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Middle Childhood Health with Special Reference to Nutritional Status and Body-Mass Index

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Abstract:

The middle childhood years are a unique developmental time when children undergo critical physical, cognitive, and social changes. Monitoring of growth and development during this stage is important for improving overall health. Further, culturally based interventions are known to have better success rate in improving access and utilization of health services. In this regard, the present paper has been conducted to know about the status of the middle childhood health with reference to nutritional status and BMI among the Pasi of Lucknow city, which is one of the largest scheduled caste (SC) groups of Uttar Pradesh, India. The study includes sample of 300 Pasi children, belonging to age group of 6 - 11 years, selected through random sampling. It is found that in these people intake of food is to fill the stomach or overcome the hunger rather than for health. It is fact of quantity versus quality and need versus awareness. The reflection of nutritional intake in food through body mass index shows that there is an imbalance not only in the kind of nutrient intake but also in the quantity (calorie intake). The findings of the study have also been compared with other significant national and international studies.

Key Words: *Middle Childhood, Scheduled Caste, Health, Nutrition, BMI.*

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Introduction

Middle Childhood: The middle childhood years are a unique developmental time when children undergo critical physical, cognitive, and social changes. During this time, children enter school, and their social context broadens beyond their families. This is the age of critical development falling between infancy and adolescence.

Middle childhood is a period of continued neurophysiologic changes, particularly synaptogenesis and myelination in the prefrontal cortex (PFC), the brain center responsible for a range of execution of functioning including attention control, working memory, reasoning, behavioral self-regulation and monitoring, inhibition, information processing, and goal-setting.

Socially, this period is characterized by new and defining social structures that involve increasing levels of independence, development and maintenance of peer relationships, increased self-regulation needs, intellectual challenges, and pubertal changes, all of which have implications for health and functioning, and employ some degree of executive functioning.

There is no exact consensus regarding an age range defining middle childhood. Middle childhood has also been differentiated from adolescence cross-culturally, largely by the onset of puberty (Collins, 1984). Middle childhood has been delimited differently by many scholars, as ages 6 to 10 (Eccles, 1999), and ages 6 to 12 (Collins, 1984).

Due to early start of formal schooling nowadays in India and sometimes early onset of puberty (between age 10–12) the middle childhood period may vary. The study propose to undertake 6 - 11 year old children, as most children start primary schooling at about 6 years of age and enter middle or junior high school around 11 years of age, which many also use to mark the beginning of adolescence.

Health and development research has largely focused on early childhood (i.e., 0–5 years old) and adolescence (12–17 years old). Very little is known about health and functioning during middle childhood. This has been due to critical development occurring in the first five years of life and high morbidity and mortality accompanying risky behavior in adolescence. But there are substantial health issues in middle childhood which need increased focus.

By traditional definitions of health, the middle childhood population is often considered healthier than any other age group (Collins, 1984). However, by a broader definition — one that includes health problems that have behavioral and social origins (Guyer, et.al., 2000) — there are a significant number of health problems affecting this age group related to mental health, health risk behaviors, and child victimization. In addition, some unhealthy behaviors of adolescence (e.g., poor nutritional habits, smoking) may have antecedents in middle childhood and some behaviors actually begin in middle childhood. These behaviors are linked to many diseases (e.g., hypertension, cancer and diabetes) that are unlikely to emerge clinically until adolescence and adulthood. Thus, the middle childhood years present an opportunity for early intervention to encourage healthy behaviors and prevent disease among adolescents and adults.

The health and wellbeing of the middle childhood population is part of a continuum that depends on what happens during infancy and early childhood and influences the behaviors and outcomes of adolescents and adults. Promoting the health of the middle childhood population, through research and policy development, would complement progress made in the areas of early childhood and adolescence, leading to a comprehensive approach for ensuring healthy development throughout childhood.

Monitoring of growth and development during middle childhood is important for improving overall health. Further, culturally based interventions are known to have better success rate in improving access and utilization of health services.

Body Mass Index (BMI): Body Mass Index is an index between the two body measurements, viz., the height in meters and weight in kilograms. The index is predictive of the health conditions and the effect of related socio-economic factors. Hence, the results of BMI can be verified by the results of dietary intake-adequacy (Kulkarni, V.S. & Alizad, S.S., 2010).

Body mass index must be calculated according to 'Quetelet's' Index, which is statistical correlation of the relationship between the height and weight of an individual arrived at by dividing body weight (kilogram) and height in meter2. In people older than 20 years a BMI of <18 is considered underweight, 18-25 is normal, 25-30 is overweight and a BMI of greater than 30 is considered obese. But in children the underweight, normal, overweight or obese BMI number is not the same as in adults. For children, BMI-for-age percentile is used, as amount of body fat changes with age and sex.

The present paper discusses the status of the middle childhood health with reference to nutritional status and BMI among the Pasi of Lucknow city, which is one of the largest scheduled caste (SC) groups of Uttar Pradesh, India.

Methodology

The study includes sample of 300 Pasi children, belonging to age group of 6 - 11 years, selected through random sampling.

Per day calorie intake has been calculated through 'Twenty-four Hour Recall Method' and has been compared with standard values given by Swaminathan, M. (1982).

To assess nutritional and health status of the children, some anthropometric measurements, height vertex and weight, have been performed with the use of standard methods described by Weiner and Lourie (1981). After that Body Mass Index has been calculated for the purpose.

At the international level, 'WHO Child Growth Standards: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age' (World Health Organization, 2006) and "Anthropometric Reference Data for Children and Adults: United States, 2003-2006" (National Health Statistics Report, 2008) are referred for comparison.

While, on national level, the comparison has been done with "Nationwide Reference Data for Height, Weight and Body Mass Index of Indian Schoolchildren" (Marwaha, R.K., et.al, 2011) and 'Weight (Kg), Height (cm) and BMI by age and gender: Rural India (16 States)' given in "Nutrient Requirements and Recommended Dietary Allowances for Indians" (National Institute of Nutrition, Indian Council of Medical Research, 2009).

Result & Discussions

Pasi Children:-

Socio-Economic Background

In any study, personal information of the respondents is of great importance, which includes age, sex, educational level, occupation, family structure, number of siblings, parent's educational & occupational level, family income, pattern of residence and such other variables, which impact directly on one's living conditions and overall health.

S. No.	Socio-demographic Aspects	Percentage
1	**Age Groups (in Years)**	
	6-7	20
	7-8	20
	8-9	20
	9-10	20
	10-11	20
2	**Sex**	
	Male	50
	Female	50
3	**Educational Status**	
	Going to School	58.67
	Not Going to School	41.33
4	**Occupation**	
	Doing Nothing	38.00
	Studying + Indulge in Economic Activities	5.00
		6.67
	Indulge in Economic Activities	53.67
	Studying	
5	**Family Structure**	
	Joint Family	25.33
	Nuclear Family	65.00
	Living with Relative	9.67
6	**Siblings in the Family**	
	Only child	4.67
	2-4	32.00
	4-6	51.00
	6+	12.33
7	**Parents' Education**	
	Paternal Educational Status	
	Illiterate	26.00
	Primary	13.00
	Junior high School	17.00
	High School	14.00
	Intermediate	12.67
	Graduate	10.33
	Post Graduate	4.33
	Technically Qualified	2.67
	Maternal Educational Status	
	Illiterate	42.67
	Primary	23.33
	Junior high School	18.00
	High School	4.33
	Intermediate	2.00
	Graduate	6.00
	Post Graduate	3.00
	Technically Qualified	0.67
8	**Parent's Occupation**	
	Father	
	Working	92.00
	Not Working	5.67
	Not Alive	2.33
	Mother	
	Working	33.00
	Not Working	5.67
	Not Alive	2.33

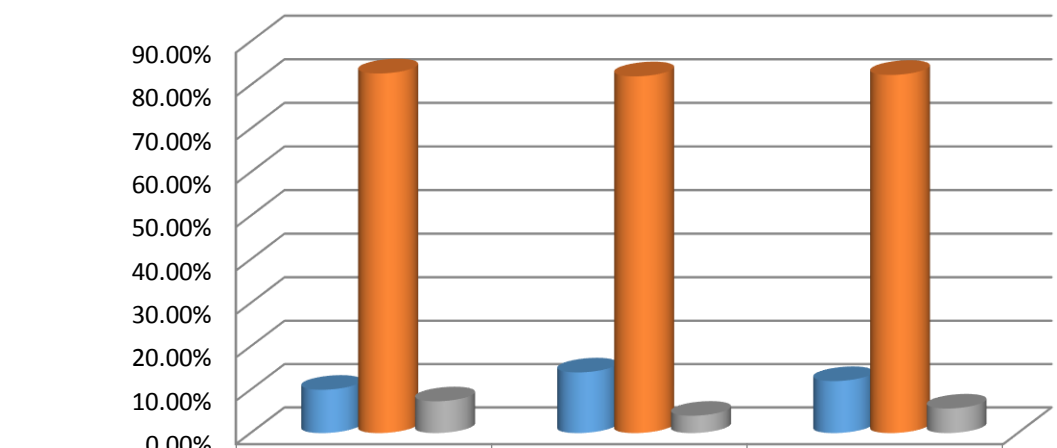
9	**Family Income (in Rs.)** Up to 2,000/- 2,000/- - 4,000/- 4,000/- - 6,000/- 6,000/- - 8,000/- 8,000/- - 10,000/- 10,000/- - 12,000/- 12,000/- -1 4,000/- 14,000/- - 16,000/- 16,000/- - 18,000/- 18,000/- - 20,000/- 20,000/- +	 27 19 8 16 11 6 2 4 4 1 2
10	**Pattern of Residence** Kaccha House (Structure of Mud) Pucca House (Structure of Brick and Cement)	 32.33 67.67
	TOTAL	100% (300 Pasi Children)

Food Habits and Nutrition

These people are both vegetarian as well as non-vegetarian. The food comprises wheat, rice, arhar (yellow pulse), jowar (Maiz) and bajara (Millet). In non-vegetarian food they take fish, mutton and chicken. In lower income group families, people take pork also. They do not take non-vegetarian food daily, as most of them cannot afford it. Their daily diet consists of roti, daal, chawal and sabji. They use mustard oil as cooking medium. They cook non-vegetarian food on special occasions, i.e., social gatherings, ceremonies, feasts and festivals. Normally males take heavy diet than female. Due to scarcity and lack of awareness, the lower income group families are deprived of nutrients, like, milk and fruits in their regular diet, even, no special care is taken for the diet of children and pregnant women.

It was reported that, generally, in middle income group families, it is believed that three meals (including breakfast) are the sufficient food for the whole day, while lower income group families believe that two meals are sufficient. Another criteria of sufficient food intake is related with 'Satisfaction', i.e., whether the person is satisfied or not. The number of meals in the regular diet of the Pasi children is shown in the Figure no.1..

Figure No. - 1
Diet Pattern



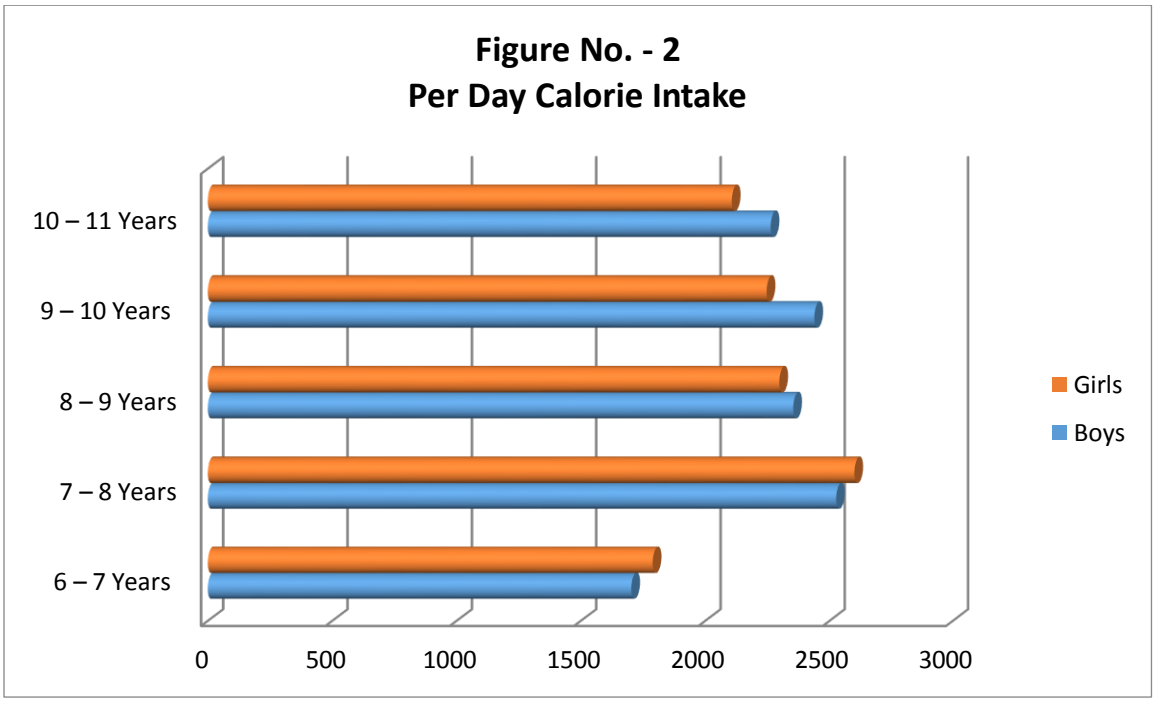
	Boys	Girls	Total
One meal	10.00%	14.00%	12.00%
Two meals	82.67%	82.00%	82.33%
Not regular meals	7.33%	4.00%	5.67%

According to Figure no.1, a majority of the children (82.33%) are taking two meals in a day, followed by those who are taking one meal in a day (12%). While, 5.67% children have reported that there is no restrict diet pattern, as the meals depend upon the availability of the food and time.

However, 82.33% children are taking two meals in a day, but due to the unawareness, most of the children are not properly nourished (Table no.-1). Nourishment and balanced diet go hand to hand and a little knowledge about the balanced diet resulted in improper nourishment.

Table No. – 1: Per Day Calorie Intake

S. No.	Age Groups	Sex	Number of Individuals	Mean (Calorie)	Standard Deviation	Standard Error of Standard Deviation	Standard Error of Mean
1	6-7 Years	Boys	30	1703.02	316.80	129.33	182.90
		Girls	30	1789.01	201.91	82.43	116.57
2	7-8 Years	Boys	30	2527.26	239.26	97.68	138.13
		Girls	30	2601.23	273.73	111.75	158.04
3	8-9 Years	Boys	30	2354.16	213.81	87.29	123.44
		Girls	30	2298.15	227.16	92.74	131.15
4	9-10 Years	Boys	30	2439.07	346.80	141.58	200.22
		Girls	30	2247.20	349.29	142.60	201.66
5	10-11 Years	Boys	30	2263.26	224.91	91.82	129.85
		Girls	30	2107.18	369.48	150.84	213.32



Per day calorie intake, which has been calculated through 'Twenty-four Hour Recall Method', shown in Table no.-1 & Figure no.-2. Following conclusions are drawn:

1. 6-7 Years Age Group

- The boys take 1703.02 ± 316.80 calorie per day which is less than the standard value 1800.00 calorie (Swaminathan, M., 1982).
- The girls take 1789.01 ± 201.91 calorie per day which is less than the standard value 1800.00 calorie.

2. 7-8 Years Age Group

- The boys take 2527.26 ± 239.26 calorie per day which is more than the standard value 2400.00 calorie.
- The girls take 2601.23 ± 273.73 calorie per day which is more than the standard value 2400.00 calorie.

3. 8-9 Years Age Group

- The boys take 2354.16 ± 213.81 calorie per day which is less than the standard value 2400.00 calorie.
- The girls take 2298.15 ± 227.16 calorie per day which is less than the standard value 2400.00 calorie.

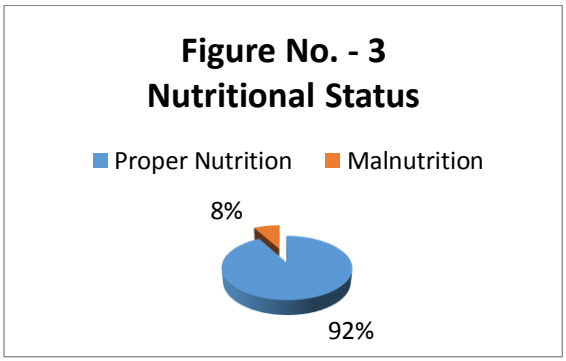
4. 9-10 Years Age Group

- The boys take 2439.07 ± 346.80 calorie per day which is more than the standard value 2400.00 calorie.
- The girls take 2247.20 ± 349.29 calorie per day which is less than the standard value 2400.00 calorie.

5. 10-11 Years Age Group

- The boys take 2263.26 ± 224.91 calorie per day which is less than the standard value 2400.00 calorie.
- The girls take 2107.18 ± 369.48 calorie per day which is less than the standard value 2400.00 calorie.

Thus, the absence of proper nutrition retards their physical and cognitive growth. As a result, these undernourished children can fail to grow up to their full genetic potential. Malnutrition was reported among most of the children, which is not only one of the largest causes of morbidity, but is also interrupting their complete and balanced mental-physical growth. In most of the cases, it was in the form of under-nutrition and imbalanced diet, while in several cases the children were suffering from specific nutritional deficiency.



Nutritional status of the children shows that only 8% are taking proper diet, while overwhelming majority, i.e., 92% are malnourished and taking imbalanced diet (Figure no.-3).

Table No. 2: Measurement No. – 1: Height Vertex

S. No.	Age Group (Years)	Sex	Number of Respondents	Mean (Cm.)	Standard Deviation	Standard Error of Standard Deviation	Standard Error of Mean
1	6 – 7	Boys	30	114.00	7.11	2.90	4.11
		Girls	30	113.70	7.26	2.96	4.20
2	7 – 8	Boys	30	119.87	2.72	1.11	1.57
		Girls	30	116.83	9.61	3.92	5.55
3	8 – 9	Boys	30	130.67	6.51	3.66	3.76
		Girls	30	128.83	13.30	5.43	7.68
4	9 – 10	Boys	30	133.13	6.14	2.51	3.55
		Girls	30	133.11	5.24	2.14	3.08
5	10 – 11	Boys	30	138.53	4.41	1.80	2.55
		Girls	30	136.73	5.35	2.18	3.09

Figure No. - 4
Mean Height by Age and Sex

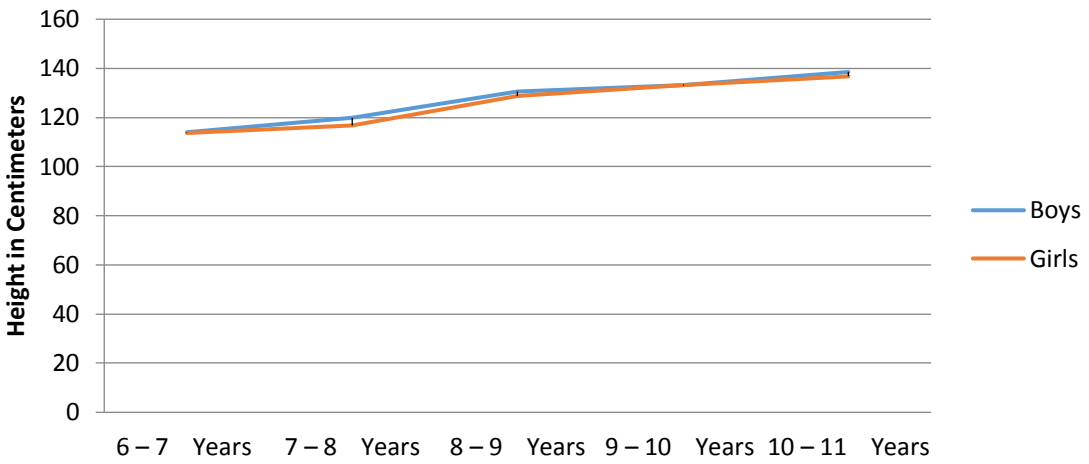
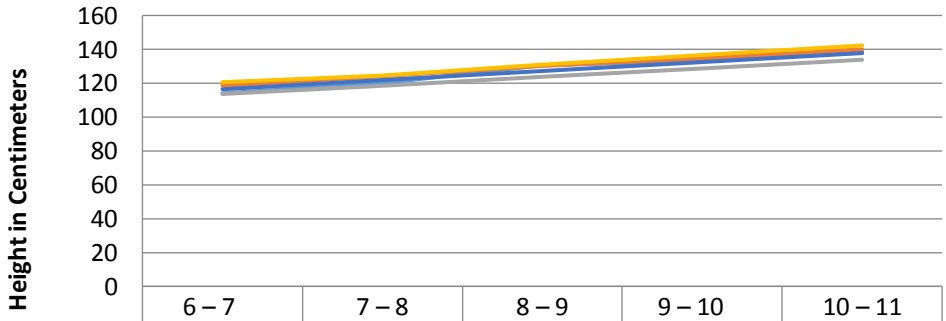
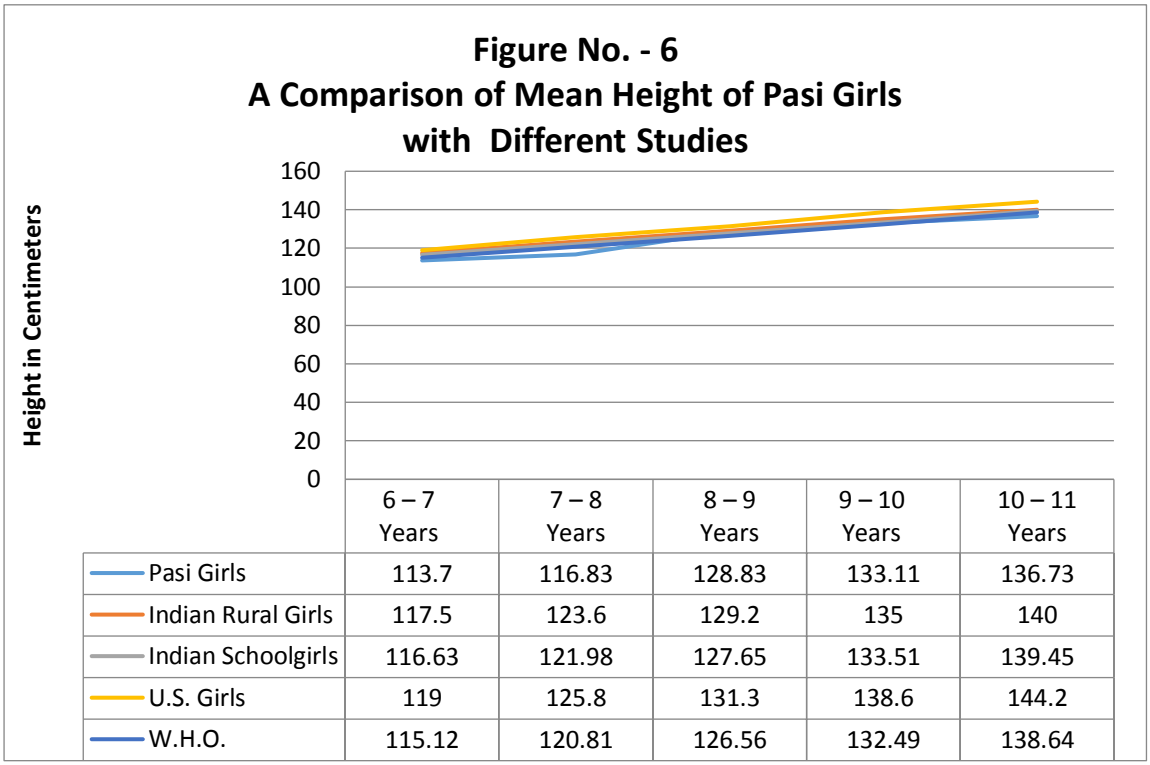


Figure No. - 5
A Comparison of Mean Height of Pasi Boys with Different Studies



	6 – 7 Years	7 – 8 Years	8 – 9 Years	9 – 10 Years	10 – 11 Years
Pasi Boys	114	119.87	130.67	133.13	138.53
Indian Rural Boys	118.5	124.3	130.1	134.6	140
Indian Schoolboys	113.63	118.66	123.68	128.7	133.86
U.S. Boys	120.6	124.7	131.1	136.8	142.3
W.H.O.	116.44	121.73	127.27	132.57	137.78



In the age group of 6 to 8 years, the mean values are less than the height-for-age standards given by World Health Organization. While, from 8 to 11 years of age this value are more than the standard reference values.

Figure no.-5 & 6 reveals the comparison of mean height of Pasi children with different studies. According to these figures, the height of Pasi boys in the age group of 6 to 8 years, is higher than the Indian schoolboys (Marwaha, R.K., et.al., 2011), while less than all other categories. In the age group of 8 to 9 years, their mean height is higher than both, Indian rural boys (National Institute of Nutrition, Indian Council of Medical Research, 2009) and Indian schoolboys. In the age group of 9 to 11 years, they are smaller than Indian rural boys and U.S. boys (National Health Statistics Report, 2008) and taller than Indian schoolboys and W.H.O. standards (World Health Organization, 2006).

In case of girls, in the age groups of 6 to 8 years and 10 to 11 years, the Pasi girls are smaller than all other categories. While in the age group of 8 to 9 years, they are taller than Indian schoolgirls and W.H.O. standards and in 9 to 10 years age group their height is more than W.H.O. standards.

2. Body Weight

Table no.-3 & Figure no.-7 reveals that the body weight of Pasi children is increasing with the age from 6 to 11 years. Boys are, on the average, slightly heavier than girls between 7 to 11 years. However, from 6 to 7 years of age, girls are slightly heavier. Except for boys of 8 to 10 years and girls of 8 to 9 & 10 to 11 years, in all the age groups of both the sexes, the mean value of weight is less than the weight-for-age standards of W.H.O.

Table No. 3: Measurement No. – 2: Body Weight

S. No.	Age Group (Years)	Sex	Number of Respondents	Mean (Kg.)	Standard Deviation	Standard Error of Standard Deviation	Standard Error of Mean
1	6 – 7	Boys	30	19.07	1.25	0.51	0.72
		Girls	30	19.37	3.35	1.37	1.92
2	7 – 8	Boys	30	22.60	2.13	0.87	1.22
		Girls	30	21.33	3.01	1.23	1.74

3	8 – 9	Boys	30	26.67	5.13	2.09	2.96
		Girls	30	25.07	0.90	0.37	0.52
4	9 – 10	Boys	30	28.30	3.75	1.33	2.17
		Girls	30	28.00	0.87	0.36	0.50
5	10 – 11	Boys	30	29.33	2.89	1.18	1.67
		Girls	30	28.53	4.01	1.04	2.31

Figure No. - 7 Mean Weight by Age and Sex

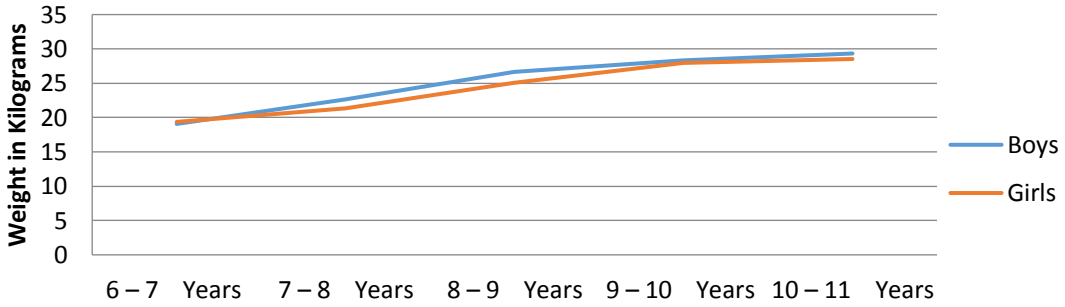
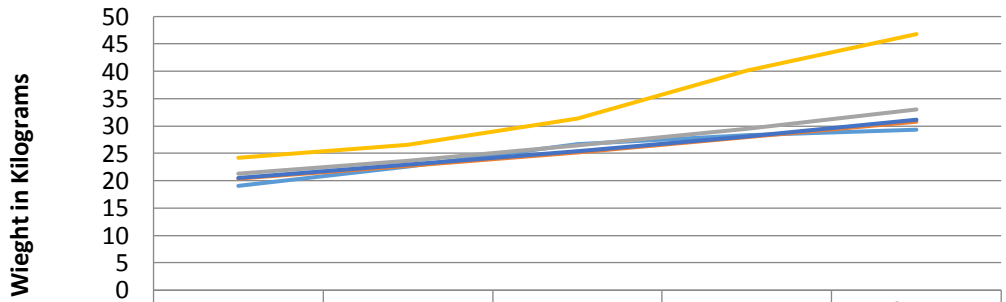
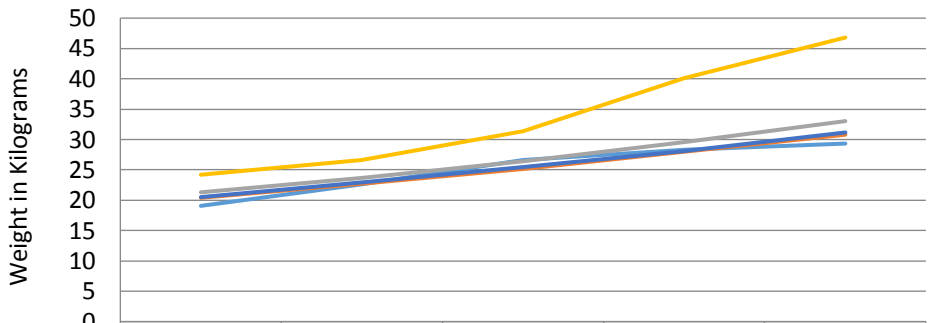


Figure No. - 8 A Comparison of Mean Weight of Pasi Boys with Different Studies



	6 – 7 Years	7 – 8 Years	8 – 9 Years	9 – 10 Years	10 – 11 Years
Pasi Boys	19.07	22.6	26.67	28.3	29.33
Indian Rural Boys	20.4	22.7	25.2	28	30.8
Indian Schoolboys	21.3	23.69	26.43	29.54	33.03
U.S. Boys	24.2	26.6	31.4	40.1	46.8
W.H.O.	20.51	22.89	25.42	28.11	31.16

Figure No. - 9
A Comparison of Mean Weight of Pasi Girls with Different Studies



	6 - 7 years	7 - 8 years	8 - 9 years	9 - 10 years	10 - 11 years
Pasi Girls	19.07	22.6	26.67	28.3	29.33
Indian Rural Girls	20.4	22.7	25.2	28	30.8
Indian Schoolgirls	21.3	23.69	26.43	29.54	33.03
U.S. Girls	24.2	26.6	31.4	40.1	46.8
WHO	20.51	22.89	25.42	28.11	31.16

The comparison with various international and national studies (Figure no.-8 & 9) shows the mean weight in kilograms of Pasi boys are lighter from all other categories in the age group of 6 to 8 and 10 to 11 years. In the age group of 8 to 9 years, they are heavier than Indian rural boys, Indian schoolboys and W.H.O. standard. In the age group of 9 to 10 years, they are again heavier than both, Indian rural boys and W.H.O. standards. The same pattern is apparent in case of Pasi girls.

Thus there is, however, linear and gradual increase in growth rate of body weight, but it is not completely satisfactory according to age.

Body Mass Index (BMI)

In the present study the value of BMI-for-age used is based on reference data of the World Health Organization (WHO) report. A child is considered underweight or having low BMI when his BMI-for-age is >5th percentile, normal weight when his BMI-for-age is between 5th to 85th, overweight when his BMI-for-age is between 85th to 95th and obese when his BMI-for-age is ≥95th percentile.

Table No. 4: Body Mass Index

S. No.	Age Group (Years)	Sex	Number of Respondents	Mean	Standard Deviation	Standard Error of Standard Deviation	Standard Error of Mean
1	6 – 7	Boys	30	14.70	0.82	0.33	o.47
		Girls	30	14.89	0.63	0.26	0.36
2	7 – 8	Boys	30	15.67	0.82	0.33	0.47
		Girls	30	15.68	3.43	1.40	1.98
3	8 – 9	Boys	30	15.50	1.63	0.67	0.94
		Girls	30	15.43	2.96	1.21	1.71
4	9 – 10	Boys	30	15.94	0.93	0.38	0.54
		Girls	30	15.82	1.65	0.67	0.95
5	10 – 11	Boys	30	15.36	1.81	0.74	1.05

		Girls	30	15.21	1.06	0.43	0.61

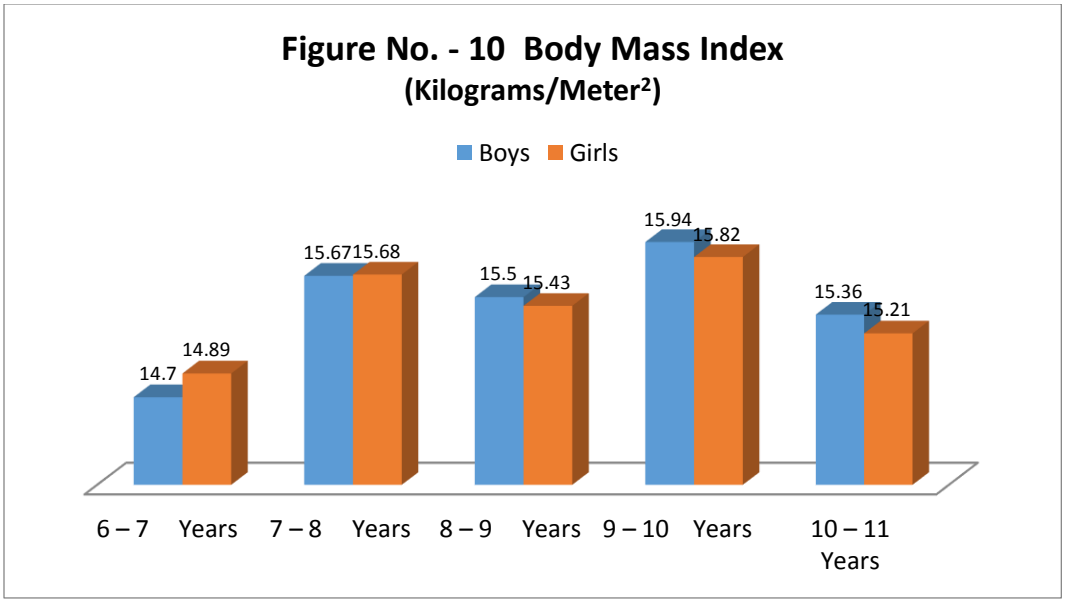
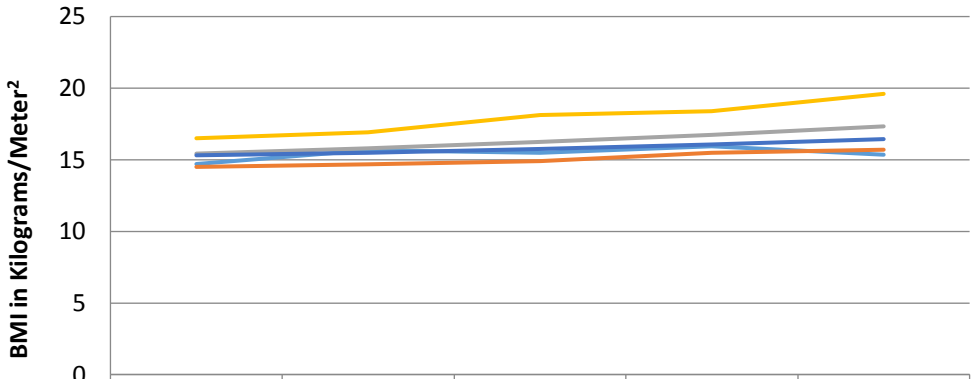


Table no.-4 & Figure no.-10 shows the mean value of BMI of Pasi children. It shows that in case of both the sexes, its value is increased from 6 -7 years to 7-8 years of age group, but decreased again in the age group of 8-9 years. Again the value is increased in all the age group of 9-10 years and decreased in the age group of 10-11 year. In most of the age groups, i.e., from 8 to 11 years, the BMI value of girls is less than the boys. It may be due to gender discrimination prevalent in the society.

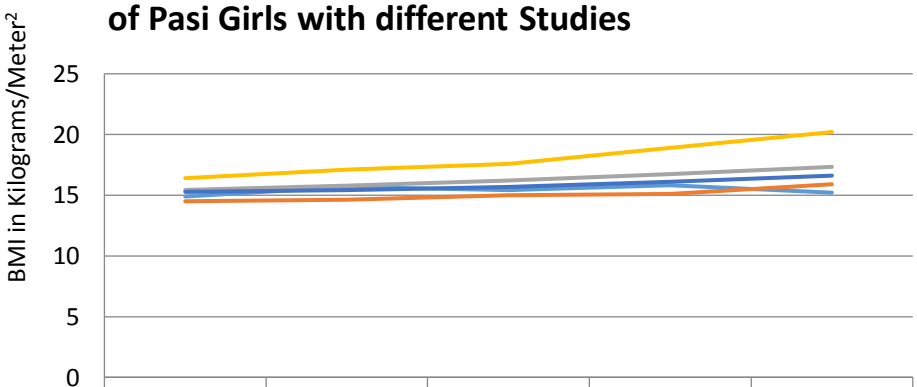
When the mean value of BMI of age group is compared with BMI-for-age, reference data of W.H.O. report, it is found that the mean value of all the age groups of both sexes reveals the normal weight category, i.e. from 15th to 50th percentile value. As the normal category ranges from 5th percentile to 85th percentile, therefore, values are too far from overweight values.

Figure No. - 11 A Comparison of Mean BMI of Pasi Boys with Different Studies



	6 – 7 Years	7 – 8 Years	8 – 9 Years	9 – 10 Years	10 – 11 Years
Pasi Boys	14.7	15.67	15.5	15.94	15.36
Indian Rural Boys	14.5	14.7	14.9	15.5	15.7
Indian Schoolboys	15.43	15.79	16.23	16.74	17.33
U.S. Boys	16.5	16.9	18.1	18.4	19.6
W.H.O.	15.31	15.48	15.74	16.05	16.44

Figure No. - 12
A Comparison of Mean BMI of Pasi Girls with different Studies



	6 - 7 years	7 - 8 years	8 - 9 years	9 - 10 years	10 - 11 years
Pasi Girls	14.89	15.68	15.43	15.82	15.21
Indian Rural Girls	14.5	14.6	15	15.1	15.9
Indian Schoolgirls	15.43	15.79	16.23	16.74	17.33
U.S. Girls	16.4	17.1	17.6	18.9	20.2
WHO	15.27	15.43	15.68	16.1	16.61

However, the BMI value in all the age group shows the normal category, but comparison with different studies (Figure no.-11 & 12) reveals that, generally its value is higher than Indian rural children, but less than Indian school children belonging to upper socio-economic strata, American children and even its value

is lesser than 50th percentile value of W.H.O reference report. This less BMI value may be attributed to the poor dietary intake, large family size, unawareness about the balanced diet, poor access to health facilities and gender discrimination.

Conclusion

In these people intake of food is to fill the stomach or overcome the hunger rather than for health. It is fact of quantity versus quality and need versus awareness. The reflection of nutritional intake in food through body mass index shows that there is an imbalance not only in the kind of nutrient intake but also in the quantity (calorie intake). Body Mass Index is an index between the two body measurements, viz., the height and weight. The former is highly influenced by genetic factors and the latter by nutrition and other environmental factors. The first measurement is relatively constant for respective age, but the second one is more fluctuating according to changing conditions. The resultant index, thus, is the predictor of genetic as well as environmental influences. Here, the height measurement of the Pasi children shows that their height is increasing linearly with the age from 6 to 11 years and as according to WHO standards. However, there is linear and gradual increase in growth rate of body weight, but it is not completely satisfactory according to age. The mean value of BMI of Pasi children varies from one age group to another and from boys to girls. While comparing the mean value of BMI with reference data of W.H.O. report, which ranges from 5th percentile to 85th percentile, in the present study it is found that the BMI value is ranging between 15th to 50th percentile values. Though the range seems normal, but is a clear picture of inadequate and imbalanced diet. In most of the age groups, the BMI value of girls is less than the boys, which is a significant fact. Comparative analysis with other studies reveals that generally its value is higher than Indian rural children, but less than Indian school children belonging to upper socio-economic strata and American children. BMI value may be attributed to the poor dietary intake, large family size, unawareness about the balanced diet, poor access to health facilities and gender discrimination.

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