



PREVALENCE OF MALNUTRITION AMONG SCHOOL GOING CHILDREN: A CASE STUDY OF LAHAUL &SPITI AND MANDI DISTRICTS, HIMACHAL PRADESH

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Abstract

Background: Malnutrition, in all its forms, is primary villain in the survival path of the children. Despite the stringent efforts, stunting is declining at slower pace and wasting is still prevalent among young children. The objective of the study is to examine anthropometric measures (stunting and wasting) among school going children in Himachal Pradesh, India.

Methods: A cross sectional study of 750 children aged 5-15 years old was conducted in the Lahaul &Spiti and Mandi, HP. For estimating the results, WHO Anthro Plus software was used in which Nutritional Survey module was assessed. Further outcomes were analyzed by bivariate logistic regression and cross tab

Results: The findings of nutritional status among schoolers were quite impressive. Prevalence of malnutrition indicators – stunting, wasting and underweight were found more among older and female children. Likelihood of being stunted and wasted were found significantly with age of children, gender, education of mother and economic status of parents in both sample districts. bivariate result between wealth quintiles and stunting showed that the likelihood of being stunted (OR= 3.44, CI= 1.58 – 4.83, $p < 0.05$) was more among children who belonged to poor class family as compared to rich class family.

Conclusion: Awareness about nutritional indicators is imperative for the households. Although, Government of India has introduced National Nutrition Mission (NNM) for malnutrition- free India in various districts, but its implementation at underlying level is a faraway dream.

Keywords: Anthro Plus Software, Height for Age, Weight for Age, Odds Ratio, WHO.

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Introduction

In the world, every child has the right to survive and thrive. Child's development for healthy adults mainly starts from mother's womb, which further depends upon socio economic conditions of the household. Apart from the infant mortality and child morbidity, nowadays malnutrition is the leading cause of death among children. One of the primary reasons of undernutrition is unhealthy and poor diet, which attributes many global health challenges. The malnutrition crisis is mainly of four types- stunting, wasting, underweight and overweight. The Global Nutrition Report, 2020¹ proposes the causes and factors work behind nutrition inequality by taking insights from World Health Organization (WHO) Commission on the Social Determinants of Health and UNICEF. At the root level, nutrition inequality is dependent upon household's earning level, social, material and psychological circumstances that further related to adequate supply of nutritious food, maternal and infant care, and timely health checkups and socio-economic position of household. It is also reckoned in the latest Global Nutrition Report (2020)¹, Asia is home to more than half of the world's stunted children (54.8%). Moreover, in the world, 20.5 million newborns have low birth weight and later on these infants suffers from undernutrition. The stiff challenge of child undernutrition always stands first in national public health concern, owing to boost economic development. Besides this, the cycle of malnutrition is intergenerational and subsist prolonged, as it hangs on variety of factor such as maternal nutrition, maternal education, household economic power, access to safe drinking water and sanitation and dietary intake by child (Global Nutrition report, 2018)². This vicious cycle not only inundate the child diseases and mortality but also affects the learning capability and score card of the children in later life that shrink the productivity in adult age. Various empirical studies enlighten the review of stunting and wasting among school going children. Alderman *et al* (2003)³ investigated the extent of malnutrition in developing countries. There was a higher correlation found between health, nutrition and cognitive development of the person. Handa *et al* (2008)⁴ examined the nutritional status of school going children and found that mean height and weight in all age groups was significantly less than the National Centre for Health Statistics Standards (NCHSS). Kumari (2005)⁵, Sati V *et al* (2012)⁶, Srivastava A *et al* (2012)⁷, Bhatia S *et al* (2013)⁸ analyzed the malnutrition among school going children with the help of anthropometric data and measurement. The studies reported that high

proportion of schoolers suffered from undernutrition in the form of stunting and wasting that ultimately effects the learning power of the children through less attendance and dropouts.

With the limelight of above literature, the present study aims to analyze the prevalence of malnutrition - stunting, wasting and underweight among school going children in sample districts of Himachal Pradesh.

Material and Methods

Study population and setting

After getting the ethical clearance, a community based primary survey was conducted among 750 children in order to analyze the prevalence of malnutrition among schoolers. The cross-sectional data was collected between February – May 2021, in two districts of Himachal Pradesh. To locate the sample respondents, the multistage sampling method was employed. At first stage, out of 12 districts, 2 district are selected for the study – Lahaul and Spiti (Low populated) and Mandi (High populated). In the second stage, again on the basis of population parameter, inhabited villages were selected from districts. At third stage, children were chosen using a random number table and surveyed through face-to-face interview method using a semi-structured questionnaire. The confidentiality of participants and willingness of participation for this study was duly considered during interview. Ethical approval from the institution has also been taken before starting the study.

Sample size

The sample size was determined by the help of Yamane Taro's formula (1967). As per the census 2011, the database on population is given. So, the sample size was:

$$n = \frac{N}{1+N(e)^2}$$

n is sample size and N is population size. e is level of precision and assumed as 0.05. With the help of this formula, 793 sample size was estimated but data was collected from 750 children participant. Rest of the sample respondents were found unwilling to participate in the present study due to some reasons

Anthropometric variables and other Socio-economic variables

The determinants of malnutrition- stunting, wasting and underweight were considered as predicted variables and measured by using the

WHO Anthro Plus software. The height of the child participant was recorded on Frankfurt plane to the nearest millimeter and weight was measured on a digital weighing machine. WHO Anthro plus software consists of three modules- Anthropometric Calculator (AC), Individual Assessment (IC) and Nutritional Survey (NS). Each module is specifically designed for analyzing the nutritional status and growth of child from birth to 19 years old. The study had used anthropometric calculator of WHO Anthro Plus software and calculated the determinants of stunting, wasting and underweight based on WHO's guidelines 2006. As per the guideline, a stunted child is one whose height for age z score is less than -2 Standard Deviation (SD) below mean and a child is considered to be wasted if his/her BMI for age z score is lower than -2 Standard Deviation (SD) below the mean. Similarly, a child is considered as underweight if his/ her weight for age is less than -2 Standard Deviation (SD) below the mean. In addition to this, socio economic variables were taken as explanatory variables in order to understand the relationship between the variables. In the study, predictor variables were wealth status of the household, mother's qualification and father's qualification.

Data Analysis

Data analysis was done by using the R studio software – R Studio team (2020): Integrated development for R, PBC Boston. Descriptive

statistics such as mean, standard deviation was computed to explore the characteristics of respondents. To quantify the relationship among malnutrition indicators and various variables such as wealth status of the household, mother's education level and father's education level, the measure of association and binary logistic regression were applied. The results obtained from measure of association was totally based on chi-square statistics. In addition to this, wealth status was measured by a list of various assets possessed by the households and quintiles were prepared through Principal Component analysis (PCA).

Results

Descriptive statistics

Table 1 elucidates the descriptive statistics on child respondents according to the socio-economic characteristics. The study participants were categorized according to age, most of children belonged to 10-12 years of age (38.8%) followed by 13-15 years of age (38%). Approximately half of the child participants were male (53.5%) and female (46.5%). In case of education level of mother, majority of mothers were qualified up to secondary level (53.9%) and 34 % mothers were found highly qualified in this study. Similarly, majority of fathers were qualified up to secondary level (54.5%) and 36% were educated at higher level. In wealth quintiles, 32.2% children belonged to poor family, 34% belonged to medium and 33% belonged to rich family.

Table 1 Descriptive profile of study participants of Himachal Pradesh (n= 750)

Socio – economic variables	Frequency (%)
Age	
5-9	174 (23.2%)
10-12	291 (38.8%)
13-15	285 (38%)
Sex	
Male	401 (53.5%)
Female	349 (46.5%)
Mother's education	
No education	90 (12%)
Up to secondary	404 (53.9%)
Graduation and above	256 (34.1%)
Father's education	
No education	71 (9.5%)
Up to secondary	409 (54.5%)
Graduation and above	270 (36%)
Wealth quintiles	
Poor	242 (32.3%)
Medium	260 (34.6%)
Rich	248 (33.1%)

Prevalence of Stunting, wasting and under weight

The findings of nutritional status of school going children were shown in table 2. Various determinants of malnutrition – stunting (< -2 SD), wasting (<-2 SD) and underweight (<- 2 SD) were classified according to socio- economic characteristics. Child respondents were divided into three age categories- 5-9, 10-12 and 13-15 years old. Majority of stunted (65.7%) and wasted (70.7%) children of both sample districts were found in 5-9 years of age, followed by 10-12 years of age and 13-15 years age. Underweight was measured up to 5-9 years of age as per the WHO guidelines (2006). Out of 174 children, 90 children of age 5-9 were found underweight (51.7%). According to gender classification, female category was found major

victim of malnutrition – stunting (66%), wasting (56.2%) and underweight (55.2%). Parental characteristics like mother’s qualification, father’s qualification also played an important role in child’s nutrition status. In case of illiterate mothers, 80% were stunted, 70% were wasted and 45% were found underweight. Similarly, in case of illiterate fathers, 67% were stunted, 73% were wasted and 38% were found underweight. The last factor was wealth status of parents and divided the respondents into three quintiles- rich, poor and medium. Majority of children participants belonged to poor class family were gripped under malnutrition- stunted (n=1 94, 80%), wasted (n=161, 66%) and underweight (n= 51, 57%) followed by medium class family.

Table 2: Nutritional status of children participants of HP (n= 750)

Variables	Stunting (<-2 SD)		Wasting (<-2 SD)		Underweight* (<-2 SD)	
	Stunted (%)	Normal (%)	Wasted (%)	Normal (%)	Underweighted (%)	Normal (%)
Age						
5-9	148 (73.6%)	53 (26.4%)	123 (70.7%)	151 (29.3%)	90 (51.7%)	84 (48.3%)
10-12	203 (65.7%)	106 (34.3%)	119 (40.9%)	172 (59.1%)		
13-15	98 (40.8%)	142 (59.2%)	95 (33.3%)	190 (66.7%)		
Sex						
Male	218 (54.3%)	183 (45.7%)	141 (35.2%)	260 (64.8%)	42 (48.2%)	45 (51.8%)
Female	231 (66.1%)	118 (33.9%)	196 (56.2%)	153 (43.8%)	48 (55.2%)	39 (44.8%)
Mother’s Education						
No education	72 (80%)	18 (20%)	63 (70%)	27 (30%)	41 (45.6%)	14 (16.6%)
Up to secondary	270 (66.8%)	134 (33.2%)	216 (53.5%)	188 (46.5%)	33 (36.6%)	30 (35.7%)
Graduation and above	107 (41.8%)	149 (58.2%)	58 (22.7%)	198 (77.3%)	16 (17.8%)	40 (47.7%)
Father’s education						
No education	48 (67.6%)	23 (32.4%)	52 (73.2%)	19 (26.8%)	34 (37.8%)	4 (4.8%)
Up to secondary	221 (54%)	188 (46%)	205 (50.1%)	204 (49.9%)	42 (46.7%)	39 (46.4%)
Graduation and above	180 (66.6%)	90 (33.4%)	80 (29.6%)	190 (70.4%)	14 (15.5%)	41 (48.8%)
Wealth quintiles						
Poor	194 (80.2%)	48 (19.8%)	161 (66.5%)	81 (33.5%)	51 (56.6%)	21 (25%)
Medium	173 (66.5%)	87 (33.5%)	125 (48.1%)	135 (51.9%)	22 (24.4%)	36 (42.9%)
Rich	82 (33%)	160 (67%)	51 (20.5%)	197 (79.5%)	17 (18.8%)	33 (3.6%)

* Calculated up to 9 years of age

Relative risk of malnutrition

Table 3 elucidates the relative risk of malnutrition indicators- stunting and wasting among school going children of Lahaul and Spiti and Mandi (n=750). To calculate the odds ratio between predicted and predictor variables, binary logistic regression technique was applied on the data. Two times logistic regression was used separately on stunting (n=449) and wasting (n=337). Findings showed that children aged between 13-15 were found more stunted (OR= 1.29, CI= 0.61-2.97, p <0.05) as compared to children of age10-12 (OR =0.83, CI= 0.61-2.97, p <0.05). In case of wasting, the odds of children aged 13-15 showed 1.62 times more risk of wasting as compared to reference category. (CI= 1.17-3.65, p <0.05). Look at the gender perspective, female sampled children were more likely to get stunted (OR =0.74, CI= 0.15-1.64, p <0.05). and wasted (OR =0.94, CI= 0.21 -1.04, p <0.06) as compared to male counterparts. Education is considered as a prime factor in determining nutrition and health of household. In present study, the odds of children whose mother was illiterate showed 2.34 times risk of being stunted as compared to high qualified mother (CI=

1.57-3.69, p<0.05). Likelihood of being stunted were found 1.47 times higher among children whose mother just had secondary education (CI= 0.26-2.97, p< 0.05). Similarly, the chance of being wasted was higher among children whose mother was found illiterate (OR =1.90, CI= 1.28-3.08, p <0.05). and have middle education (OR =1.13, CI= 0.49- 3.67, p <0.05). Father’s education level was found insignificant to malnutrition indicators – stunting and wasting, but it was a negative association between father education attainment and malnutrition. The odds of child of illiterate father had 0.61 (CI =0.17 -2.72, p > 0.05) times more risk of being stunted and 1.22 (CI= 0.45 -2.58, p >0.05) times more risk of being wasted. In the view of economic status, the odds of child belonged to poor family had 3.44 (CI = 1.58-4.83, p< 0.05) times more risk of being stunted and 2.57 (CI = 0.80- 3.61, p< 0.05) times more risk of being wasted as compared to child belonged to rich family. Similarly, likelihood of being stunted (OR= 1.95, CI= 0.84- 3.30, p < 0.05) and wasted (OR= 1.64, CI= 0.11-2.03, p< 0.05) was found more among children belonged to medium class as compared to rich class.

Table 3: Binary Logistic regression analysis of stunting and wasting among school going children, HP. (n=750)

Variables	Category	Stunted odd ratio (n=449)	Significance (p-value)	Wasted odd ratio (n=337)	Significance (p-value)
Age	5-9	1		1	
	10-12	0.83 (0.37-1.94)	0.004	1.38 (0.24- 2.01)	0.005
	13-15	1.29 (0.61-2.97)	0.005	1.62 (1.17-3.65)	0.005
Sex	Male	1		1	
	Female	0.74 (0.15 -1.64)	0.005	0.94 (0.21- 1.04)	0.006
Mother ‘s education	No education	2.34 (1.57-3.69)	0.002	1.90 (1.28-3.08)	0.002
	Up to secondary	1.47 (0.26-2.91)	0.003	1.13 (0.49-3.67)	0.003
	Graduation and above	1		1	
Father’s education	No education	0.61 (0.17-2.72)	0.194	1.22 (0.45 – 2.58)	0.219
	Up to secondary	0.26 (0.04-2.11)	0.156	0.99 (0.26 – 1.87)	0.114
	Graduation and above	1		1	
Wealth quintiles	Poor	3.44 (1.58-4.83)	0.002	2.57 (0.80-3.61)	0.004
	Medium	1.95 (0.84- 3.30)	0.001	1.64 (0.11-2.03)	0.002
	Rich	1		1	

Note: 1 Reference Category
Significance Level is 0.05

Discussion

Chronic malnutrition is one of the prime causes of mortality and morbidity among school going children. Of the sampled children (n= 750), overall prevalence of stunting, wasting and underweight was found 59.9%, 44.9% and 51.7% respectively in both sampled districts of Himachal Pradesh. On gender domain, female children were found more malnourished as compared to male children – stunting (n= 231, 66.1%), wasting (n=196, 56.2%) and underweight (n= 48, 55.2%). Bivariate results showed significant outcomes between dependent (stunting and wasting) and independent variables (socio economic factors). Children aged 13-15 were found under the risk of stunting and wasting due to number of factors- burden of education, less sports activities, mother education, intake of non-nutritious food. Education of mothers highly influenced the nutritional status of children significantly, as odds ratio were found greater than one. Conversely, education of father was found insignificant to the nutritional status of child for this sampled study ($p > 0.05$). Findings obtained from present study was coincide with past literature. Khanam et al (2021)¹¹ showed that the likelihood of being stunted and wasted increased with the increase in age of child. It was mentioned in empirical study that socioeconomic and demographic factors were highly associated with malnutrition.^{12 17} Family economic status and education background of parents highly correlated with stunting and wasting.^{12 16} Hence, stunting and wasting are predictors of risk as they signify the cognitive development of child and highly affects on wealth status of the household. In this study, bivariate result between wealth quintiles and stunting showed that the likelihood of being stunted (OR= 3.44, CI= 1.58 – 4.83, $p < 0.05$) was more among children who belonged to poor class family as compared to rich class family. Likewise, in wasting, the odds of child belonged to poor family had 2.57 times (CI= 0.80 – 3.61, $p < 0.05$) more risk of wasting as compared to rich family children. A cross sectional study of Madagascar also showed that older children were found at more risk of being stunted, wasting and underweight due to intake of non-nutritious diet¹³. Srivastava et al (2012) showed in their study that the risk of malnutrition was found higher among children whose mothers were less qualified and children living in joint families^{14 15}

Conclusion

The results showed that in Himachal Pradesh, still little proportion of schoolers are engulfed with severe under nutritional problem. Although Mandi

district of Himachal Pradesh is able to eradicate these morbidities but Lahaul and Spiti is persistently cope up with malnutrition. Withstanding to this hurdle, Governemnt of India implement National Nutrition Mission with logo of ‘Kuposhan –Mukt Bharat’ in 2018 to cover all states and districts in phased manner. One point is to be noted here that the sample children who suffered from any type of malnutrition- stunting, wasting and underweight are belonged to poor economic class. Moreover, mothers claimed that they have no enough economic resources in the hand to provide nutritious diet to their children such as protective food and body building food. Thus, employment opportunities must be widened at the village level instead of introducing such big- boned expensive missions. Moreover, Awareness about missions and programmes must be diffused at underlying level

Limitations

The scope of the study was limited in terms of coverage of districts of Himachal Pradesh. Only two high priority districts were covered under the study to find the determinants of malnutrition. In Lahaul and Spiti, only high populated villages are covered. Moreover, field survey in Spiti valley was challenging due to its climatic conditions.

Conflict of interest

There is no any conflict of interest.

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