Malnutrition among School Children (0- 14 Years) of Gujars of Great Kashmir Himalayan Range (J & K state).

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Abstract- Variation in the availability of nutrients in diet and departure of same from standard requirement had badly affected the health of school children of Gujars of Great Kashmir Himalayas. Eighty percent of the sample pre-school children were identified under various levels of malnutrition. Severe degree of malnutrition has been computed at a very low weight. Even average weight was less by three and half kg than the weight recommended by I.C.M.R. The present paper attempts to analyze not only the geographical distribution and assessment of magnitude of malnutrition as a health problem among preschool children but also attempts to identify the causes that are directly or indirectly responsible.

Index Terms- Malnutrition, Under nutrition, Standard Requirement, Great Kashmir Himalayas.

I. INTRODUCTION

Inadequate amount of nutrients in diet in comparison to Indian Council of Medical Research (ICMR) recommended dietary allowances leads to malnutrition and under nutrition (Doshi,1995), that in-turn leads to not only low growth, under nutrition weight; increased risk of infectious diseases and deficiency diseases but also has a negative effect upon mental development (Verhasselt, 1997; Mishra, 1985).

The nutritional needs of child keep on changing. During infancy and early childhood period the nutrition requirements are quite high due to rapid growth but they level off during middle childhood period. Around the onset of puberty an accelerated phase of growth begins and the nutritional requirements increases tremendously before they taper off to adult level (Nath, 1997). There are many nutritional problems which effect children and the major ones are, low birth weight, protein energy malnutrition, exophthalmia. Scurvy and nutrition anemia (Park,2011). Malnourished children have poorer psychomotor development, leading to economic hardships for individuals and families in adulthood.

Nutritional deficiency may also cause, poor posture, certain bone deformities, narrow chest, poorly developed teeth and teeth badly placed in jaws (Dowd and Dent, 2011).

Malnutrition has long been recognized because of poverty (Aggarwal, 1986). Besides low income (Levinson, 1974), malnutrition is the result of household food insecurity, lack of clean water, lack of knowledge on good sanitation, and lack of alternative sources of income. It is also compounded by, inadequate care, gender inequality, poor health services, and poor environment. Malnutrition causes great deal of human sufferings both physical and emotional (Oshaug et al., 1994. It is associated with more than half of all children's deaths worldwide (Pelletier et al., 1995). In India thirty per cent of children are born with low birth weight and almost 50 percent remain underweight by the age of three (UNICEF, 2012). Despite the improvement in survival of school children , there is still a major burden of diseases and ill health among this group particularly in the areas of poor nutrition and intestinal parasitic diseases that directly effects their education. Among the nutrition experts Patwardhan (1966) and Pelto (1991), have strongly stressed the consideration of geographical factors in identification and assessment of deficiency diseases. Nutrition patterns are affected not only by socio-economic and socio – cultural backwards of community but also by religion as religion plays a significant role to the extent that it imposes several restrictions on food consumed by them (Rani, Reddy and Sreedevamna, 2003).

Despite the economic growth in developing countries, under nutrition is still highly prevalent and is the main cause of chronic diseases. Every year, nearly 11 million children die before reaching their 5^{th} birthday (Gupta, 2008). WHO has claimed that malnutrition contributes to 3.4 million child deaths at the global level (WHO, 2000). It has been estimated that nearly 30 percent of infants, children, adolescents, adults and elderly in the developing world are suffering from one or more of the multiple forms of malnutrition (WHO, 1999). Standard of nutrition varies from country to country and within the regions of diverse agro-climatic conditions whatever standard is chosen, under nutrition and malnutrition is wide spread in India, because of in-adequate poor and faulty nutrition status (Jaffrey, 1988). Child ill health described as the silent emergency has been a major focus of attention for several decades. Several nutrition programmes like I.C.D.S and Minimum Needs Programme have been launched for the downtrodden sections of population in general and vulnerable sections of population which includes pre-school children in particular but these programmes have not been successful to raise the level of nutrition to the optimum level (Bagchi.1994, Sacher and Gill 1993, Price, 1994).

Tribal areas constituting a very significant part of backward areas of the country, predominantly live in hilly and forest areas which are comparatively inaccessible and isolated and face the basic problems of poverty that leads to low health status (Gopalan, 2005). Gujars of Jammu and Kashmir are a scheduled tribes inhabiting mountainous and forest areas of Kashmir Himalayas. Due to physical constraints and low socio-economic

set up Gujars of Jammu and Kashmir face the problems of nutrition and health. The present research paper was an attempt to analyze the magnitude and geographical distribution of malnutrition as a public health problem and to identify the causes that are directly or indirectly responsible for such a situation .

II. Review of Literature

Science of nutrition began in the late eighteenth century. It was Antonie Lava Voisier , a French Scientist who did work on energy metabolism and is often called as father of science of nutrition (Vidya, 1999). Impact of nutrition on health of children is not a recent approach in Medical geography but has attracted the attention of experts for the last more than half a century and hence very good literature is available regarding the nutrition and its related health problems among children. Some notable contributions are.

Mc Carrison (1921), Tandon (1972), Chatterjee (1976), Mishra (1985), Aggarwal (1986),Freund (1990), Kumar (1995), Zargar et al. (1996), Kuhnlein and Pelto (1997), Pant (1998) ,Scrimshaw & Schürch (1998) ,Narasinga (1999), Das et al. (2000), Jood et al. (2000), Mahapatra et al. (2000**),** Ray et al. (2000), Rice et al. (2000), Lakshmi and Padma (2004), Duboise (2004), Rather (2004), Agrahar (2005), Chapagain et al. (2005), Das and Biswas (2005), Gopalan (2005), Kumari (2005), Salah et.al (2006), Sohana et al. (2007) **,** Varma, Kapoor and Goyle (2011),Varma et al. (2011), Khan and Khan (2012) .

III. Study Area

Great Kashmir Himalayan range is one of the most important physiographic divisions of Jammu and Kashmir State and extends uninterruptedly for a length of 150 km from Sundran drainage basin of Anantnag in the south to Kazinag ridge of Baramulla in the north. Great Kashmir Himalayan range is a massive topographical feature enclosing Kashmir Valley on the east-north east and north –northwest. The range lies between $33^0$22’32.02” N – $34^0$47’42.67” North latitude and $73^0$48’10.96” E – $75^0$34’22.23” East longitudeThe mountainous range has an average altitude of 3442 meters and stretches over an area of 8948.84 sq. Kms (Figure 1).

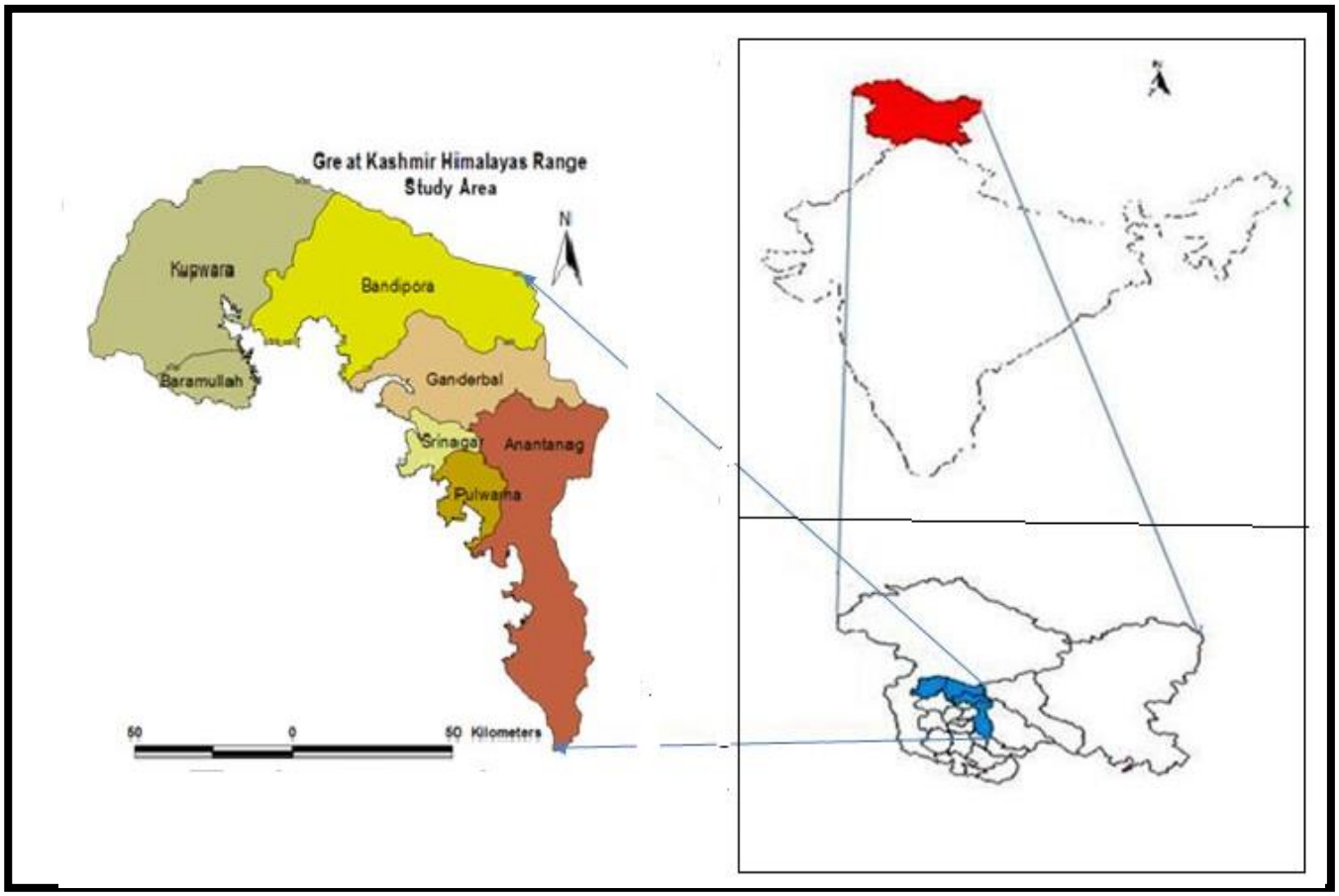


Fig. 1 : LOCATION MAP

Of the various mountain ranges girdling the Valley of Kashmir, Great Himalayan range is by far the most important range because of the altitude of its peaks, Kolahoi (5425) meters) , Sheshnag (5096), Saribal (4882) , Harmukh (4876 meters) , Shutiyan(4371 meters) Rang top (3487 meters). . The base contour of the range is around 1800 meters in the south and gradually decreases to around 1600 towards north. Below the base contour of the mountain range, the Valley of Kashmir has homogeneity in level. The region has a slope from 10-30^0 in the foothills and above 40^0 in the hilly areas. The present slope

characteristics have evolved through a sequence of events including spectacular changes in base level through faulting, folding and the consequent rejuvenation of drainage channels with pronounced effects on land forms in general and slope in particular (Raza et al., 1978)

The region is inhabited by Gujar community with very low socio-economic development.

Data Base and Methodology

Data base

The present research work was based on both primary and secondary data. Large data both primary and secondary was collected and generated from different sources.

Methodology

A comprehensive methodology used for the present study. An outline of the various methodological steps is provided in the figure 3.4 and described under the following headings.

Delineation of Study Area and demarcation of Altitudinal Zones (Unit of Study)

Base map of the study area was delineated from 19 SOI Toposheets and processed digitally in GIS environment. Great Kashmir Himalayan Range was divided into the following seven altitudinal zones with the help of software's like ERADAS Imagine 9.0 and Arc view GIS 3.2a.

Table 1 : Altitudinal Zones by Area

Altitudinal Zone	Alt. in meters amsl	Area in Sq. Kms.	Area in % to total Area
A	1600 – 1750	499.18	5.59
B	1750-1900	510.22	5.70
C	1900-2050	490.19	5.47
D	2050-2200	516.45	5.70
E	2200-2350	515.38	5.75
F	2350-2500	530.12	5.96
G	2500 – 6000	5887.30	65.83
	Total	**8948.84**	**100**

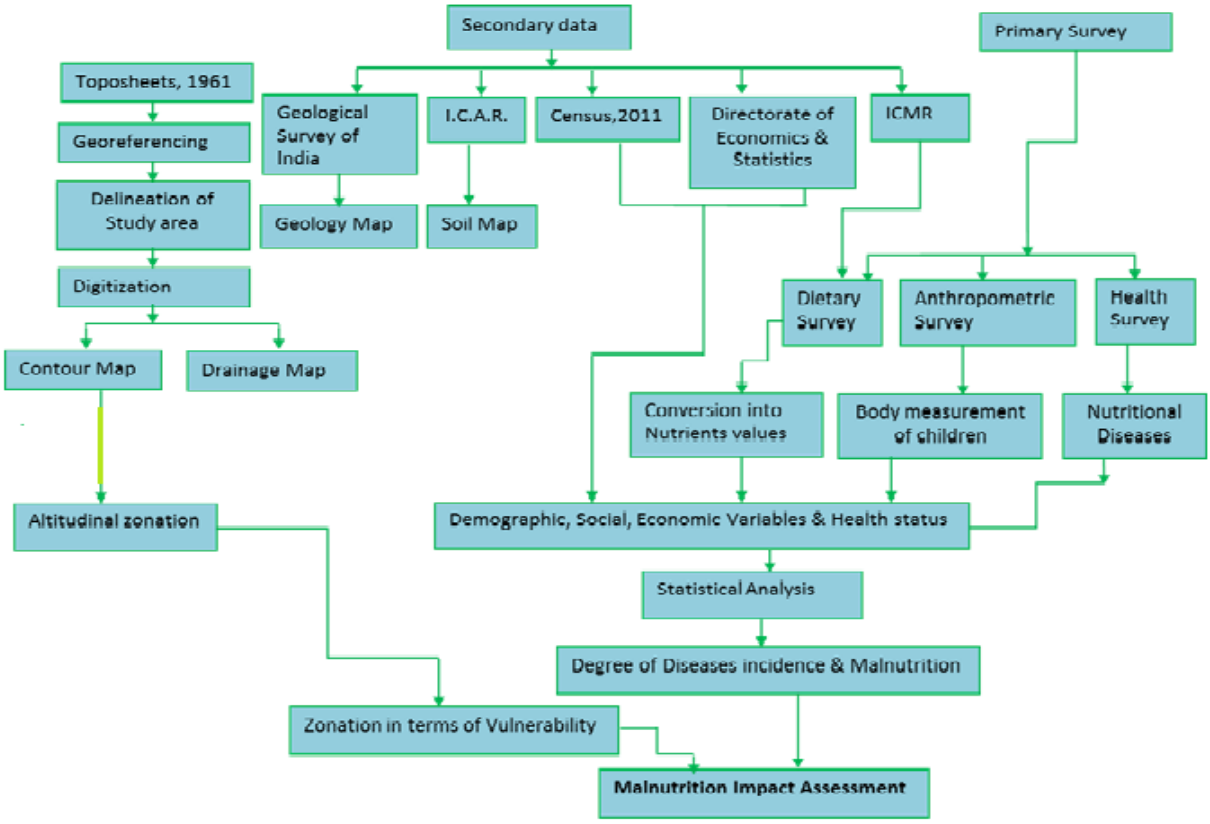


Fig . 2 : Flow chart showing methodological framework of the study

Selection of Sample Villages, Sample Households and Sample children (0-14 years):

Stratified Random Sampling technique was used for selection of around 20% of sample villages (60) and 20% of sample households (2080) in proportion to total number of villages and households from each altitudinal zone. For Micro level study, a Sample of 4160 children, one male and one female, falling in 0-14 years were selected for Micro study. The reason behind selection of this age group was because of renewed awareness that the determinants of chronic diseases in later life and health behavior are laid down in 0 – 14 years of age (table 2). This age group was further divided into three sub groups - (0-3, 4-6 and 7-14 years) for being ages of different levels of schooling. Geo-coordinates and altitude of each sample village was measured with the help of GPS during field survey (Table 3).

Table 2 :Sample frame of the study

Alt. Zone	Alt. In mts. (AMSL)	Total Area (Km ^{2})	Revenue villages			Number of households			Number of children (0-14 years) for MICRO STUDY		
			Total In Area	Sample	Percentage of sample	Total in Sample villages	Sample	Percentage of sample	Male	Female	Total
A	1600-1750	499.18	9	2	22.22	460	92	20.00	92	92	184
B	1750- 1900	510.22	31	6	19.35	1000	200	20.00	200	200	400
C	1900- 2050	490.19	71	14	19.71	2380	476	20.00	476	476	952
D	2050- 2200	516.45	72	14	19.44	2290	458	20.00	458	458	916
E	2200- 2350	515.38	81	16	19.75	2790	558	20.00	558	558	1116
F	2350- 2500	530.12	40	8	20.00	1480	296	20.00	296	296	592
G	2500-6000	5887.30	Un inhabited by Gujars								
Total		8948.84	304	**60**	19.73	10,400	**2080**	**20.00**	**2080**	**2080**	**4160**

Source : Computed from SOI toposheets and census of India 2011

Table 3 : Sample villages with altitude and geo-coordinates

S No.	Village Name	Lat./Long	Altitude (mamsl)	S No.	Village Name	Lat./Long	Altitude (mamsl)
1	Grand	$33^0$40’43” N $75^0$15’20” E	1830	31	Dardpora Gugerpati	34^0 25’43” N 74^0 42’16.” E	2250
2	Hard kichloo	$33^0$50’45” N $75^0$16’40” E	2390	32	Aragam Nagbal	$34^0$22’31” N 74^0 40’58E	2060
3	Gujran Batkot	$33^0$56’34” N $75^0$18’07” E	2186	33	Chithi Bande chaliwan	$34^0$22’46” N 74^0 41’13.” E	2290
4	Ishnad	$33^0$52’08” N $75^0$18’04” E	2268	34	Argam Halwadi	$34^0$22’30” N 74^0 40’57.” E	2055
5	Hapatnar	$33^0$48’ 17“ N 75 ^{0} 21’ 15”E	2520	35	Sumlar Gujarpati	$34^0$22’30” N 74^0 43’41” E	1885
6	Salia	$33^0$55’28” N $75^0$17’26” E	2210	36	Chuntimula gujarpati	$34^0$24’23” N 74^0 44’05.” E	1980
7	Gous	$33^0$52’09” N $75^0$18’32” E	2190	37	Chatibandhi Gorhajan	$34^0$23’40” N 74^0 42’25” E	1835
8	Shojan	$33^0$51’14” N $75^0$18’25” E	1890	38	Malangam gujarpati	$34^0$26’12” N 74^0 33’26. E	1950
9	Grandwan	$33^0$52’43” N $75^0$17’54” E	2020	39	Mulkalama gujarpati	$34^0$24’03” N 74^0 43’34” E	2375

10	Lidu	33^{0}57'31" N 75^{0}18'52" E	2049	40	Gujarpati Muqam	34^{0}26'58" N 74^0 34'36" E	2250
11	Rishkobal	33^{0}08'03" N 75^0 17'51" E	2350	41	Kudara	34^{0}25'03" N 74^0 47'01" E	2410
12	Nagbal	33^{0}52'32" N 75^{0}20'25" E	2260	42	Dachna Gujarpati	34^{0}26'02 " N 74^0 30'56" E	1680
13	Dragund	34^{0}25'51" N 75^{0}04'55" E	2120	43	Manobal	34^{0}30'15" N 74^0 30'15" E	2055
14	Narasthan	34^{0}13'27" N 75^{0}05'25" E	2250	44	Londa	34^{0}18'24" N 74^0 10'20" E	2010
15	Guturu	34^{0}30'27" N 75^{0}25'20" E	2160	45	Nilzab	34^{0}30'25" N 74^0 12'42" E	2290
16	Hajannar	34^0 04'31" N 75^{0}03'37" E	1893	46	Potwari	34^{0}19'45" N 74^0 12'20" E	2065
17	Nogh	33^{0}55'46" N 75^{0}11'10" E	2142	47	Khaitan	34^{0}30'50" N 74^0 30'35" E	1935
18	Bangidar	33^{0}54'40" N 75^{0}14'09" E	2354	48	Nowgam	34^{0}28'19" N 74^0 14'25" E	1980
19	Basmia	33^{0}55'44" N 75^{0}11'06" E	2262	49	Lahkoot	34^{0}21'45" N 74^0 20'52" E	1955
20	Faqir Gujri	34^0*24* '1*6*." N 74^0 *38' 50*." E	*2089*	50	Rashiwari	34^{0}40'55" N 74^0 48'45" E	2410
21	Shal khud	34^{0}1*0' 59*' N 74^0 *5*4'*5*8 E	*2215*	51	Shiltra	34^0 19'14" N 74^0 12'08" E	1835
22	Nagbal gujarpati	34^{0}1*5' 22*' N 74^0 *34*'2*5*' E	*1967*	52	Inderdaji	34^{0}20'12" N 74^0 08'54" E	1950
23	Khanan	34^{0}18'47" N 74^0 51'59" E	2030	53	Khuri payeen	34^{0}39'55" N 74^0 45'30" E	2250
24	Poshkar	34^{0}14'26" N 74^0 58'05" E	2080	54	Khuri Bala	34^{0}42'15" N 74^0 45'40" E	2315
25	Pahalnar	34^{0}20'49" N 75^0 51'59" E	2142	55	Wadur bala	34^0 18'26" N 74^0 11'06" E	2058
26	Wangat	34^{0}19'33" N 75^0 06'50" E	2195	56	Turkkpora	34^{0}32'52" N 74^0 26'35" E	2386
27	Astan mohla	34^{0}15'29" N 74^0 54'44" E	2048	57	Wanpur	34^{0}28'*12*" N 74^0 16'30" E	2036
28	Yarmukam	34^{0}17'44" N 74^0 47'11" E	2360	58	Wahalutar	34^{0}46'*22*" N 74^0 14'32" E	2253
29	Tsunt Wali war	34^{0}47'14" N 74^0 54'28" E	2370	59	Potus	34^{0}4*5' 20*" N 74^0 12'28" E	2 146
30	Waniarm	34^{0}17'44" N 74^0 48'30" E	2295	60	Naidhu	34^{0}2*5' 23*" N 74^0 16'55" E	1684

Source: Based on GPS readings during Sample survey, 2013

Sample Survey / Field work

Field survey of 2080 sample households in stratified sample of 60 villages from seven altitudinal zones as unit of study was carried out . Food intake , anthropogenic measurement and health survey of 4160 sample children, comprising of one male and one female from each household of sample village was carried out. A structured schedule was used for primary data collection.

Malnutrition grading

As physical dimensions of body are influenced by nutrition particularly during the rapidly growing period of early childhood. Body measurement like weight for age, height for age, mid upper arm circumference(MURC) and body mass can also provide information regarding malnutrition . Weight for age is the best one and used in the present study.

The weight of all individual sample children has been measured by digital weight measuring machine and compared with I. C. M. R. standard and then be categorized into different nutritional grades by applying the following percentage departure formula.

$$\text{Grades Malnutritio} = \frac{\text{Estimated Weight}}{\text{Standard Weigh}} \times 100$$

Normal	> 80%	
	Grade I	80 – 70 %
	Grade II	70 – 60%
	Grade III	60 – 50%
	Grade IV	<50%

This classification was recommended by Indian Academy of Pediatrics (IAP) .

IV. Results and Discussion

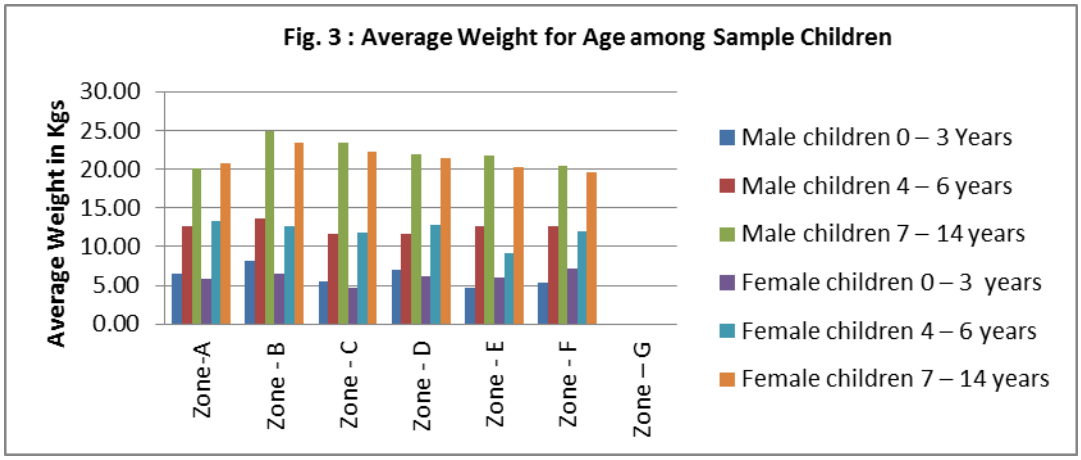
Weight for Age

Weight of the 4180 children was recorded to assess the anthropometric status and classified into three age groups: 0 to 3, 4 to 6 and 7-14 years for both male and female children for comparative analysis and is shown in table 4. Analysis of data reveals that average weight of sample children in the age group 0 to 3 years was 6.220 kg for males and 6.084 kg for females. The average weight in the age group 4 to 6 years was 12.465 kg for males as compared to 11.925kg for females of the same age group. Average weight in the age group 7 to 14 was 22.105 kg for males and only 21.270 kg for females (Figure 3). It was very interesting to note that the average weight of both male and female children was very less than the ICMR recommended weight for children of different age groups. Weight of children varies from one sample village to another. There was a decline in the weight of both male and female children with the increase in the altitude. Largest differences in the calculated weight than the ICMR recommended weight was noted in the age group 0-3 years. The reason could be large nutrition need for the fast growth on one side and very less attention of parents towards child because of being engaged in primary activity of collection of fire wood from the forest and herding of animals, getting of water from large distances etc.

Table 4: Average weight for age among sample Children by Age and Sex in Great Kashmir Himalayan Range.

Altitudinal Zone with Alt. in meters (amsl)	**No. of Sample Villages.**	**No. of male Sample children (Male & Female – same ratio)**	**Average Weight for age (Kg) among sample children by age and sex**					
			Male children			**Female children**		
			0 – 3 Years ICMR	**4 – 6 years ICMR**	**7 – 14 years ICMR**	**0 – 3 years ICMR**	**4 – 6 years ICMR**	**7 – 14 years ICMR**
Zone-A (1600 – 1750)	2	184	6.475	12.635	20.13	5.86	13.295	20.73
Zone - B (1750-1900)	6	400	8.158	13.632	24.962	6.505	12.613	23.467
Zone - C (1900-2050)	14	952	5.53	11.7	23.38	4.72	11.75	22.34
Zone - D (2050-2200)	14	916	7.05	11.61	21.93	6.25	12.77	21.35
Zone - E (2200-2350)	16	1116	4.7	12.65	21.72	5.95	9.22	20.19
Zone - F (2350-2500)	8	592	5.41	12.56	20.51	7.22	11.901	19.54
Zone G	Uninhabited							
Total	60	4160	6.22	12.465	22.105	6.084	11.925	21.27

Source: Sample survey, 2013



Source: - Based on Sample survey 2013

Malnutrition among Children (Based on Weight for age)

Classification proposed by Indian Academy of Pediatrics (IAP) was used for assessment of prevalence of malnutrition among the children in the age range of 1 to 14 years. Grades of malnutrition has been worked out for both male and female sample children of age groups 0-3, 4-6, 7-14 separately and briefly described as under

Grades of Malnutrition among Sample children (0-3 years) Based on Weight for age

Analysis of table 5 reveals that very less number of male sample children were normal (1.47 %) with weight for age greater than 80 percent of the recommended weight and the remaining were suffering from various grades of malnutrition. Near about 10.75 per cent were suffering from Grade I malnutrition with weight for age 70 to 80 % than recommended weight, 17.50 per cent were suffering from Grade II malnutrition with weight for age 60 to 70 % than recommended weight, 19.91 percent were suffering from Grade III malnutrition with weight for age 50 to 60 % than recommended weight and even 2.21 per cent were suffering from Grade IV malnutrition with weight for age less than 50 % than recommended weight. In case of female sample children percentage of various Grades of malnutrition was Grade I (6.43%), Grade II (18.23), Grade III (19.81) and Grade IV (2.42%). There is a considerable variation in grades of malnutrition in different altitudinal zones Grades of malnutrition in both male and female sample children shows an increasing trend with altitude (Figure 4).

Grades of Malnutrition among Sample children (4-6 years) Based on Weight for age

Analysis of data obtained from field survey reveals that very less number of male sample children were normal (2.68 %) with weight for age greater than 80 percent of the recommended weight and the remaining were suffering from various grades of malnutrition. Near about 12.61 per cent were suffering from Grade I malnutrition with weight for age 70 to 80 % than recommended weight, 18.33 per cent were suffering from Grade II malnutrition with weight for age 60 to 70 % than recommended weight, 16.46 percent were suffering from Grade III malnutrition with weight for age 50 to 60 % than recommended weight and even 1.25 per cent were suffering from Grade IV malnutrition with weight for age less than 50 % than recommended weight. In case of female sample children percentage of various Grades of malnutrition were Grade I (7.33%), Grade II (19.86), Grade III (19.05) and Grade IV (1.61%) (Table 6). Altitude wise variation in grades of malnutrition in different altitudinal zones is also evident from the table 7.2. Grades of malnutrition in both male and female sample children shows an increasing trend with altitude (Figure 5)

Grades of Malnutrition among Sample children (7-14 years) Based on Weight for age

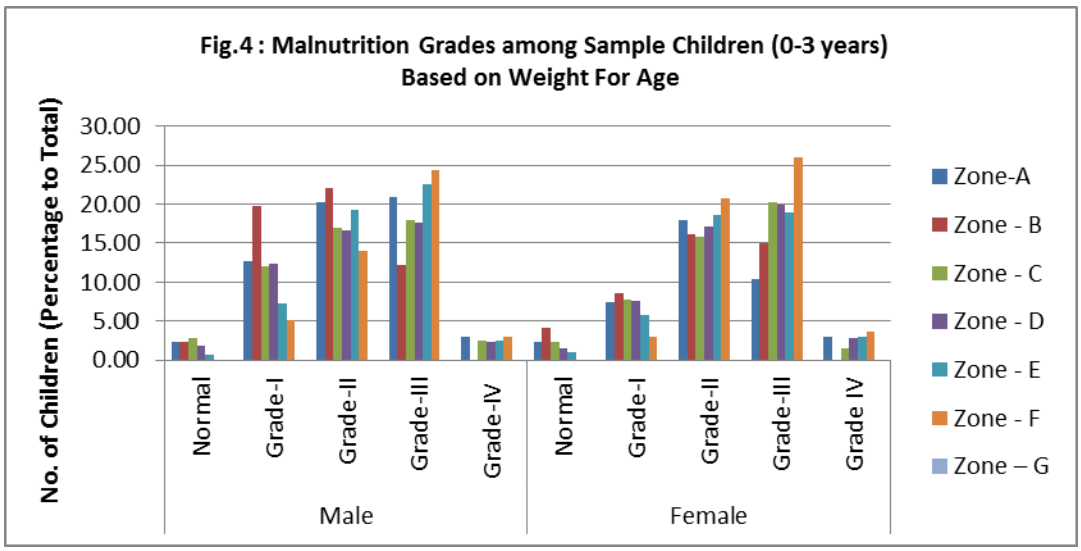
In case of sample children of 7-14 age group , it is observed that very less number of male sample children were normal (1.86 %) with weight for age greater than 80 percent of the recommended weight and the remaining were suffering from various grades of malnutrition. Near about 12.61 per cent were suffering from Grade I malnutrition with weight for age 70 to 80 % than recommended weight, 19.92 per cent were suffering from Grade II malnutrition with weight for age 60 to 70 % than recommended weight, 16.91 percent were suffering from Grade III malnutrition with weight for age 50 to 60 % than recommended weight and even 0.29 per cent were suffering from Grade IV malnutrition with weight for age less than 50 % than recommended weight. In case of female sample children percentage of various Grades of malnutrition were Grade I (9.75%), Grade II (19.11%), Grade III (18.87%) and Grade IV (0.43%) and altitude wise variation in grades of malnutrition in different altitudinal zones is also evident (Table 7). Grades of malnutrition in both male and female sample children show an increasing trend with altitude (Figure.6).

Table 5: Prevalence of malnutrition among children (0– 3 years) based on weight for age percentage departure (IAP classification)

Altitudinal Zone with Alt. in meters (amsl)	No. of Sample Villages	No. of Sample children (Male & Female –same	No of children with % to total in different grades of malnutrition									
			Male					Female				
			Normal (Weight for age >80%)	Grade-I (Weight for age (70 to 80%)	Grade-II Weight for age 60to 70%)	Grade-III Weight for age 50 to 60%)	Grade-IV Weight for age < 50%)	Normal (Weight for age >80%)	Grade-I (Weight for age (70 to 80%)	Grade-II Weight for age 60to 70%)	Grade-III Weight for age 50 to 60%)	Grade-IV Weight for age < 50%)
Zone-A (1600 – 1750)	2	39	1 (2.56)	5 (12.82)	8 (20.51)	8 (20.51)	1 (2.56)	1 (2.56)	3 (7.70)	7 (17.96)	4 (10.26)	1 (2.56)
Zone - B (1750-1900)	6	92	2 (2.18)	18 (19.56)	20 (21.75)	12 (13.04)	0 (0.00)	4 (4.36)	7 (7.60)	15 (16.30)	14 (15.21)	0 (0.00)
Zone - C (1900-2050)	14	199	5 (2.51)	26 (13.06)	31 (15.58)	37 (18.59)	4 (2.01)	4 (2.01)	15 (7.55)	33 (16.58)	41 (20.60)	3 (1.51)
Zone - D (2050-2200)	14	210	4 (1.90)	26 (12.38)	35 (16.67)	37 (17.62)	5 (2.38)	3 (1.43)	16 (7.62)	36 (17.14)	42 (20.00)	6 (2.86)
Zone - E (2200-2350)	16	274	2 (0.73)	20 (7.30)	53 (19.34)	62 (22.63)	7 (2.55)	3 (1.09)	16 (5.84)	51 (18.61)	52 (18.99)	8 (2.92)
Zone - F (2350-2500)	8	135	0 (0.00)	7 (5.19)	19 (14.07)	33 (24.44)	4 (2.96)	0 (0.00)	4 (2.96)	28 (20.74)	35 (25.93)	5 (3.70)
Zone G	Uninhabited											
Total	60	**949**	**14 (1.47)**	**102 (10.73)**	**166 (17.50)**	**189 (19.81)**	**21 (2.11)**	**15 (1.58)**	**61 (6.43)**	**170 (18.13)**	**188 (19.81)**	**23 (2.32)**

Source: Based on Sample survey, 2013

Figures in parenthesis represent percentage to total sample children.



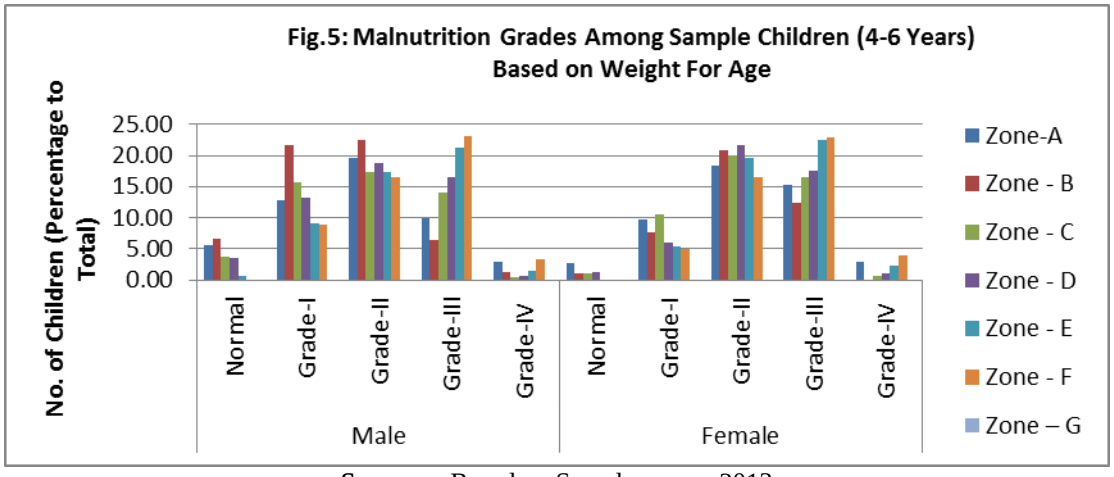
Source: - Based on Sample survey 2013

Table 6: Prevalence of malnutrition among children (4-6 years) based on weight for age percentage departure (IAP classification)

Altitudinal Zone with Alt. in meters (amsl)	No. of Sample Villages	No. of Sample children (Male & Female, same ratio)	No of children with % to total in different grades of malnutrition									
			Male					Female				
			Normal (Weight for age (> 80%)	Grade-I (Weight for age (70 to 80%)	Grade-II Weight for age 60to 70%)	Grade-III Weight for age 50 to 60%)	Grade-IV Weight for age < 50%)	Normal (Weight for age (> 80%)	Grade-I (Weight for age (70 to 80%)	Grade-II Weight for age 60to 70%)	Grade-III Weight for age 50 to 60%)	Grade-IV Weight for age < 50%)
Zone-A (1600 – 1750)	2	54	3 (5.55)	6 (11.11)	11 (20.37)	5 (9.25)	1 (1.85)	2 (3.70)	6 (11.11)	10 (18.52)	9 (16.67)	1 (1.85)
Zone – B (1750-1900)	6	102	6 (5.88)	22 (21.57)	24 (23.52)	7 (6.86)	1 (0.98)	1 (0.98)	8 (7.84)	22 (21.57)	11 (10.78)	0 (0.00)
Zone – C (1900-2050)	14	270	10 (3.70)	42 (15.56)	48 (17.77)	34 (12.60)	1 (0.37)	3 (1.11)	29 (10.74)	56 (20.74)	45 (16.66)	2 (0.74)
Zone - D (2050-2200)	14	250	9 (3.60)	31 (12.40)	48 (19.20)	40 (16.00)	2 (0.80)	3 (1.20)	16 (6.40)	53 (21.20)	45 (17.60)	3 (1.20)
Zone - E (2200-2350)	16	292	2 (0.68)	27 (9.25)	49 (16.78)	63 (21.57)	4 (1.37)	0 (0.00)	16 (5.48)	56 (19.18)	69 (23.63)	6 (2.05)
Zone - F (2350-2500)	8	150	0 (0.00)	13 (8.67)	25 (16.67)	35 (23.33)	5 (3.33)	0 (0.00)	7(4.67)	25 (16.67)	34 (22.67)	6 (4.00)
Zone G	**Uninhabited**											
Total	60	**1118**	**30 (2.68)**	**141 (12.61)**	**205 (18.33)**	**184 (16.46)**	**14 (1.25)**	**9 (0.80)**	**82 (7.33)**	**222 (19.86)**	**213 (19.05)**	**18 (1.61)**

Source: Based on Sample survey, 2013

Figures in parenthesis represent percentage to total sample children.



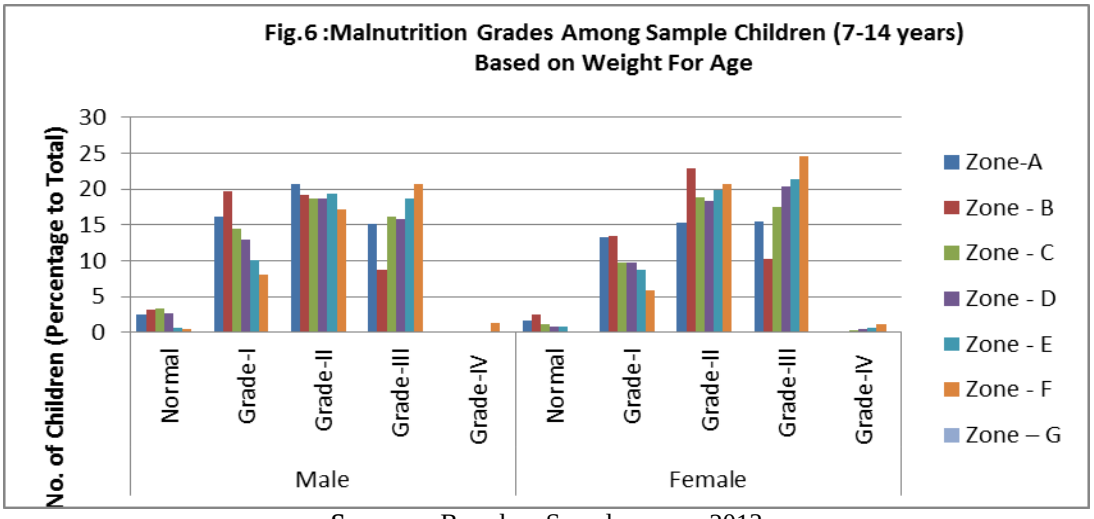
Source: - Based on Sample survey 2013

Table 7 : Prevalence of malnutrition among children (7 - 14 years) based on weight for age percentage departure (IAP classification)

Altitudinal Zone with Alt. in meters (amsl)	No. of Sample Villages	No. of Sample children (Male & Female –same ratio) (7-14 Years)	No of children with % to total in different grades of malnutrition .									
			Male					Female				
			Normal (Weight for age (> 90%)	Grade-I (Weight for age (70 to 80%)	Grade-II Weight for age 60to 70%)	Grade-III Weight for age 50 to 60%)	Grade-IV Weight for age < 50%)	Normal (Weight for age (> 80%)	Grade-I (Weight for age (70 to 80%)	Grade-II Weight for age 60to 70%)	Grade-III Weight for age 50 to 60%)	Grade-IV Weight for age < 50%)
Zone-A (1600 – 1750)	2	91	2 (2.19)	14 (15.38)	21 (23.07)	14 (15.38)	0 (0.00)	2 (2.19)	13 (14.28)	13 (14.28)	12 (13.19)	0 (0.00)
Zone - B (1750-1900)	6	206	7 (2.97)	40 (21.19)	40 (21.19)	19 (10.78)	0 (0.00)	6 (2.97)	27 (13.75)	46 (20.07)	21 (10.04)	0 (0.00)
Zone - C (1900-2050)	14	483	13 (2.69)	72 (14.90)	93 (19.25)	78 (16.15)	0 (0.00)	7 (1.45)	51 (10.56)	87 (18.01)	81 (16.77)	1 (0.20)
Zone - D (2050-2200)	14	456	11 (2.41)	60 (13.16)	85 (18.64)	76 (16.67)	1 (0.22)	4 (0.88)	45 (9.87)	83 (18.20)	89 (19.52)	2 (0.44)
Zone - E (2200-2350)	16	550	4 (0.73)	53 (9.64)	105 (19.09)	101 (18.36)	2 (0.36)	5 (0.91)	50 (9.09)	110 (20.00)	117 (21.27)	3 (0.55)
Zone - F (2350-2500)	8	307	2 (0.65)	25 (8.14)	54 (17.59)	66 (21.50)	3 (0.98)	0 (0.00)	18 (5.86)	61 (19.87)	75 (24.43)	3 (0.98)
Zone G	**Unihabitated**											
Total	60	**2093**	**39 (1.86)**	**264 (12.61)**	**398 (19.02)**	**354 (16.91)**	**6 (0.29)**	**24 (1.15)**	**204 (9.75)**	**400 (19.11)**	**395 (18.87)**	**9 (0.43)**

Source: Based on Sample survey, 2013

Figures in parenthesis represent percentage to total sample children.



Source: - Based on Sample survey 2013

V. Conclusion and Suggestions

The study leads to the conclusion that the average weight for age in almost all age groups was less than the recommended by ICMR. There was a decline in the weight of children both male and female with the increase in the altitude because of decrease in nutrition intake.

From the classification of children into different grades of malnutrition on the basis of weight for age, it was observed that in all the three age groups, 0-3, 4-6 and 7-14, very less number of sample children were normal and majority of sample children both male and female were falling in different grades of malnutrition. Malnutrition grade III was very dominant with good percentage of sample children both male and female and even some percentage of sample children were falling in IV grade of malnutrition which is a bad indication of nutrition status. Female children were more malnourished than the males in the higher age groups. Grade of malnutrition in both male and female sample children shows an increasing trend with altitude.

On the basis of inferences drawn from the present analysis, the following measures are suggested for improving the nutritional status of children (0- 14 years) in this mountainous region. These recommendations are expected to serve as vital input for formulating a planning strategy for the development of nutritional status of children in this mountainous region.

1) Full coverage under ICDS and Strengthening of existing ICDS.
2) Proper coordination between functionaries.
3) Adoption of early infant feeding practices especially in higher altitudinal zones.
4) Proper health care of children during illness.
5) Awareness and full involvement of the community.
6) Development of basic facilities.
7) Proper immunization of children.

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