Prevalence and Socio Demographic Determinants of Malnutrition in Rural Communities of District Fatehgarh Sahib, Punjab

POONAM KHANNA[1]*, RAJBIR KAUR[1],TEJINDER SINGH[3], JILL MILLER[4], AMANDEEP KAHLON SANDHU[2] and JYOTI[1]

[1]School of Public Health, PGIMER, Chandigarh, India.
[2]Mehar Baba Charitable Trust, Fatehgarh Sahib, India.
[3]University of Utah, Salt Lake City, UT, India.
[4]Girl Rising, Salt Lake City, UT, India.

Abstract

Malnutrition is a global concern in developing countries. About one third of the world's malnourished children live in India. To study the prevalence of malnutrition and its associations with socio demographic factors among under 5 children in rural areas. A community based cross sectional study was conducted in district Fatehgarh Sahib. A census based technique was used with 573 under 5 children from nine villages of Fatehgarh Sahib District. Data was collected using structured questionnaire and anthropometric measurements. 573 children, ages 5 years and below, were enrolled for this study with 58.2 % participants in upper middle and upper class, and 5.9 % in lower and lower middle class. It was found that 14.14 %, 15.71 % and 18.85 % of the children were malnourished with respect to Weight for age (WHZ) and Height for age (HAZ) z-scores and disturbet body weight. Multivariate regression analyses of all indicators of malnutrition reflect parental education, socioeconomic status, an increase in number of children in household and children born in second or third order were some of the socio-demographic factors, which had an impact on the nutritional status of the under-five children. Significantly for stunting (a marker of malnutrition of great concern), children from a lower caste had a 2.2 fold higher odds (OR 2.24), second or higher birth order was associated with 26% higher odds (OR 1.262), and children born to parents with lower literacy (primary and below) had 52 % and 33 % higher odds for mother's and father's education respectively (OR 1.52 and 1.32). The burden of under-nutrition among under-5 children has not changed significantly even after several intervention programs. Therefore, policy makers must focus on simultaneous socioeconomic development also. Additional qualitative research is needed on identifying and designing new programs or modifying existing programs with services which can be easily understood and afforded equitably by the intended beneficiaries.

Introduction

Malnutrition is a global concern and continues to be one of the leading causes of morbidity and mortality, particularly in developing countries where one out of three preschool children is affected[1]. Malnutrition also prevents children from reaching their full physical and mental potential, which, in turn hampers progress of a country where this malady is conspicuously large in proportion. Global child malnutrition findings estimate that 156 million children under 5 around the world are stunted, 42 million are overweight and 50 million are wasted[2].

Despite India's 50 % increase in Gross Domestic Product (GDP) since 1991, more than one third of the world's malnourished children live in India[3,4]. As per National Family Health Survey of 2015-16 nearly one-third of children were found too short for their age whereas, wasting was still very high by international standards in all of the States/ Union Territories[1]. This is believed to be due to a combination of socio-economic and societal factors including poverty,[5-9] food insecurity, gender inequality, disease and poor access to health and developmental services[10]. The majority of studies on child nutritional status have described the prevalence of malnutrition among under-5 children and analyzed socioeconomic and demographic factors associated with child malnutrition[11,12].

The State of Punjab is an otherwise wealthy region and compared to the Empowered Action Group States of the country, it has overall better performance in relation to the socio-economic status and constituting socio-demographic variables. Despite the presence of factors like relatively improved food security and access to health care services, the nutritional status of under-five children doesn't appear to be better. According to National Family Health Survey (2015-16)[1], approximately 24.5 % under five rural children of the State are affected by some degree of stunting, a relatively incurable state of malnutrition.

Although poverty is an important factor in the poor nutrition situation, nutritional deficiencies are widespread even in households that are economically well off[17]. To recognize and reveal the possible impact of various socio-demographic variables in rural communities of relatively wealthy regions of country, an attempt has been made to investigate the prevalence of malnutrition and associated socio demographic variables among under 5 children.

Methodology

Study Design and Area

A community based cross sectional study was conducted in Fatehgarh Sahib District of the state of Punjab in the northwestern part of India.

Study Population, Sample Size and Sampling Technique

In this study, a census based sampling technique was used to enrol 573 under -five children from nine villages of Fatehgarh Sahib District. The villages were selected using purposive sampling technique. Instead of statistical computation, an attempt was made to include all the under-five children in the study, with an aim to analyze the impact of various demographic variables on the nutritional status of these children.

Data Collection

Data was collected using structured questionnaire consisting of items to collect information on socio-demographics and anthropometric measurements. The anthropometric data was collected using the procedure stipulated by the WHO (2006)[13] for taking anthropometric measurements.

Height/Length Measurement

Body length of children age up to 23 months was measured without shoes and height was read to the nearest 0.1cm by using a horizontal wooden length board with the infant in recumbent position. However, height of children 24 months and above was measured using a vertical wooden height board by placing the child on the measuring board, and child standing upright in the middle of board, with the child's head, shoulders, buttocks, knees and heels touching the board.

Body weight was measured using electronic digital weighing scale with minimum/light clothing and no shoes. Calibration was done before making the measurement by setting it to zero. In the case of child's age below two years, an automatic mother-child adjustment was made to the scale that eliminated the mother's weight while she stood on the scale with her baby.

Z-Scores for weight-for height, height-for-age

and weight-for-age were calculated using WHO growth standards for specific age groups. Malnutrition indicators including wasting, stunting and underweight were defined as z-score $\leq$ -2 SD for weight-for-height, height-for-age and weight-for-age, respectively (WHO, 2006)[13]. The socio-demographic data were obtained in an interview using a structured questionnaire developed by the researchers including the Udai-Pareek Socio-Economic Measurement Scale for Rural Population.

Operational Definitions

The term malnutrition is an umbrella term including indicators reflecting both decreasing and increasing anthropometric measurement; the results focused on indicators which reflect poor health due to under-nutrition.

The term Stunting included moderate to severe height retardation for age (low height for age) with z-scores of -2SD and less. Wasting included moderate to severe reduction in body weight for height (low weight for height) with z-scores of -2SD and less. Similarly, underweight included moderate to severe reduction in body weight for child's age (low weight for age) with z-scores of -2SD and less.

Statistical Analysis

The data obtained were cleaned, validated manually and analyzed using computer software (STATA version 14.1). Prevalence of malnutrition in under-five children was measured separately for wasting, stunting and underweight. Influence of various socio-demographic factors on under-nutrition was measured using bivariate analysis, whereas binomial logistic regression analysis was done to measure impact of a particular socio-demographic factor by controlling for other variables. Results were considered significant when p-value was < 0.05. Measures of under-nutrition including wasting, stunting and underweight were outcome variables. The socio-demographic factors including age, parental education, socio-economic status, family size, birth order etc. constituted the independent variables in the study.

Ethical considerations

A written consent was taken from the mother or legal caregiver to collect data.

This study was approved by Ethics Committee of Post Graduate Institute of Medical Education and Research, Chandigarh.

Results

Data was collected for 573 under five children located in nine villages of the district. The study population included 48.69 % (n=279) female and 51.31% (n=294) male children. The majority of children (23.6 %, n=135) belonged to 12-24 month age group. Nearly 58.2 % (n=334) study participants belonged to upper middle and upper socio-economic class; 5.9 % (n=34) were in lower middle and lower class. There were a total of two or less number of children in a household among 71.75 % (n=409) study participants, followed by 22.98 % (n=131) study participants' homes with 3 to 4 children. Sixty one percent participants were being raised in joint families (n=351) (Table 1).

The prevalence of under-nutrition was determined based on different parameters of moderate to severe degree of under-nutrition represented by z-score of -2 standard deviations and less; with 14.14 % (n=81) study participants having low weight for height (wasting), 15.71% (n=90) having low height for age (stunting) and 18.85 % (n=108) study participants having low weight for age (underweight) (Table 2).

The bivariate analysis highlighted that not all the factors were associated with occurrence of all the forms of under-nutrition considered in the study. The occurrence of low weight for height (wasting) was statistically significantly associated (p value<0.05) with socioeconomic status of the under-five rural children. More number of socio-demographic characteristics of the child and family were statistically significantly associated with occurrence of low weight for age and height for age among under-five rural children, including birth order of the child with more likelihood of being stunted or underweight with advancing birth order, the socio-economic class, type of family and parental education. The occurrence of low weight for height, low height for age and low weight for age was not statistically significantly associated with sex of the under-five child. (Table 3)

The binomial logistic regression was performed to see the independent effect of various socio-demographic factors of the child which appeared

Table 1: Socio-demographic characteristics of the under-five children in nine villages of district Fatehgarh Sahib

Variable	Females (n=279)	Males (n= 294)	Total (n=573)
Age in months			
0-6 months	16 (2.8%)	15 (2.6%)	31 (5.4%)
6-12 months	28 (4.9%)	25 (4.4%)	53 (9.2%)
12-24 months	71 (12.4%)	64 (11.2%)	135 (23.6%)
24-36 months	54 (9.4%)	63 (11.0%)	117 (20.4%)
36-48 months	50 (8.7%)	66 (11.5%)	116 (20.2%)
48-60 months	60 (10.5%)	61 (10.6%)	121 (21.1%)
Socio-Economic Status class			
Lower class middle and lower class	18 (3.1%)	16 (2.7%)	34 (5.9%)
Middle class	97 (16.9%)	108 (18.8%)	205 (35.7%)
Upper middle and upper class	164 (28.6%)	170 (29.6%)	334 (58.2%)
Type of family			
Single	61 (10.6%)	56 (9.8%)	117 (20.4%)
Joint	172 (30.0%)	179 (31.2%)	351 (61.3%)
Extended	46 (8.0%)	59 (10.3%)	105 (18.3%)
Type of house			
No house	2 (0.3%)	3 (0.5%)	5 (0.9%)
Kutcha	17 (3.0%)	16 (2.8%)	33 (5.8%)
Mixed	39 (6.8%)	58 (10.1%)	97 (16.9%)
Pucca	221 (38.6%)	217 (37.9%)	438 (76.4%)

Table 2: Prevalence of under-nutrition among under five children in nine villages of district Fatehgarh Sahib

Indicator of undernutrition*	Females (n=279)		Males(n= 294)		Total(n=573)	
Moderate to severe wasting	45	16.13%	36	12.24%	81	14.14%
Moderate to severe stunting	45	16.13%	45	15.31%	90	15.71%
Moderate to severe underweight	60	21.51%	48	16.33%	108	18.85%

Table 3: Factors affecting the status of nutrition among under-five children in nine villages of district Fatehgarh Sahib

	Parameter of measurement of malnutrition					
	Wasted (n=81)		Stunted (n=90)		Underweight (n=108)	
Variable	N, %	p-value	N, %	p-value	N, %	p-value
Sex						
Females (n=279)	45 (7.9)	0.182	45 (7.9)	0.787	60 (10.5)	0.113
Males (n=293)	36 (6.3)		45 (7.9)		48 (8.4)	
Birth order of child						
1 (n=294)	46 (8.0)	0.519	27 (4.7)	0.000	47 (8.2)	0.000
2 (n=215)	28 (4.9)		42 (7.3)		37 (6.5)	

3 and above (n=64)	7 (1.2)		21 (3.7)		24 (4.2)	
Age						
0 to 6 months (n=31)	6 (1.0)	0.705	3 (0.5)	0.07	6 (1.0)	0.202
6 to 12 months (n=53)	8 (1.4)		3 (0.5)		6 (1.0)	
12 to 24 months (n=135)	15 (2.6)		16 (2.8)		19 (3.3)	
24 to 36 months (n=117)	15 (2.6)		21 (3.7)		25 (4.4)	
36 to 48 months (n=116)	16 (2.8)		24 (4.7)		22 (3.8)	
48 to 60 months (n=121)	21 (3.7)		23 (4)		30 (5.2)	
Caste						
General (n= 237)	21 (3.7)	0.001	17 (3.0)	0.000	16 (2.8)	0.000
Others (n= 336)	60 (10.5)		73 (12.7)		92 (16.1)	
Socio-Economic Status (SES) class						
Lower (middle, lower middle and lower)	46 (8.0)	0.002	62 (10.8)	0.000	77 (13.4)	0.000
Upper (upper middle and upper)	35 (6.1)		28 (4.9)		31(5.4)	
Number of children in family						
2 or less (n= 409)	59(10.4)	0.436	50 (8.8)	0.000	65 (11.4)	0.011
3-4 (n=131)	15(2.6)		28 (4.9)		34 (6)	
5 or more (n=33)	6(1.1)		12 (2.1)		9 (1.6)	
Type of family						
Single (n=117)	18 (3.1)	0.891	32 (5.6)	0.000	37 (6.5)	0.00
Joint (n=351)	49 (8.6)		40 (7.0)		54 (9.4)	
Extended (n=105)	14 (2.4)		18 (3.1)		17 (3.0)	
Mother's education						
Illiterate	6 (1.0)	0.211	12(2.1)	0.000	11 (1.9)	0.000
Below or up to primary	14 (2.4)		18 (3.1)		22 (3.8)	
Below or up to high	34 (5.9)		45 (7.9)		49 (8.6)	
Secondary and above	27 (4.7)		15 (2.6)		26 (4.5)	
Father's education						
Illiterate	8 (1.4)	0.067	10 (1.7)	0.000	14 (2.4)	0.000
Below or up to primary	6 (1.0)		16 (2.8)		12 (2.1)	
Below or up to high	46 (8.0)		44 (7.7)		57 (9.9)	
Secondary and above	21 (3.7)		20 (3.5)		25 (4.4)	

to be statistically significantly associated with the outcome variables in the bivariate analysis. After adjusting for the statistically significantly associated factors of bivariate analysis, binomial logistic regression modeling showed a statistically significant association of socio-economic status of child's family with occurrence of low height for age and low weight for age. The adjusted odds ratio signified that poor socio-economic status due to lower rank in ascribed social hierarchy (caste) tended to have an impact on occurrence of acute form of under-nutrition (i.e. underweight). It also signified that the occurrence of chronic form of under-nutrition (i.e. stunting) among under-5 rural children living in families of lower socio-economic status was due to increased number of children in the household. (Table 4 a).

Discussion

Prevalence of wasting, stunting and underweight among children was 14.14 %, 15.71 % and 18.85 % respectively is closer to the National average in India (16.1 %, 24.5 % and 21.1 %) established by NFHS-4 (2015-16) for rural Punjab. The percentage of kids affected by moderate degree of wasting has increased dramatically from 9.2 per cent in 2005 to 15.6 per cent in 2015 in both urban and rural areas[26].

Prevalence of under-nutrition is relatively higher among females in this study, however, without having any significant association.

Table 4 (a): Binomial Logistic Regression Model for factors affecting stunting and underweight in under five rural children in nine villages of district Fatehgarh Sahib (for statistically s ignificant associations in bivariate analysis)

Variable in question	Stunting				Under weight			
	Unadjusted		Adjusted		Unadjusted		Adjusted	
	OR	p-value	OR	p-value	OR	p-value	OR	p-value
Socio-demographic factors of child								
Birth order of child		0.000		.087		0.000		.503
First child	0.207	0.000	.665	.405	0.317	0.000	.745	.517
Second child	0.497	0.027	1.262	.601	0.346	0.001	.628	.276
Socio economic factors of the family								
Socio-economic Status class (lower)	3.82	0.000	2.24	0.03	4.64	0.000	2.52	0.006
Caste (general)	0.278	0.000	0.75	0.48	0.192	0.000	0.42	0.02
Number of children in household		0.000		.037		0.012		.407
1-2 children	0.209	0.000	.226	.014	0.441	0.052	.470	.201
3-4 children	0.408	0.037	.300	.018	0.818	0.652	.666	.430
Type of family		0.000		.421		0.001		.449
Single	1.841	0.066	1.260	.629	2.421	0.008	1.590	.309
Joint	0.631	0.135	.837	.669	0.955	0.880	1.126	.763
Parental Education								
Mother's Education		0.000		.111		0.000		.957
Illiterate or unknown	9.929	0.000	3.570	.025	4.701	0.000	1.169	.771
Below or up to primary	5.167	0.000	1.523	.375	3761	0.000	1.205	.653
Below or up to high	3.073	0.000	1.843	.087	1.866	0.017	1.006	.985
Father's Education		0.001		.894		0.001		.512
Illiterate or unknown	4.065	0.002	.988	.983	5.364	0.000	1.421	.499
Below or up to primary	3.937	0.000	1.328	.550	2.080	0.061	.665	.381
Below or up to high	1.751	0.05	.980	.952	1.869	0.016	1.072	.814

Table 4(b): Binomial Logistic Regression Model for factors affecting wasting in under five rural children in nine villages of district Fatehgarh Sahib (for statistically significant associations in bivariate analysis)

Variable in question	Unadjusted		Adjusted	
	OR	p-value	OR	p-value
SES class (lower)	2.04	0.003	1.44	0.24
Caste (general)	0.44	0.003	0.57	0.11

Children older than two years of age reported to have higher prevalence of one or the other form of under-nutrition. Though it had no statistically significant association with occurrence of under-nutrition, it does points out towards the importance of first 1000 days of pregnancy and post-partum. The strikingly increased proportion of undernourished children in the age band of 24 months and above may signifies

that the health of child not only depends upon the type of nutrition she or he is being provided routinely, but health of woman during the gestational period also has an effect on the nutritional status of under five children. The age group of 24 months and above may be representing the group of under-five children whose mothers' health could have suffered from lack of adherence to the right protocol to be followed during pregnancy including full antenatal check-up, nutritious diet; and a healthy life-style and care of child after birth to reduce the risk of acquiring diseases or infections. National Family Health Survey of 2015-16 has also revealed that only 27.9 % females from rural Punjab availed full ante-natal services[27]. Poor gestational development pushes children towards morbidity and increased the risk of death, poor school performance and poor socio-economic growth. A report by Save the Children organization reveals that globally, 14.5 % of under-five child deaths happen among the stunted children[28].

All forms of under-nutrition were found increasingly in underprivileged caste sections. Similar scenario of under-nutrition was observed in relation to the socio-economic status class. Since stunting is chronic form of under-nutrition, its occurrence tends to link to the poor status of the female health during pregnancy, which may be due to poverty in the house. This is supported by a multinational cohort study published in the year 2010[29].

Stunting and underweight were also statistically significantly associated with number of children in a household; supported by a study representing global scenario[23]. However, this may not be a significant causal association. There will be difference in impact on nutritional status with respect to number of children in a household by virtue of a joint or extended family versus that of the total number of children born to a female. The difference could not be clearly explained based on the available data. But, the adjusted odds ratio of stunting among households having less vs. more number of total children obtained in this study favors that the lesser the number of children in a household, the better is the nutritional status of under-five children. A south-Ethiopian study favors this in relation to underweight under-five children[30].

Further analysis involving the age gap among all children in a household may favor the importance of keeping a three-year gap between two pregnancies for better nutritional outcomes of children.

Other than the above findings, parental education was found to be statistically significantly associated with stunting and underweight among under-five children; however it became statistically non-significant association when adjusted for other socio-demographic factors in the regression modeling. Study conducted by Jyothi Lakshmi *et al.,*[18] also mentioned that presence of wasting among preschool children were not significantly associated with mother's literacy status. These findings are in contrast with many other studies[4-8,24,25]. However, one cannot rule out the fact that a relatively better educational status of parents has a positive impact on understanding the importance of factors determining good health, even when the earning parent is not able to earn enough to feed the family[20-22,28].

Overall, this study illustrated that the socio-economic status of a family impacts the prevalence of under-nutrition among under-five rural children[14-16,19]. The resultant inequality is much more pronounced for chronic conditions like stunting than for wasting. Similar findings were observed by Poel *et al.,* Many other studies have identified poverty as the chief determinant of malnutrition in developing countries that enables intergenerational shift of poor nutritional status among children[3,10].

From the results it can be concluded that the prevalence of under-nutrition is lesser but comparable to the national averages for the state of Punjab in India. Other associated variables need to be studied including hygiene and sanitation practices followed in the family, breast feeding and weaning practices, parents' nutritional knowledge and practices.

In India, various interventions programs are in operation but the impact of these operations is such that under-nutrition still prevails among children below 5 years of age. In addition, changes in dietary and life-style related practices are also negatively impacting the nutritional status of children below 5 years, resulting in an increased prevalence of non communicable diseases including cardiovascular and musculoskeletal disorders. The existing programs need to be implemented and streamlined in a way so that they can actually help controlling

the progression of malnutrition from mild to moderate and to severe at the earliest. The policy makers must focus on simultaneous socioeconomic development also. Additional qualitative research is needed on identifying and designing new programs or modifying existing programs with services which can be easily understood and afforded equitably by the intended beneficiaries[28].

It is recommended to ensure the effective service delivery under various existing programs at the grass root level. Qualitative research may be carried out to have an insight on the beneficiaries' knowledge and attitude related barriers to effective service utilization targeting maternal and child health. Information on the morbidity status in previous month can help identify most common cause of acute forms of under-nutrition. Periodic surveys may be conducted to identify seasonal variations affecting nutritional status of under-five rural children.

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