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Anthropometric Studies of School Going Children (6-12 Years) in Three Regions of Jammu & Kashmir State

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Abstract: ***Anthropometric measurements are used to assess the size, shape and composition of the human body. Anthropometry is concerned with the measurement of variation of the physical dimensions and the gross composition of the human body at different age levels and degree of nutrition***

Keywords: Anthropometric measurements, nutrition, school children, malnutrition

1. Introduction

Anthropometric measurements are used to assess the size, shape and composition of the human body. Anthropometry is concerned with the measurement of variation of the physical dimensions and the gross composition of the human body at different age levels and degree of nutrition. Growth is influenced by biological determinants including sex, intrauterine environment, birth order and by environmental factors including climate, season and socio-economic level. Physical dimension of the body are much influenced by nutrition particularly in the rapidly growing period of childhood. Despite the well-known importance of nutritional health several cultural, social, political, economical and educational factors contribute to malnutrition among children. School going children constitute one-fifth of the total population and are the future of the nation. The health supervision of the school children is necessary and can help to identify the magnitude of morbidity and malnourishment in a community.

The UNICEF reported that 150 million children are malnourished worldwide. One in every three malnourished children lives in India (Meera, 2009). According to the World Health Organization, an estimated 250 million children in more than 100 countries are vitamin A deficient (laxminarayan et.al 2008). In developing countries like India various forms of malnutrition affect a large segment of population and both macro and micronutrients deficiencies are or major concerns. The school age is period is nutritionally significant because this is the prime *time* to build up body stores of nutrients in preparation for rapid growth.

Anthropometric measurements are useful in many fields. For example, athletes understand that body size and composition are important factors in sports performance.

Health care professional rely on body measurements to evaluate a patients overall health. For example, body mass index, or BMI is a measurement of a persons weight to height ratio. Health care providers, insurance companies and government agencies use BMI to determine if a person is underweight, overweight or obese. A BMI of 30 or greater indicates obesity. Because obesity is linked to chronic disease, like heath disease, diabetes and certain cancers, knowing this anthropometric measurement can be a lifesaver. Anthropometric measurements can also be used when studying groups of people. This broader approach allows researchers to evaluate health-trends and concerns in various populations.

2. Review of Related Literature

Khan, Sinha et. Al (2005) conducted a study on "Anthropometric measurements" where the sample size was 1012 rural school going children. The sample was selected randomly. There were 776 males and 236 female in the age group of 5-15 years. The values of weight and height were recorded for every child in the study sample. Age and sex break-up was studies and compared with the ICMR (Indian Council of Medical Research) standard. The comparison made separately for boys and girls showed that the values for both sexes and in all age groups were less than the ICMR standard. An inference is, therefore, drawn that rural school children of middle and low socio-economic status are shorter and lighter as compared with even their own urban parts on whom the ICMR values are based.

D.R. Bharati, P.R. Deshmukh & B.S. Garg (2006) conducted a study on "correlates of overweight and obesity among school going children". The cross-sectional study was carried out in all the 31 middle schools (5^{th} to 7^{th} standard) and high schools (8^{th} to 10^{th} standard) of wardha city. Probability proportionate to size of population technique (PPS) was used to decide the number of children to be situated from each school, each class and then each section. Height and weight was measured and BMI was calculated. The results revealed that overweight and obesity was found to be 3.1 percent and 1.2 percent respectively. The magnitude of overweight/obesity among school going children of wardha city was found to be 4.3 percent.

Agenta Sjoberg, Lauren Lissner (2008) conducted a study on "recent anthropometric trends among Swedish school children; evidence for decreasing prevalence of overweight

in girls". The results revealed that between 2000/2001 and 2004/2005, the prevalence of overweight plus obesity in girls decreased from 19.6% to 15.9% (P<0.01).

Stevel Milanese (2013) conducted a study on Anthropometric and Micronutrient Status of School – children in an urban west Africa setting". School Children (n=604) aged from 5 to 17 years (52.5%, 47.57% girls, 47.5% ≥ ioy) were selected through a two stage random cluster sampling results revealed that 4.9% of children were stunted, 18.4% were thin, 5.6% had severe thinness. Prevalence of anemia, iron deficiency and iron deficiency anemia was 14.4%, 39.1% and 10.6% respectively. 3.0% had vitamin A deficiency, 35.9% a marginal vitamin A status, and 25.9% zinc deficiency. Under nutrition, especially thinness, iron and zinc deficiencies in school children requires special targeted nutrition interventions.

Mansur DI, et. Al (2015) conducted a study on "Nutritional status of rural school going children". The present study was cross sectional study, conducted on 438 rural school going children (169 male and 259 female) with the age group 4-16 years. The results reveals that the nutritional status in terms of prevalence of underweight, stunting and thinness were found to be 30.85%, 24.54% and 10.05% respectively. It was revealed that 37.87% was underweight 29.59% was stunted and 11.25% was thinness among male children where as in female children, 26.27% was underweight, 21.24% was stunted and 9.27% was thinness. Hence high prevalence of underweight, stunting and thinness were observed in male than in female children

3. Methods and Tools

There is a range of ways to measure the human body. Some measurements are simple enough to be taken in a family doctor's office. These measurements require minimal tools. For instance, weight is a basic anthropometric measurement that is easily measured with a scale and height and weight are the only measurements needed to determine a person's BMI. A tape measure is the only tool needed to determine a person's waist to hip ratio. This is a measure of the waist circumference divided by the hip circumference. This ratio is significant along with this number.

One of the method is a skin-fold test, which is a method used to estimate a person's body fat percentage using skin fold calipers. Skin-fold calipers are simple tools used to pinch folds of skin from different areas of the body. The thickness of the skin folds is recorded and a formula is used to estimate how much body fat the person is carrying.

4. Methodology

A useful criteria for assessing the nutritional status was applied on the current study. Anthropometric assessment measures physical dimensions regarding body weight and length at different ages to assess the degree of nutritional status. The choice of another measurement depends on the age of the child, the precession with which it is measured, co-operation by the child and skill of examination. According to WHO (1995) anthropometry provides the single most potable, universally applicable, in expensive and non invasive technique for assessing the size, proportion and composition of the human body. It reflects both health and nutritional status and predicts performance, health and survival. Many body parameters can be used to assess individual nutrition status. The parameters assessed during the study are weight, height and body mass (BMI) as described by Jelliffe (1966) Nutritional Anthropometry is most effective in early detection of PEM. The tools used were :

- A weighing scale (Krups, Spring Balance) for assessment of weight of children.
- For assessment of Height, stadio meter was used (Ht. Rod).
- For BMI, calculations of weight / height / meter^2 were used.

For collection of data, a questionnaire cum interview method was adopted. It was pretested or 10% of sample population for its validity and reliability before application to the population under study. To access the anthropometry measurements different techniques were used. The height was measured by a height rod, which was standardized before use and height was recorded without shoes. Body weight was taken using ordinary weighing scale, and standardized with standard weight before and in between survey and error was recorded. Mean & SD calculated and compared with …….standards.

Height is a vertical distance between the point vertex and floor. It is a measure of linear growth of the body and degree of skeletal development. Height of the subject was measured with a measuring rod. Subject was made to stand erect barefoot on a flat surface and hair flat with feet parallel, knees fully extended, back of heels, calves, buttocks, trunk and shoulders made to touch the vertical measuring rod against the walls. Arms were kept hanging from the sides in a natural manners , wooden piece of vertical measuring rod was gently lowered making contact with the crown of the head and the reading was taken on a calibrated vertical rod to the nearest 0.1 cm. Eyes to be as level as possible with the reading to avoid error. The researcher positioned the child correctly herself.

Weight indicated the body mass and is composite of all body constituents like water, minerals, fat, protein, bone etc. Weight of the subject was recorded with a personal weighing machine which was tested periodically and calibrated for its accuracy with the known standard weights. The weighing machine was kept on a flat surface and weight of child was recorded wearing minimum clothes without shoes. Zero error of scale was checked before taking the weight and corrected as and when required. Reading was taken to the nearest 100 gms. and weight was not taken right after a meal. Weight of children was taken at their respective schools. For the meaningful inter-pretation of anthropometric data, we related with reference values and for this National Council for Health Statistics (NCHS) data as a reference was used.

It reflects body weight relative to height and the proper description of low weight for height is 'thinness' a term that

does not necessary imply a pathological process. The term 'wasting' on the other hand is used to describe a recent and sever process that has lead to significant weight loss, usually as a consequence of acute starvation and or severe diseases.

It is calculated by dividing weight in Kgs by the square of height in meters. In older children it is used, but not widely used for young children because of its variation with age. Dietary assessment was also taken.

5. Nutritional Status (Anthropometry)

Table – 2 reveals that as per weight for height criteria 56.9 percent children were found normal with almost similar percentages observed in male and female children respectively (57.8 %) and (56.1 %). Mild malnutrition was seen among 23.8 percent, and the percentages being 23.3 percent for male children and 24.2 percent for female children.

The percentage dropped for moderate mal-nourishment to 13.9 percent and it was slightly higher *i.e.* 14.4 percent for female children as compared to 13.2 percent male children. Severe mal-nourishment was seen in 5.4 percent children with almost similar percentage for male children 5.6 percent and 5.3 percent female children. The overall differences were insignificant.

In Jammu region, 27.8 percent male children were mildly mal-nourished followed by 22.2 percent moderately and 11.9 percent severely mal-nourished, as against 28.7 percent mildly, 15.5 percent moderately and 7.5 percent severely mal-nourished female children.

In Kashmir region, 31.4 percent male children were mildly, followed by 10.0 percent moderately and 2.1 percent severely mal-nourished, as against 23.8 percent of mild, 18.1 percent moderate and 8.1 percent of severely mal-nourished among female children.

In Ladakh 11.3 percent male children were mildly, 8.5 percent moderately and 3.5 percent severely mal-nourished, as compared to 19.6 percent mildly, 9.5 percent moderately mal-nourished female children. All the regional differences were significant.

Table 1: Nutritional Status (Clinical Assessment)

Nutritional Status		Jammu		Kashmir		Ladakh		Overall			
		Male Children	Female Children	Male Children	Female Children	Male Children	Female Children	Male Children	Female Children	Total	
(Number Of Abnormalities)	Nil	55 (43.7)	95 (54.6)	65 (46.4)	97 (60.6)	67 (47.2)	93 (58.9)	187 (45.8)	285 (57.9)	472 (52.4)	
	1 to 2	48 (38.1)	52 (29.9)	66 (47.1)	54 (33.8)	67 (47.2)	61 (38.6)	181 (44.4)	167 (33.9)	348 (38.7)	
	3 to 4	17 (13.5)	22 (12.6)	9 (6.4)	9 (5.6)	8 (5.6)	4 (2.5)	34 (8.3)	35 (7.1)	69 (7.7)	47.5
	> 4	6 (56.4)	5 (45.4)	0 0.0	0 0.0	0 0.0	41.1	6 (1.5)	5 (1.0)	11 (1.2)	
								54.2 %	42%		
	χ^2 value	3.981		6.215		5.000		13.292			
	p value	0.264 (NS)		0.045 (Sig.)		0.082 (NS)		0.004 (Sig.)			

- *Percentage in parenthesis*
- *NS denotes p-value > 0.05*
- *Sig. denotes p-value < 0.05.*

Table 2: Nutritional Status (Anthropometry)

Nutritional Status		Jammu		Kashmir		Ladakh		Overall			
		Male	Female	Male	Female	Male	Female	Male	Female	Total	
Weight For Height	Normal	48 (38.1)	84 (48.3)	79 (56.4)	80 (50.0)	109 (76.8)	112 (70.9)	236 (57.8)	276 (56.1)	512 (56.9)	
	Mild mal Nourishment	35 (27.8)	50 (28.7)	44 (31.4)	38 (23.8)	16 (11.3)	31 (19.6)	95 (23.3)	119 (24.2)	214 (23.8)	
	Moderate malnourishment	28 (22.2)	27 (15.5)	14 (10.0)	29 (18.1)	12 (8.5)	15 (9.5)	54 (13.2)	71 (14.4)	125 (13.9)	43.1
	Severe malnourishment	15 (11.9)	13 (7.5)	3 (2.1)	13 (8.1)	5 (3.5)	-	23 (5.6)	26 (5.3)	49 (5.4)	
								42.1 %	43.9%		
	χ^2 value	5.076		10.642		9.335		0.476			
	p value	0.166 (Sig.)		0.014 (Sig.)		0.025 (Sig.)		0.924			

- *Percentage in parenthesis*
- *NS denotes p-value > 0.05*
- *Sig. denotes p-value < 0.05.*

Table 3: Average Weight (Kgs) of Children … at 6 Years

Region	Gender	Number	Mean	± S.D	P value	Result
i. Jammu	Male	20	16.85	± 1.974	.251	NS
	Female	8	18.00	± 3.128		
ii. Kashmir	Male	12	18.83	± 4.933	.029	Sig.
	Female	24	15.75	± 3.148		
Ladakh	Male	23	17.78	± 2.717	.813	NS
	Female	22	17.60	± 2.412		
Overall	Male	55	17.67	± 3.145	.157	NS
	Female	54	16.84	± 2.980		
ICMR Standards	Male	19.0 kgs.				
	Female	19.0 kgs.				

- *NS denotes p-value > 0.05*
- *Sig. denotes p-value < 0.05.*

Table 4: Average Weight (kgs.) of Children at (7 – 9) Years

Region	*Gender*	*Number*	*Mean*	*± S.D*	*P value*	*Result*
iii. Jammu	Male	48	19.64	± 3.899	.035	Sig.
	Female	61	22.88	± 6.368		
iv. Kashmir	Male	77	22.37	± 3.965	.072	NS
	Female	64	20.98	± 5.157		
Ladakh	Male	48	23.08	± 3.943	.097	NS
	Female	54	21.69	± 4.367		
Overall	Male	173	21.81	± 4.150	.547	NS
	Female	179	21.50	± 5.383		
ICMR standards	Male	26.9 kgs				
	Female	26.9 Kgs				

- *NS denotes p-value > 0.05*
- *Sig. denotes p-value < 0.05.*

Table 5: Average Weight (kgs) of children AT (10 – 12) Years

Region	Gender	Number	Mean	± S.D	P value	Result
v. Jammu	Male	58	25.51	± 5.348	.000	Sig.
	Female	105	29.54	± 5.813		
vi. Kashmir	Male	51	29.36	± 5.711	.085	NS
	Female	72	29.70	± 8.325		
Ladakh	Male	71	29.86	± 5.843	.687	NS
	Female	82	30.30	± 7.489		
Overall	Male	180	27.75	± 5.916	.002	Sig.
	Female	259	29.83	± 7.450		
ICMR standards	Male	35.4 kgs				
	Female	31.5 kgs				

- *NS denotes p-value > 0.05*
- *Sig. denotes p-value < 0.05.*

Table 6: Average HEIGHT (cms) of Children at 6 Years

Region	Gender	Number	Mean	± S.D	P value	Result
vii. Jammu	Male	20	111.21	± 9.179	.028 (< .05)	Sig.
	Female	8	120.81	± 11.491		
viii Kashmir	Male	12	112.23	± 4.829	.073	NS
	Female	24	106.48	± 10.179		
Ladakh	Male	29	108.96	± 6.552	.809	NS
	Female	22	108.29	± 9.788		
Overall	Male	55	110.49	± 8.128	.538	NS
	Female	54	109.34	± 11.154		
NCHS standards	Male	116.1 cms				
	Female	114.6 cms				

- *NS denotes p-value > 0.05*
- *Sig. denotes p-value < 0.05.*

Table 7: Average Height (cms) of Children at (7 – 9) years

Region	Gender	Number	Mean	± S.D	P value	Result
ix. Jammu	Male	48	125.19	± 6.511	.371	NS
	Female	61	123.21	± 13.251		
x. Kashmir	Male	77	123.38	± 9.340	.427	NS
	Female	64	121.80	± 14.085		
Ladakh	Male	48	122.06	± 8.614	.225	NS
	Female	54	120.03	± 8.165		
Overall	Male	173	123.52	± 8.944	.124	NS
	Female	179	121.75	± 12.286		
NCHS standards	Male	128.3 cms				
	Female	127.9 cms				

- *NS denotes p-value > 0.05*

Table 8: Average Height (Cms) of Children AT (10 – 12) years

Region	Gender	Number	Mean	± S.D	P value	Result
Jammu	Male	58	133.70	± 7.523	.002	Sig.
	Female	105	138.41	± 10.192		
Kashmir	Male	51	133.06	± 11.3.96	.021	Sig.
	Female	72	138.85	± 14.864		
Ladakh	Male	71	136.71	± 16.32	.266	NS
	Female	82	134.66	± 16.17		
Overall	Male	180	134.71	± 9.719	.018	Sig.
	Female	259	137.35	± 12.447		
NCHS standards	Male	143.44 cms				
	Female	144.86 cms				

- *NS denotes p-value > 0.05*
- *Sig. denotes p-value < 0.05.*

Table 9: Average Calorie Intake (Kcal) Of Children At 6 Years

1) Region	*Gender*	*Number*	*Mean*	*± S.D*	*P value*	*Result*
xi. Jammu	Male	20	1504.00	± 183.484	.029	Sig.
	Female	8	1345.75	± 89.183		
xii. Kashmir	Male	12	1548.00	± 171.275	.460	NS
	Female	24	1495.46	± 210.524		
Ladakh	Male	23	1620.13	± 203.492	.119	NS
	Female	22	1535.82	± 146.225		
Overall	Male	55	1562.16	± 193.443	.046	Sig.
	Female	54	1489.72	± 181.057		
ICMR standard	Male	1690				
	Female	1690				

- *NS denotes p-value > 0.05*

- *Sig. denotes p-value < 0.05.*

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