



Original Research Article

A Study on Prevalence of Malnutrition amongst Primary School; Children in a Rural Area of District Bareilly- An Application of Poisson Regression

Dharmendra Kumar Gupta¹, Sonam Maheshwari², Ved Prakash Shrotriya³, Shyam Bihari Gupta⁴,
Atul Kumar Singh⁵, Asheesh Kumar⁶, Ratnesh⁷

¹Assistant Professor, ²Statistician cum Lecturer, ³Principal and Professor, ⁴Professor and Head, ⁵Associate Professor, ⁶Medical Officer, ⁷Post Graduate Student,
Department of Community Medicine, SRMS IMS, Bareilly.

Corresponding Author: Dharmendra Kumar Gupta

Received: 01/08/2015

Revised: 11/09/2015

Accepted: 15/09/2015

ABSTRACT

Introduction: Development of children is the first priority on country development agenda, not because of most vulnerable but because they are our future assets and also the future human resource of the country. Children are considered to be the most important natural resource and biggest human investment for development in every community.

Objective: To assess the nutritional status of primary school children in rural area and to find out the various socio demographic currettes of nutrition status / factor associated with malnutrition.

Materials and Methods: Study was conducted at four primary school children up to the fifth class, Bhojipura block, District Bareilly. It was descriptive cross sectional study. The participant consist of 340 school children among these 229 were male and 111 participant were female. In this study we use chi square to check the association between BMI and socio demographic variables. Poisson regression was used to estimate the association as prevalence ratios (PRs) between BMI categories and confounders including age, residence, socioeconomic status (SES), education level and occupational status of Parents.

Result: Out of total 340 primary school children, 69.9% were underweight in total while according to sex wise 73.6% and 61.3% were underweight in male and female respectively. Male children have 21 % more chance of having increased BMI as compare to its counterpart.

Conclusion: Education status and the SES of the parents were strongly associated with the nutritional status of the children and helping in the improvement of the nutritional status of the primary school children.

Key words: Malnutrition, Poisson regression, Nutritional status, Body Mass Index (BMI), SES.

INTRODUCTION

Malnutrition is one of a major public health concern affecting a significant number of school children influencing their health, growth and development and school academic performance.

Malnutrition is the largest health problem of children in developing countries.

Approximately 60 million children are underweight in India and child malnutrition is responsible for 22% of the country's burden of disease. One in every three malnourished children in the world lives in India. Malnutrition is more common in India than in Sub-Saharan Africa. ^[1]

School health has been regarded as a high priority intervention in developed countries. Development of children must be the first priority, not because they are most vulnerable but because they are our future assets and also the future human resource of the country. Nutrition plays a vital role, as inadequate nutrition during childhood may lead to malnutrition, growth retardation, reduced work capacity and poor mental and social development. Malnutrition essentially means “bad nourishment”. It concerns not enough as well as too much food, the wrong types of food and the body's response to a wide range of infections that result in malabsorption of nutrients or the inability to use nutrients properly to maintain health. Clinically, malnutrition is characterized by inadequate or excess intake of protein, energy, and micronutrients such as vitamins, and the frequent infections and disorders that result. [2]

Factors including biology, economy, culture, environment and disease contribute to undernutrition. Children are most vulnerable to undernutrition due to their low dietary intake, less access to food, inequitable distribution of food within households, improper food storage and preparation, dietary taboos and infections with pathogens. Child undernutrition can be mitigated through nutritional information campaigns, broader access to maternal and child health care practices and availing affordable, diverse, and nutrient-rich food. [3]

Primary school age is a dynamic period of physical growth and mental development of the child. Research indicates that nutritional deficiencies and poor health in primary school age children are among the causes of low school enrolment, high absenteeism, early dropout and poor classroom performance. The present position with regard to the health and nutritional status of the children in our country is very unsatisfactory. Apart from

mid-day meal programme which is run by the Government of India in government run schools, there are no other efforts for children in age group 5-14 years. The NFHS data shows that 53% of children in rural areas are underweight in India and this varies across states. The extent of stunted growth of children is also of concern and has consequences for schooling. [4]

Children are considered to be the most important natural resource and biggest human investment for development in every community. The number of malnourished children in India is among the highest in the world and is twice than that of the sub-Saharan region. [5]

Study conducted by GK Medhi, NC Hazarika, B Shah, J Mahanta showed the prevalence of underweight among children was 59.9% (357 of 596), and thinness among adults was 69.9% (1,213 of 1,735). [6]

Study conducted by S Biswas, K Bose, A Mukhopadhyay results showed that boys were significantly heavier and taller than girls at ages 2-4 years. The overall (age and sex combined) rate of stunting was 39.2 %. The prevalence of stunting was higher among boys (43.4 %) than girls (35.4). Based on World Health Organization classification of severity of malnutrition, the overall prevalence of stunting was very high (≥ 40 %) among boys and high (30-39 %) among girls. [7]

Studies conducted done by Mitra M, Kumar PV, Chakrabarty S, Bharati P. More than 90 percent of children (both boys and girls) in the age group of 4-6 years suffered by underweight (< -2 SD weight for age), which was comparatively lower in 7-9 and 10-12 years age group children. 84.51 percent of boys suffered by stunting (< -2 SD height for age), which was much higher than girls (47.54%) in 4-6 years age group. Similarly, 80 percent of 4-6 years age group children were affected by wasting (< -2 SD weight for height). [8]

Study conducted by Das DK, Biswas R overall prevalence of 'thinness' and 'stunting' were found to be 14.7% and 37.8% respectively. There was no significant association ($p > 0.05$) of thinness or stunting with per capita monthly family income and literacy status of parents. [9]

Several other studies [10-13] have also been conducted, which showed the problem of under nutrition among rural children in different parts of India.

BMI is related to socioeconomic status. The seminal review of 144 studies by Sobal and Stunkard (1989) [14] conducted 15 years ago demonstrated a direct relationship between SES and BMI in developing societies. That is, men, women and children of higher SES had a higher likelihood of being obese than those of lower SES. There are also two very recent papers that focus on the role of income as a BMI determinant. Cawley et al. (2008) [15] and Schmeiser (2008) [14] look at the impact of income on weight in the US. While Cawley et al. (2008) find no statistically significant effects, Schmeiser (2008) [16] find that family income significantly raises the BMI.

Aim and Objectives: The aim of the study is to estimate the prevalence and risk factors responsible for malnutrition among primary school children in the rural area of Bareilly district of Uttar Pradesh. To find out the relationship between various risk factors and its association with socio-demographic profile of these children.

MATERIALS AND METHODS

Research Setting: The study was conducted at four primary school children up to the fifth class from the rural area of Bhojipura Bareilly. The study was carried out in four private schools in Bhojipura block of Bareilly district in Uttar Pradesh India. The schools include Ram SahayKundallal Junior High School Chakdha, Cambridgeacademy imamnagar Gautiya, ZSNC Public school and Cambridge academy.

Research Question: Study was conducted in the month of January 2015, to find out of prevalence and nutritional status of the primary school children in rural area of district Bareilly. Descriptive cross sectional study was done. Purposive sampling was done to select the study population. All the children of the school present on the survey day were taken in the study.

Study Area: School children of up to fifth class in the rural area of the Bhojipura block, Bareilly, and belonging to the northern part of the India.

Study Population: The participant consist of 340 school children (both male and female) among these 229 were male and 111 participant were female from the above mentioned schools of the age group 4- 12 years participated in the study. The study was carried out as a part of the National Service Scheme (NSS) program.

Methodology: A team of the RHTC under one faculty head visited each of the four schools during the study period. Data collection involved the simple interviewing technique using a semi-open questionnaire that was filled by the researcher on the health card .We developed a semi-structured questionnaire consisting of questions inquiring recording socio-demographic profile of the study subjects like age, sex, caste, family income, education of father and mother, occupation of father and mother etc. the social class of the sample group was determined by B.G. Prasad classification. Permission was granted to us by the respective headmasters of the schools and the purpose of study was explained to them. The children of the school were also explained about the study. The research protocol and questionnaire was approved by the Institutional Ethical community. When the response variable is in the form of a count we face a yet different constraint. Counts are all positive integers and for rare events the Poisson distribution is more appropriate since the Poisson mean > 0 . So

the logarithm of the response variable is linked to a linear function of explanatory variables. The regression equation may be written as

$$\text{Log}_e(Y) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots$$

and so $Y = (e^{\beta_0}) (e^{\beta_1 X_1}) (e^{\beta_2 X_2}) \dots$

Anthropometric Measurement: In our study BMI (Body mass index) were using to assess the nutritional status of the study participants.

$$\text{BMI} = \frac{\text{(Weight in Kilogram)}}{\text{(Height in Meter)}^2}$$

Weight: the weight of the child was calculated by the using of weighing machine. The weight of participants was measured by standing on the weighing machine, zero error was checked before the start of survey and there after every fifteen reading.

Height: the height was measured of the children by standing by the side of the wall upright with heels close to each other and both the arm hanging by the side of the body. The height was measured from head to heels by the help of a simple measuring tape during all their measurement; student was wearing their school uniform.

BMI: According to the WHO standard, we divide this measurement in to three categories.

1. Underweight < 18.5
2. Normal ranges -18.5-24.5
3. Obese > 24.5

Nutritional Status: the mean weight and height of the children according to age and sex were compared with the median weight for age and height for age per NCHS standards .majority of the children are underweight of the school children .To assess the nutritional status between the age group was 4 to 12 years. these age group were the most vulnerable group of the physical and mental changes .Children with weight of age , 80 % of 50th percentile of the NCHS standards were taken as underweight. Malnutrition of the schoolchildren were eliminated by the providing them of healthy

diet and the socioeconomic status of the children.

RESULT AND DISCUSSION

Table 1:- Demographic characteristics of the Sample population (N=340)

Variable	Frequency	Percentage
Age		
4-7	68	20.0
7-10	202	59.4
10+	70	20.6
Sex		
Male	229	67.4
Female	111	32.6
BMI		
Underweight	236	69.4
Normal	72	21.2
Overweight	32	9.4
Religion		
Hindu	117	34.4
Muslim	206	60.6
Others	17	5.0
Socio-Economic Status		
Poor	155	45.6
Middle	123	36.2
Upper	62	18.2
Father –Education		
Illiterate	120	35.3
Primary	44	12.9
Middle	104	30.6
Intermediate	72	21.2
Mother –Education		
Illiterate	237	69.7
Primary	43	12.7
Middle	30	8.8
Intermediate	30	8.8
Father –Occupation		
Agriculture	81	23.8
Shoe keeper	123	36.2
Skilled	90	26.5
Unskilled	34	10.0
Service	12	3.5
Mother –Occupation		
House-Wife	236	69.4
Working	104	30.6
Total	340	100

Table 1 presents the socio-demographic characteristics of sample population. The sample mainly comprises children of age group 7-10 (59.4%). Only 21.2% children are normal while 69.4 % children are underweight. In this area percentage of underweight children is alarming high. Sample mainly consists of Muslim population (60.6).In the present sample, 18.2 per cent people come under upper socio economic status while 45.6 per

cent population belongs to lower class. Percentage of intermediate education is higher in father as compared to mother. Overall, we can designate near about 30 per cent mother are literate Most of the fathers

are shopkeeper, which is followed by percentage of who involve in agriculture activity. 31 per cent mothers are working in that area.

Table 2:-Association of different demographic variables with BMI categories

Variables	Underweight	Normal weight	Overweight	p value
Age				
3-6	60	5	3	0.000*
7-10	142	40	20	
10+	34	27	9	
Sex				
Male	168	46	15	0.017*
Female	68	26	17	
Religion				
Hindu	124	26	7	0.004*
Muslim	103	41	5	
Others	9	5	3	
Socio-Economic status				
Poor	103	35	17	0.041*
Middle	96	17	10	
Upper	37	20	5	
Father –Education				
Illiterate	88	24	8	0.043*
Primary	27	11	6	
Middle	81	15	8	
Intermediate	40	22	10	
Mother –Education				
Illiterate	168	45	24	0.005*
Primary	34	6	3	
Middle	18	11	1	
Intermediate	12	10	8	
Father –Occupation				
Agriculture	55	12	14	0.002*
Shoe keeper	79	29	15	
Skilled	70	19	1	
Unskilled	25	9	0	
Service	7	3	2	
Mother –Occupation				
House-Wife	157	57	22	0.125
Working	79	15	10	

*(Significant at 5 % level of Confidence)

In Table 2, with the help of chi square we want to explore that which socio-demographic factor is associated with BMI. We can observe BMI is significantly associated with age, socio economic status, parent's education, religion except mother occupation at 1% level of confidence Poisson regression describes about the incidence rate. According to table 3 with the help of Poisson Regression, children in age group 4-7 and in 7-10 has 22 per cent and 13 per cent have less chances of being overweight As compared to Children whose age is greater than 10. Male children have 21 per cent

more chances of having higher BMI. According to Religion Hindu and Muslim have 20 and 11 per cent more chance of having higher BMI respectively. Socio economic status has direct relationship with high BMI. As the level of status increases, having chance of higher BMI also increases. Parents who are illiterate have 30 per cent less chances of higher BMI. Father is occupied by agriculture 40 % less chances of high BMI as compared to service man. Mother occupation has no remarkable point regarding BMI.

Table3: Determinants of body mass index (BMI) among Children in DhuraTanda, Bareilly: Prevalence ratios (OR) from Poisson regression

VARIABLES	PR	CI	p value
Age			
4-7	0.785	0.587-0.856	0.008*
7-10	0.869	0.682-1.025	0.125
10+(Ref)	-	-	-
Sex			
Male	1.216	0.967-2.223	0.045*
Female(Ref)	-	-	-
Religion			
Hindu	1.201	0.889-2.001	0.001*
Muslim	1.114	0.859-1.999	0.041*
Others(Ref)	-	-	-
Socio-Economic status			
Poor	0.589	0.358-0.799	0.002*
Middle	0.789	0.458-2.015	0.412
Upper(Ref)	-	-	-
Father –Education			
Illiterate	0.689	0.488-0.967	0.042*
Primary	0.885	0.568-1.022	0.214
Middle	0.926	0.858-2.000	0.004*
Intermediate(Ref)	-	-	-
Mother –Education			
Illiterate	0.721	0.545-0.969	0.035*
Primary	0.847	0.599-1.056	0.001*
Middle	0.855	0.702-1.505	0.006*
Intermediate(Ref)	-	-	-
Father –Occupation			
Agriculture	0.585	0.359-0.889	0.044*
Shoe keeper	0.655	0.448-0.999	0.024*
Skilled	0.788	0.215-0.882	0.051
Unskilled	0.702	0.512-0.812	0.027*
Service(Ref)	-	-	-
Mother –Occupation			
House-Wife	0.998	0.556-1.559	0.036*
Working(Ref)	-	-	-

*(Significant at 5 % level of Confidence)

In the present study, the overall age and sex combined prevalence of underweight; stunting and thinness were 16.9%, 17.2% and 23.1%, respectively. Both sexes had similar rates of stunting but significantly more boys were underweight and thin. According to the WHO classification of severity of malnutrition among children, the overall age and sex combined rates of underweight, stunting and thinness were medium, low and very high, respectively.

Stunting reflects a failure to reach linear growth potential due to sub optimal health and/or nutritional conditions, underweight reveals low body mass relative to chronological age, which is influenced by both, a child's height and weight.

Underweight thus cannot distinguish between a child that is small in weight relative to his/her height and a child that is low in height relative to his/her age, but who may be normal in weight-for-height. On the other hand, thinness is an indicator of acute under nutrition, the results of more recent food deprivation.

This study provided evidence that these children were under acute and chronic nutritional stress indicating the requirement of immediate appropriate public health nutritional intervention programmes. This has important implications for public health policy-makers, planners and organizations seeking to meet national and international development targets. However, it must be noted here that the conclusion drawn may not be applicable for all districts of India but to a certain extent; it may be true for Bareilly.

CONCLUSION

Education status and gender of children were strongly associated with the nutritional status of the children and helping in the improvement of the nutritional status of the primary school children.

Considering that under weight is the condition with severe short and long-term health repercussions, with regard to the prevalence found in nutritional indicators, it is worth emphasizing the importance of maintaining actions to control starvation and malnutrition in the population. However, it is necessary to adjust the guidelines of current actions and to clearly define the profile of their beneficiaries concerning underweight, due to the possible effects of foods low nutritional value. In this case, it is suggested that the access of the population to food should be accompanied by a specific education process focused on adequate consumption, nutritional needs.

REFERENCES

1. Rashmi M R, Shweta B M, Fathima FN, Agrawal T, Shah M, Sequeira R. Prevalence of Malnutrition and Relationship with Scholastic Performance among Primary and Secondary School Children in Two Select Private Schools in Bangalore Rural District (India). *Indian J Community Med* 2015;40:97-102
2. http://www.who.int/water_sanitation_health/diseases/malnutrition/en/
3. Degarege D, Degarege A, Animut A. Undernutrition and associated risk factors among school age children in Addis Ababa, Ethiopia. *BMC Public Health*. 2015; 15: 375.
4. S Neelu, B M, G S.K, C H, B S.K. Nutritional Status of urban primary school children in Meerut. *The Internet Journal of Epidemiology*. 2009 Volume 8 Number 1.
5. Local Action creating Health Promoting Schools. The world Health Organization's Information Series on School Health (online). WHO 2000 (Cited 2015 jan 13) Available from:URL:<http://www.WHO.Schoolyouthhealth/media/en/88.pdf>.
6. Gagnolati M., Shekar M., Gupta M.D, Bredenkamp C. and Lee Y.K. India's undernourished children: A call for reform and action. *The International Bank for Reconstruction and Development/The World Bank*, Washington DC. (2005).
7. Bose K, Biswas S, Bisai S, Ganguli S, Khatun A, Mukhopadhyay A , BhadraM. Stunting, underweight and wasting among Integrated Child Development Services (ICDS) scheme children aged 3-5 years of Chapra, Nadia District, West Bengal, India. *Matern Child Nutr* 2007; 3: 216-221.
8. Mitra M, Kumar PV, Chakrabarty S, Bharati P. Nutritional status of Kamar tribal children in Chhatisgarh. *Indian J Pediatr* 2007; 74 (4): 381-4.
9. Das DK, Biswas R. "Nutritional status of adolescent girls in a rural area of North 24 Parganas district" West Bengal. *Indian J Public Health* 2005; 49(1):18-21.
10. Griffiths PL, Bentley ME. The nutrition transition is underway in India. *J Nutr* 2001;131(10):2692-700.
11. Malhotra A, Passi SJ. Diet quality and nutritional status of rural adolescent girl beneficiaries of ICDS in north India. *Asia Pac J Clin Nutr* 2007; 16 Suppl 1: 8-16.
12. Singh MB, Lakshminarayana J, Fotedar R, Anand PK. Childhood illnesses and malnutrition in under five children in drought affected desert area of western Rajasthan, India. *J Commun Dis* 2006; 38(1):88-96.
13. Vashisht RN, Krishan K, Devlal S. Physical growth and nutritional status of Garhwal girls. *Indian J Pediatr* 2005; 72 (7): 573-578.
14. Sobal J, & Stunkard AJ "Socioeconomic status and obesity: a review of the literature" *Psychological Bulletin*, 1989; 105(2): 260-275.
15. Cawley J, Moran J, Simon K, "The impact of income on the weight of elderly Americans" National Bureau of Economic Research, Working Paper No. 14104, 2008.
16. Schmeiser M., "Expanding wallets and waistlines: the impact of family income on the BMI of women and men eligible for the Earned Income Tax Credit" Unpublished manuscript, Deptt. of Consumer Science, University of Wisconsin at Madison, 2008.

How to cite this article: Gupta DK, Maheshwari S, Shrotriya VP et al. A study on prevalence of malnutrition amongst primary school children in a rural area of district Bareilly-an application of poisson regression. *Int J Health Sci Res*. 2015; 5(10):30-36.
