence of malnutrition in school children 6-14 years of age in rural and urban area of Bikaner, Rajasthan, India. Int J of Community Medicine And Public Health. 2017; 3, p. 1079-1083.
14. Singh A., Khan S, Joshi, H.S, et al. (2018). An Epidemiological Study on Malnutrition among Primary School -going Children of Rural Area of Bareilly District, Uttar Pradesh, India. International Journal of Advanced & Integrated Medical Sciences. 3:8 -11.
15. Obaidullah Nasih et al.2021, A Comparative Study of Nutritional Status of Urban And Rural Schoolchildren In Selected Developing Countries: Systematic Review. Int J Recent Sci Res. 12, pp. 41537-41542.
16. P. Karak, R. Maiti, P. Das, and A. Karmakar, "Assessment of Nutritional Status of School Children In Rural And Urban Areas of Bankura, West Bengal," Int. J. Pharm. Sci. Res., vol. 9, no. 1, p. 338, 2018,
17. Bogale, T.Y., Bala, E.T., Tadesse, M. et al. Prevalence and associated factors for stunting among 6–12 years old school age children from rural community of Humbo district, Southern Ethiopia. BMC Public Health 18, 653 (2018).
18. Umeokonkwo, A.A., Ibekwe, M.U., Umeokonkwo, C.D. et al. Nutritional status of school age children in Abakaliki metropolis, Ebonyi State, Nigeria. BMC Pediatr 20, 114 (2020).
19. Goyal RC, Chavan UA: Health status of school children in Ahmednagar city. Indian J Maternal Child Health 1993, 4:81-83.
20. Sunderam VM: Health profile of school children in Madras city. Indian Pediatr 1978, 15:725- 730.
21. Integrated child development services (ICDS) scheme [Internet]. Icds-wcd.nic.in. 2022 [cited 28 February 2022].