5.1 DISCUSSION ON PHYSICAL GROWTH

The present study has determined the growth standards of the school going adolescent boys and girls of Himachal Pradesh within the age group of 10 to 17 years. The growth standards were assessed principally from height and weight which are considered as the two most sensitive anthropometric indicators of physical growth. The study has also attempted to evaluate the growth deficiencies in this population from two growth indices namely height - for - age and BMI-for-age.

Attempt has been made to compare the height and weight of the present Himachali boys and girls with similar Indian population as reported in some earlier studies.

5.1.1 DISCUSSION ON HEIGHT

5.1.1.1 COMPARISON OF MEAN HEIGHT OF HIMACHALI BOYS WITH OTHER INDIAN POPULATION

The pooled mean height of Himachali boys of 10-17 years was 155.7 cm. As compared to four studies reported in other Indian population of same age group Himachali boys were found to be taller(Fig.5.1), than rural adolescents from nine different Indian states[1](Mean difference=10.4 cm), the tribal adolescents from Orissa[2](Mean difference=10.2 cm), rural adolescent boys from West Bengal[3](Mean difference=9.9 cm),urban school children from north India[4](Mean Difference= 1.9 cm) and rural boys from Haryana[5](Mean Difference= 1.9 cm).

However, the mean height of Himachali boys were 2.5 cmlower than the mean height reported for Indian school boys belonging to the upper socio-economic strata[6].

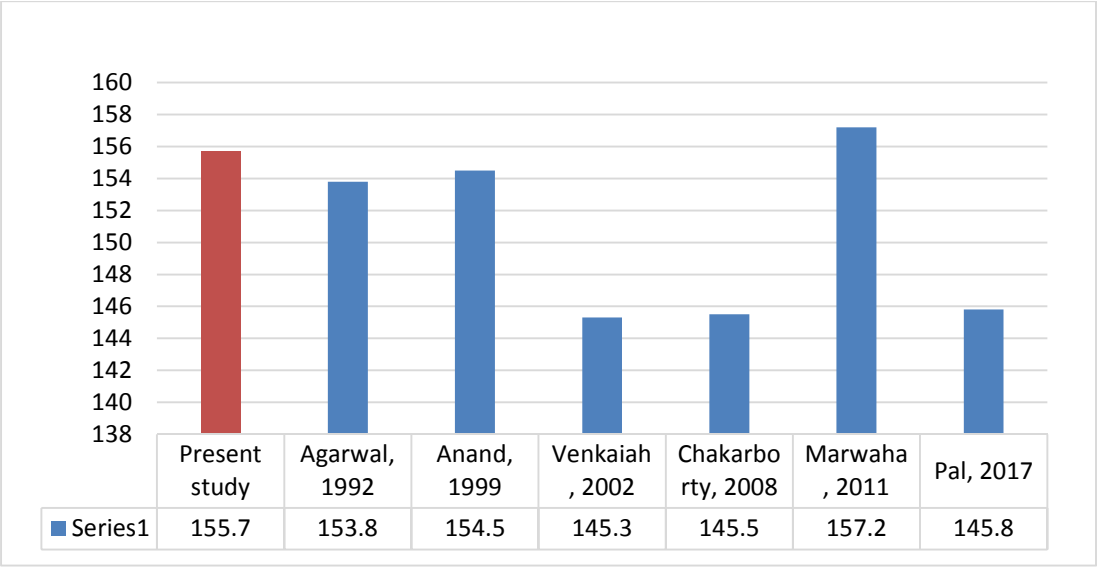

Fig.5.1 :Comparison of height of the Himachali boys with other Indian studies

1. Agarwal etal.,1992. Affluent school children from urban population of north India.
2. Anand K, 1999. Rural school children from Haryana, North India
3. Venkaiahetal., 2002. Rural adolescents from nine Indian states.
4. Chakraborty&Bharti, 2008. Shabar tribal children from Orissa.
5. Marwahaetal., 2011. Urban school children from different Indian cities of upper socio-economic strata.
6. Pal etal., 2017. Rural children from West Bengal of lower socioeconomic strata.

5.1.1.2 COMPARISON OF MEAN HEIGHT OF EARLY ADOLESCENT HIMACHALI BOYS WITH OTHER STUDIES

The mean height of early adolescent (10-14years) Himachaliboys was 148.3 cm.This was found to be higher thanthe early adolescent Indian boys as reported in five different studies. In decreasing order, the mean differences were19 cm, 10.9 cm, 6.1 cm, 5.1 cm and 3.3 cm, as compared to the rural boys of West Bengal[7],boys oflower socioeconomic class from Assam[8], urban school children from Kolkata[9], urban school boys of Ahmedabad[10] and rural school children from Jammu and Kashmir[11]respectively (Figure 5.2).

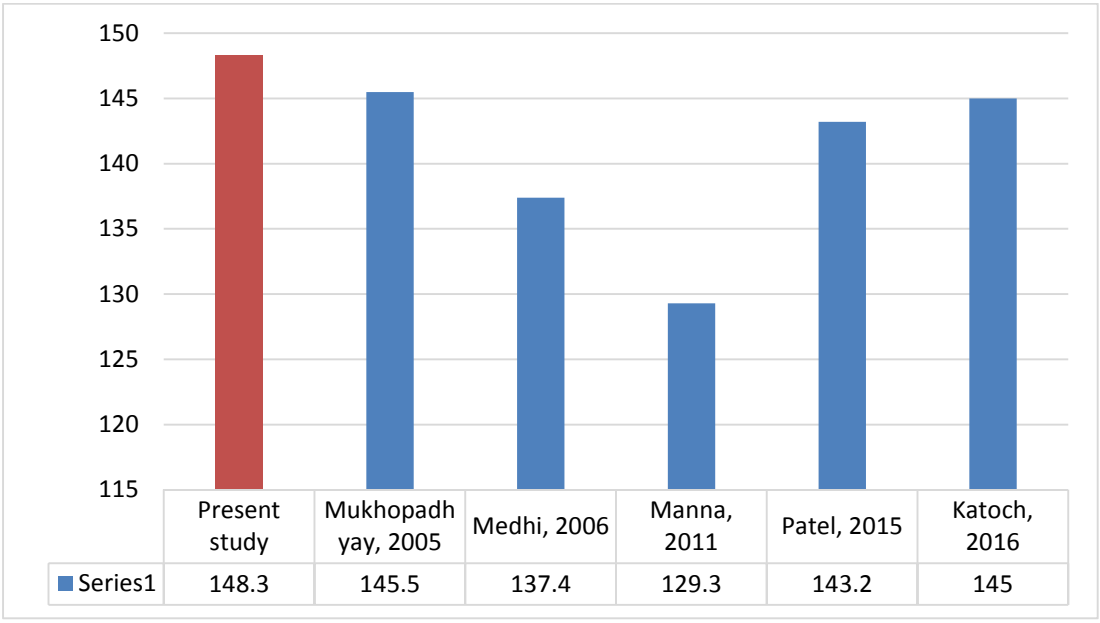

Fig.5.2 :Comparison of height of the early adolescent Himachali boys with other Indian studies

1. Mukhopadhyayetal., 2005. Urban school children from North 24 Parganas, West Bengal.
2. Medhietal., 2006. Children of tea garden workers, from lower socioeconomic class of Assam.
3. Manna et al., 2011. Rural school children from Darjeeling and Jalpaiguri districts of West Bengal.
4. Patel etal., 2015. Urban school children from Ahmedabad, Gujrat.
5. Katoch and Sharma. 2016. Rural school children from Doda district, Jammu and Kashmir.

5.1.1.3 COMPARISON OF MEAN HEIGHT OF LATE ADOLESCENT HIMACHALI BOYS WITH OTHER STUDIES

The pooled mean height of late adolescent Himachali boys (15-17 years) was 168.1 cm. This was higher than the mean heights of different population of late adolescent Indian boys. In decreasing order, the mean differences were found to be 11.4 cm, 10.7 cm, 1.1 cm,10.9 cm as compared to tribal adolescents from Orissa[2], rural adolescents from different Indian states[1],rural adolescent boys from West Bengal[3] and urban affluent Indian school children[4]respectively. However, themean height was found to be slightly lower by 0.9 cm when compared withthe Indian school children[6]. This comparison is presented in Figure 5.3

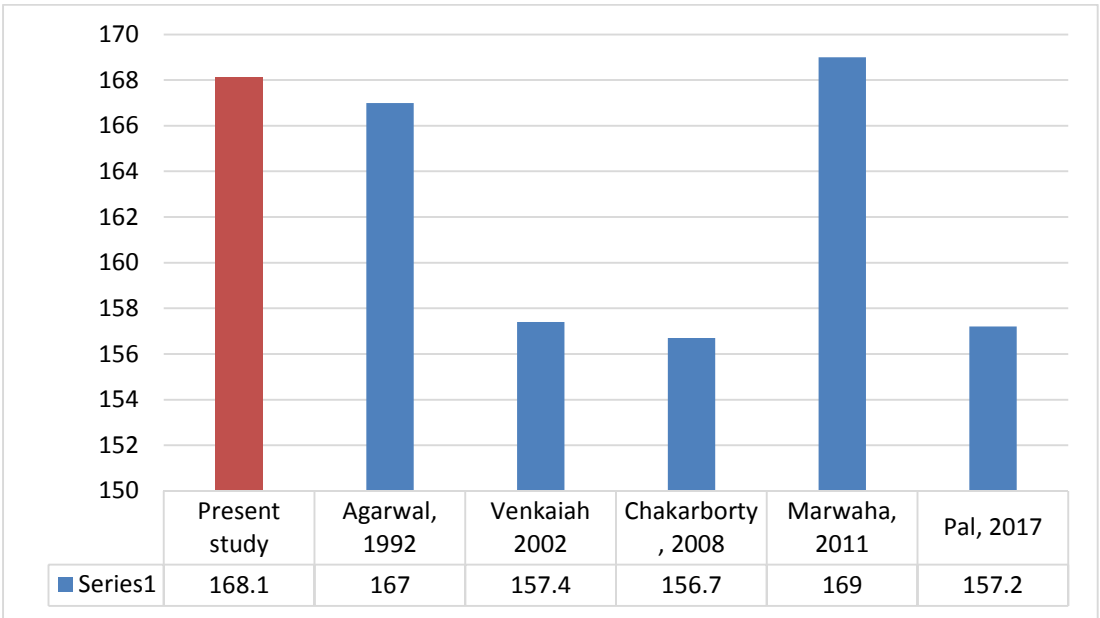

Fig.5.3 :Comparison of height of the late adolescent Himachali boys with other Indian studies

1. Agarwaletal., 1992. Affluent school children from urban population of north India.
2. Venkaiahetal., 2002. Rural adolescents from nine Indian states.
3. Chakraborty&Bharti, 2008. Shabar tribal children from Orissa.
4. Marwahaetal., 2011. Urban school children from different Indian cities of upper socio-economic strata.
5. Pal etal., 2017. Rural children from West Bengal of lower socioeconomic strata.

5.1.1.4 COMPARISON OF HEIGHT OF HIMACHALI GIRLS WITH OTHER INDIAN POPULATION

The height of Himachali girls was (mean=150.7 cm) shorter by 1.3 cm and 1.6 cm as compared to Indian school children[6]and Rajput females from Shimla district of Himachal Pradesh[12]respectively, and taller by 0.7 cm, 7.2 cm, 7.6 cm, and 8.5 cm as compared to urban girls of north India[4], rural girls from West Bengal[3] and rural adolescent girls from different Indian states[1], and Shabar tribal adolescent girls from Odissa[2] respectively. (Fig.5.4)

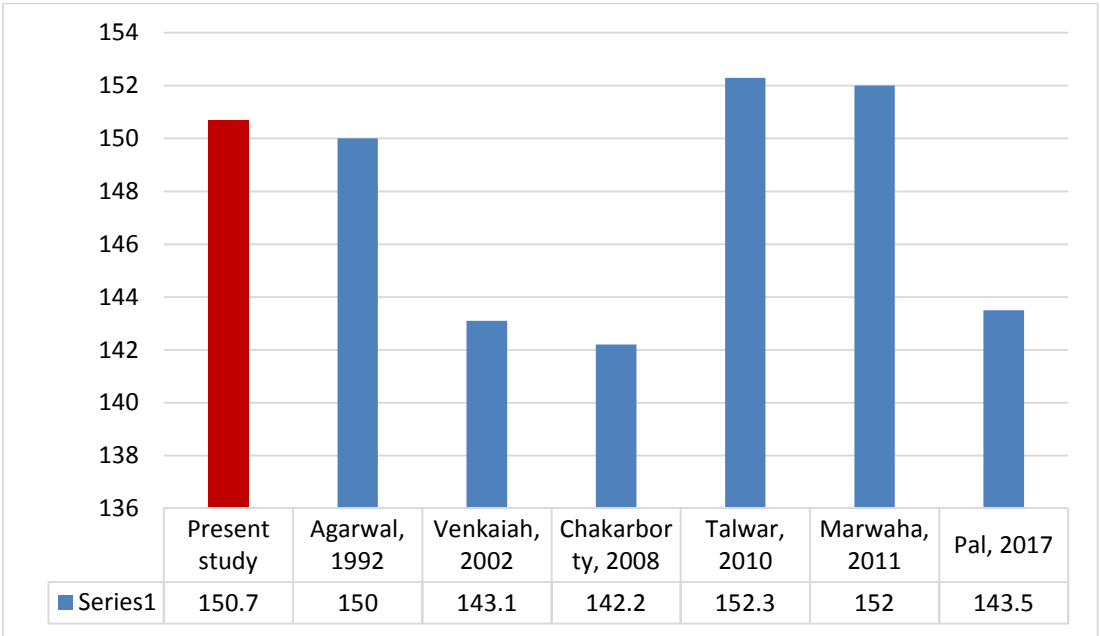

Fig.5.4 :Comparison of height of the Himachali girls with other Indian studies

1. Agarwaletal., 1992. Affluent school children from urban population of 19 cities of north, south, east and west of India.
2. Venkaiahetal., 2002. Rural adolescents from nine Indian states.
3. Chakraborty&Bharti, 2008. Shabar tribal children from Orissa.

4. Talwar,2010. Adolescent Rajput females from Shimla district of Himachal Pradesh.
5. Marwaha et al., 2011. Urban school children from different Indian cities of upper socio-economic strata.
6. Pal etal., 2017. Rural lower social class children from West Bengal.

5.1.1.5 COMPARISON OF MEAN HEIGHT OF EARLY ADOLESCENT HIMACHALI GIRLS WITH OTHER STUDIES

The mean height of early adolescent (10-14years) Himachali girls was 147.4 cm. This was found to be higher than the mean height reported for five different Indian population of early adolescent girls. In decreasing order, the mean differences ofheight between Himachali girls and these population were 15.8 cm, 9.8 cm, 8.2 cm, 6.2 cm and 4.2 cm,when compared with rural school children of North Bengal[7], girls of lower socioeconomic class from Assam[8], rural girls from PaschimMedinipur district of West Bengal[13], girls from urban areas of Ahmedabad[10], and urban girls from north 24 Pargana of West Bengal[9]respectively. This comparison is presented in Figure 5.5

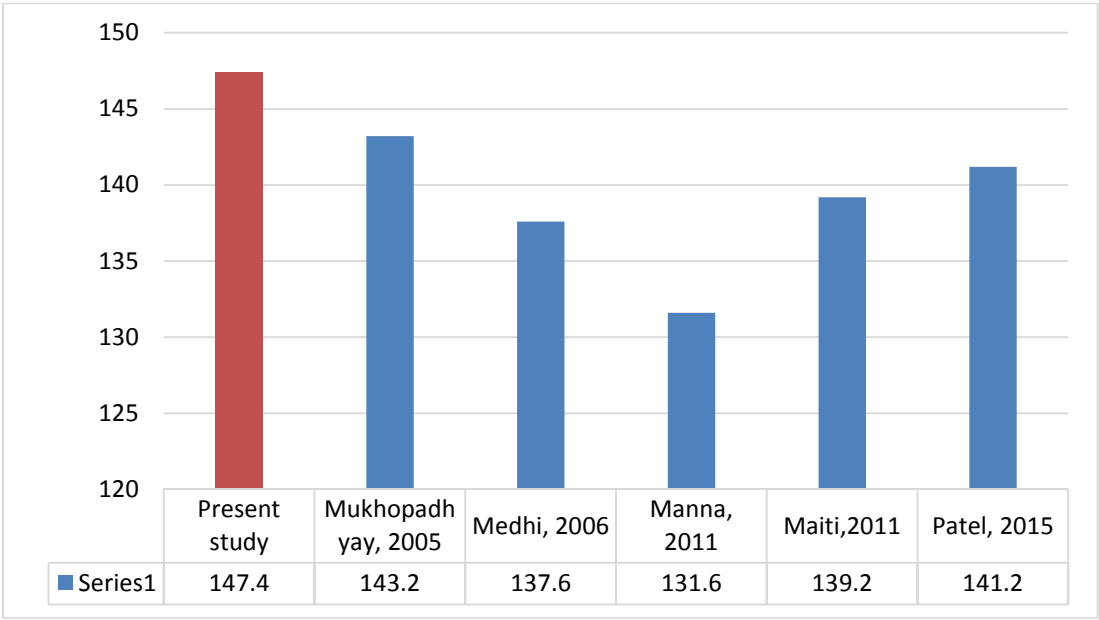

Fig.5.5 :Comparison of height of the early adolescent Himachaligirls with other Indian studies

1. Mukhopadhyayetal., 2005. Urban school children from North 24 Parganas, West Bengal.

2. Medhietal., 2006. Children of tea garden workers, from lower socioeconomic class of Assam.
3. Manna et al., 2011. Rural school children from Darjeeling and Jalpaiguri districts of West Bengal.
4. Maitietal., 2011. Early adolescent school girls in PaschimMedinipur district of West Bengal.
5. Patel etal., 2015. Urban school children from Ahmedabad, Gujrat.

5.1.1.6 COMPARISON OF MEAN HEIGHT OF LATE ADOLESCENT HIMACHALI GIRLS WITH OTHER STUDIES

The pooled mean height of late adolescent (15-17 years) girls was 156.0 cm. This was found to be higher than the mean heights of different Indian studies reported for late adolescent girls. In decreasing order,the mean differences of height between the late adolescent Himachali girls and other studies were 9.1 cm, 5.6 cm, 5.5 cm, 5 cm and 1.2 cm as compared to tribal adolescents from Orissa[2], school going adolescent girls from Tamilnadu[14], rural adolescent girls from West Bengal[4], rural adolescents from different Indian states[1], and adolescent Rajput females of Shimla district of Himachal Pradesh respectively. However, this reported height was found to be slightly lower by 1.5 cm as compared to the Indian school children[6]andalmost similar to the affluent class adolescents from eight different states of India[5] and rural school children from Haryana[5] (mean value=155.4 cm). This comparison is presented in Figure 5.6

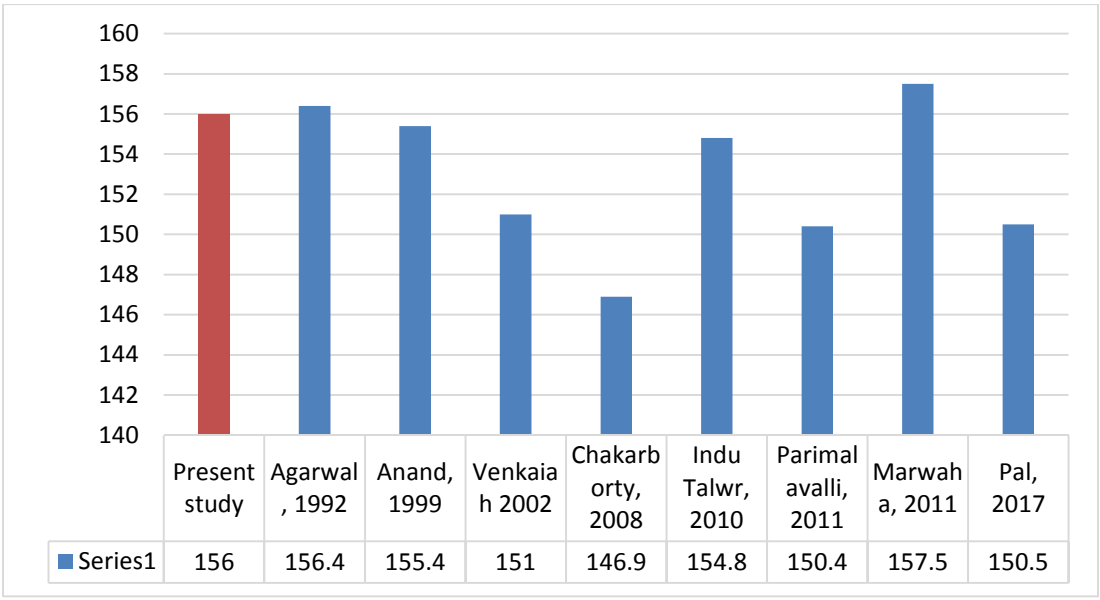

Fig. 5.6 :Comparison of height of late adolescent Himachali girls with other Indian studies

1. Agarwaletal., 1992. Affluent school children from urban population of 19 cities of north, south, east and west of India.
2. Anand K, 1999. Rural school children from Haryana, North India.
3. Venkaiahetal., 2002. Rural adolescents from nine Indian states.
4. Chakraborty&Bharti, 2008. Shabar tribal children from Orissa.
5. Indu Talwar,2010. Adolescent Rajput females from Shimla district of Himachal Pradesh.
6. Parimalavalli& Sangeetha,2011. School going adolescent girls from Tamilnadu.
7. Marwahaetal., 2011. Govt and Private school children from 19 cities from north, south, east and west zones of India.
8. Pal etal., 2017. Rural lower social class children from West Bengal.

5.1.2 DISCUSSION ON WEIGHT

5.1.2.1 COMPARISON OF MEAN WEIGHT OF HIMACHALI BOYS WITH OTHER INDIAN POPULATION

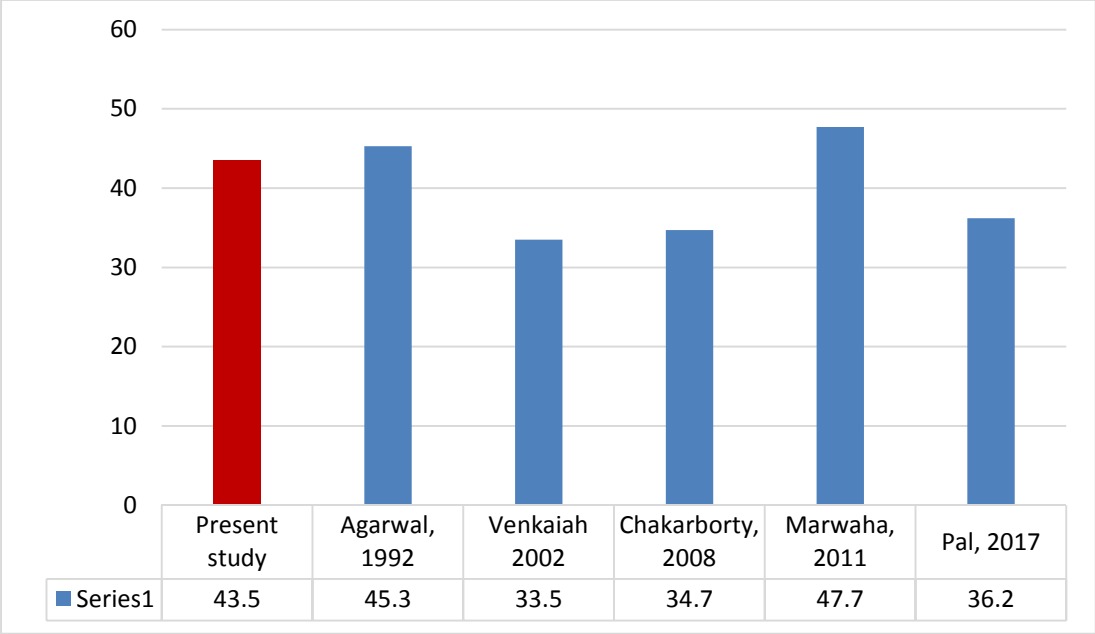

Fig.5.7 :Comparison of weight of the Himachali boys with other Indian populations

1. Agarwaletal., 1992. Affluent school children from urban population of north India.
2. Venkaiahetal., 2002. Rural adolescents from nine Indian states.

3. Chakraborty&Bharti, 2008. Shabar tribal children from Orissa.
4. Marwahaetal., 2011. Urban school children from different Indian cities of upper socio-economic strata.
5. Pal etal., 2017. Rural children from West Bengal of lower socioeconomic strata.

The mean weight of Himachali boys (10-17 years) was 43.5 kg. This was higher by 10 kg as compared torural adolescents from nine different Indian states[1]by 8.8 kg from tribal adolescent boys from Orissa[2] and 7.3 kg from rural adolescent boys from West Bengal[3].However, the weight ofHimachali boys werefound to be less by 4.4 kgand 1.8 kg as compared to the Indian school boys belonging to the upper socio-economic strata[6], and urban school children from north India[4]. (Fig. 5.7).

5.1.2.2 COMPARISON OF WEIGHT OF EARLY ADOLESCENT HIMACHALI BOYS WITH OTHER STUDIES

The mean weight of early adolescent (10-14years) Himachali boys was 37.1 kg. Only one study conducted on the urban school children from Karad, Maharastra[18] reported a higher weight (Mean=39 kg). However, when compared with six different population of early adolescent Indian boys, the Himachali boys appear to be heavier with mean differences ranging between 2.8 kg to 9 kg[8-11,15-16]. This comparison is summarised in Figure 5.8.

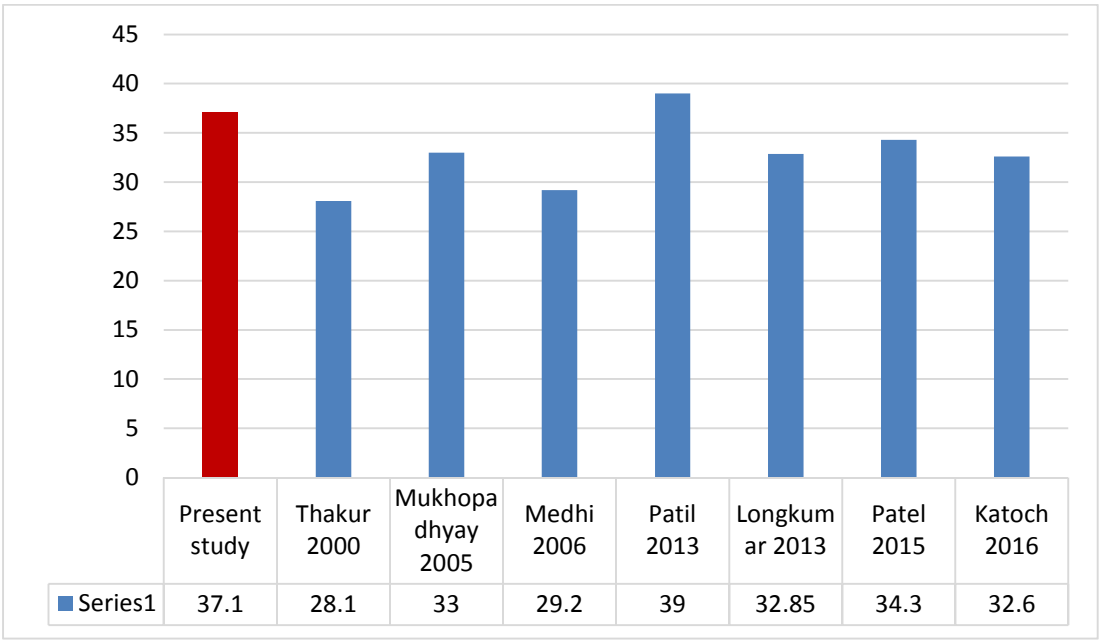

Fig.5.8 :Comparison of weight of the early adolescent Himachali boys with other Indian populations

1. Thakur et al., 2000. Lower middle to lower class Urban adolescents from South Gujrat.
2. Mukhopadhyayetal., 2005. Urban school children from North 24 Parganas, West Bengal.
3. Medhietal., 2006. Children of tea garden workers, from lower socioeconomic class of Assam.
4. Patil et al., 2013. Urban-well to-do class school children from Karad, Maharastra.
5. Longkumar, 2013. Urban Naga school children from Nagaland.
6. Patel etal., 2015. Urban school children from Ahmedabad, Gujrat.
7. Katoch and Sharma, 2016. Rural school children from Doda district, Jammu and Kashmir.

5.1.2.3 COMPARISON OF MEAN WEIGHT OF LATE ADOLESCENT HIMACHALI BOYS WITH OTHER STUDIES

A mean weight of 54 kg was obtained for late adolescent (15-17 years) Himachali boys. This was higher than the mean weights of reported for rural adolescents Indian boys[1](Mean difference= 11.7 kg),tribal adolescents from Orissa[2]((Mean difference=9.9 kg), rural adolescent boys from West Bengal[3](Mean difference=9.3 kg).However, this reported weight was lower by4.5 kg and 2.9 kgwhen compared tothe Indian school children[6]and urban affluent Indian school children[4]. This comparison is presented in Figure 5.9.

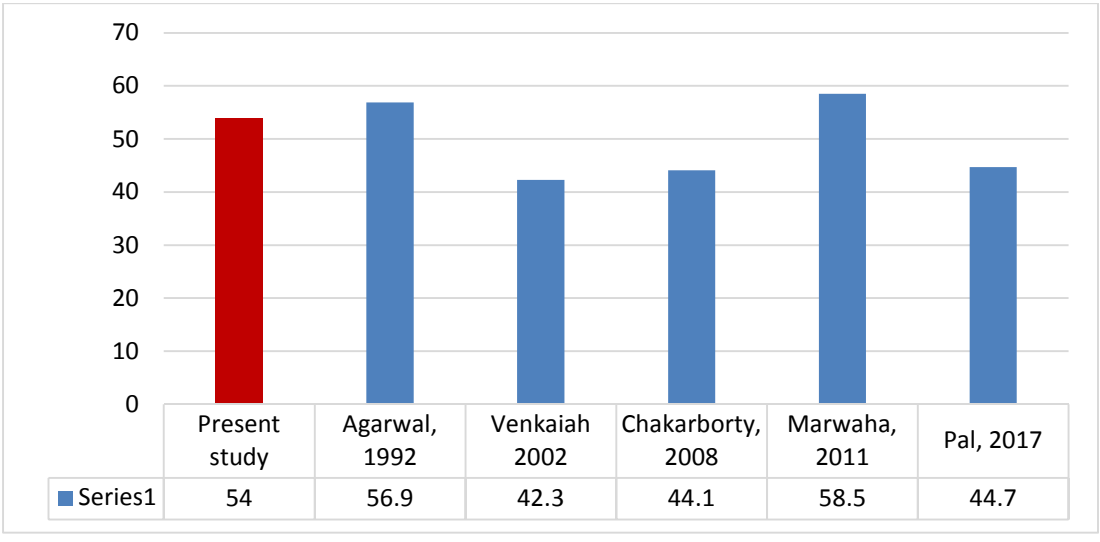

Fig.5.9 :Comparison of weight of the late adolescent Himachali boys with other Indian populations

1. Agarwaletal., 1992. Affluent school children from urban population of north India.
2. Venkaiahetal., 2002. Rural adolescents from nine Indian states.
3. Chakraborty&Bharti, 2008. Shabar tribal children from Orissa.
4. Marwahaetal., 2011. Urban school children from different Indian cities of upper socio-economic strata.
5. Pal etal., 2017. Rural children from West Bengal of lower socioeconomic strata.

5.1.2.4 COMPARISON OF WEIGHT OF HIMACHALI GIRLS WITH OTHER INDIAN POPULATION

The mean weight of Himachali girls (40. 1 kg) was similar to the mean weight of Rajput females from Shimla district of Himachal Pradesh[12]. Himachali girls were found to be heavier by 6.4 kg as compared to rural adolescent girls of different Indian states[1]by 6 kg and 5.9 kg as compared to tribal adolescent girls of Orissa[2] and rural adolescent girls of West Bengal[3] respectively.

However, the mean weight was less by 5.5 kg and 1.3 kg as compared to the Indian school boys belonging to the upper socio-economic strata[6] and urban school children from north India[4]. (Fig.5.10).

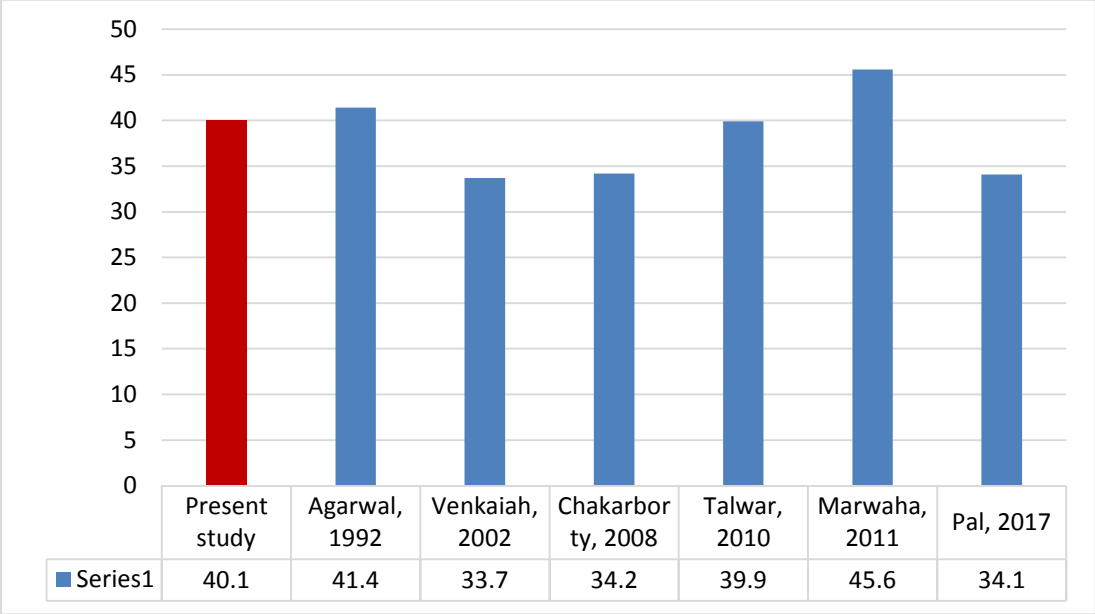

Fig.5.10 :Comparison of weight of the Himachali girls with other Indian studies

1. Agarwaletal., 1992. Affluent school children from urban population of 19 cities of north, south, east and west of India.

2. Venkaiahetal., 2002. Rural adolescents from nine Indian states.
3. Chakraborty&Bharti, 2008. Shabar tribal children from Orissa.
4. Talwar, 2010. Adolescent Rajput females from Shimla district of Himachal Pradesh.
5. Marwaha et al., 2011. Urban school children from different Indian cities of upper socio-economic strata.
6. Pal etal., 2017. Rural children from West Bengal of lower socioeconomic strata.

5.1.2.5 COMPARISON OF WEIGHT OF EARLY ADOLESCENT HIMACHALI GIRLS WITH OTHER STUDIES

The mean weight of early adolescent (10-14years) Himachaligirls was 36.8 kg. This was higher than the mean weight reported for seven different Indian populationof early adolescent girls. The mean differences between the weight of Himachali girls with these population varied between 1.3 kg to 7.6 kg[8-10,13,15-17], as presented in figure **5.1.2.5.**However, the mean weight of Himachali girls was found to be less by 4.3 kg as compared to urban school girls from Maharastra[18]. (Fig 5.11)

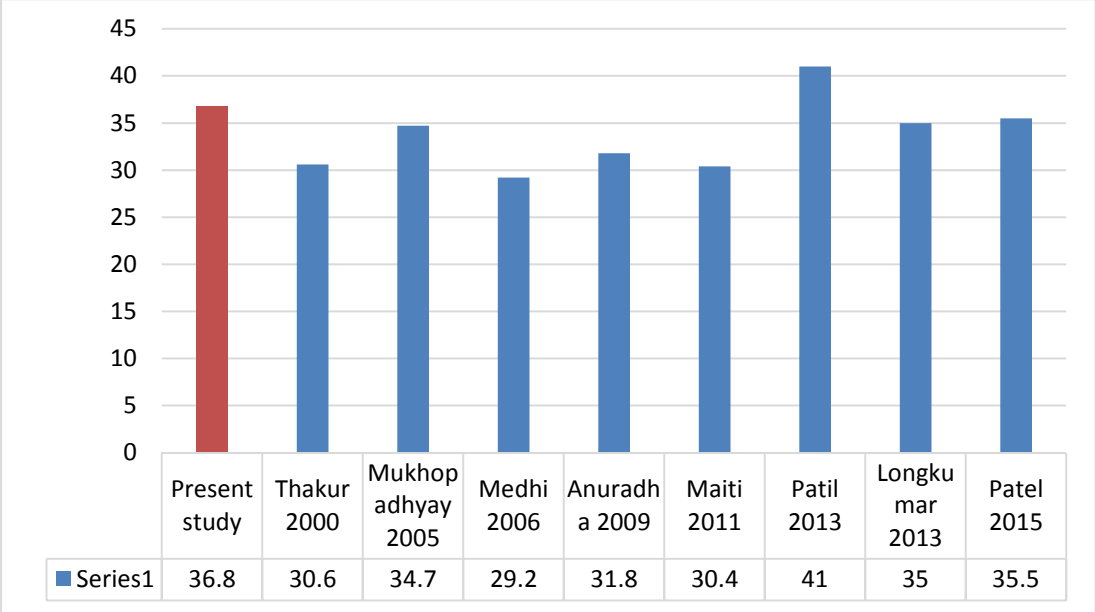

Fig.5.11 :Comparison of weight of the early adolescent Himachali girls with other Indian studies

1. Thakur et al., 2000. Lower middle to lower class Urban adolescents from South Gujrat.

2. Mukhopadhyayetal., 2005. Urban school children from North 24 Parganas, West Bengal.
3. Medhietal., 2006. Children of tea garden workers, from lower socioeconomic class of Assam.
4. AnuradhaGoyle, 2009. Girls of government school from Jaipur city.
5. Maiti et al., 2011. Adolescent girls from PaschimMedinipur district of West Bengal.
6. Patil et al., 2013. Urban-well to-do class school children from Karad, Maharastra.
7. Longkumar, 2013. Urban Naga school children from Nagaland.
8. Patel et al., 2015. Urban school children from Ahmedabad, Gujrat.

5.1.2.6 COMPARISON OF WEIGHT OF LATE ADOLESCENT HIMACHALI GIRLS WITH OTHER STUDIES

The mean weight of late adolescent (15-17 years) girls was 45.5 kg. like the early adolescent group, this was higher as compared to mean weight reported for most of the Indian population of late adolescent girls. With the mean differences ofweight varied between 0.6 kg to 6.3 kg.[1-3,12,14].However, theweight was lower by 7 kgand 4.8 kg as compared to the Indian school children[6]and affluent class adolescents from different Indian states[4].(Fig5.12)

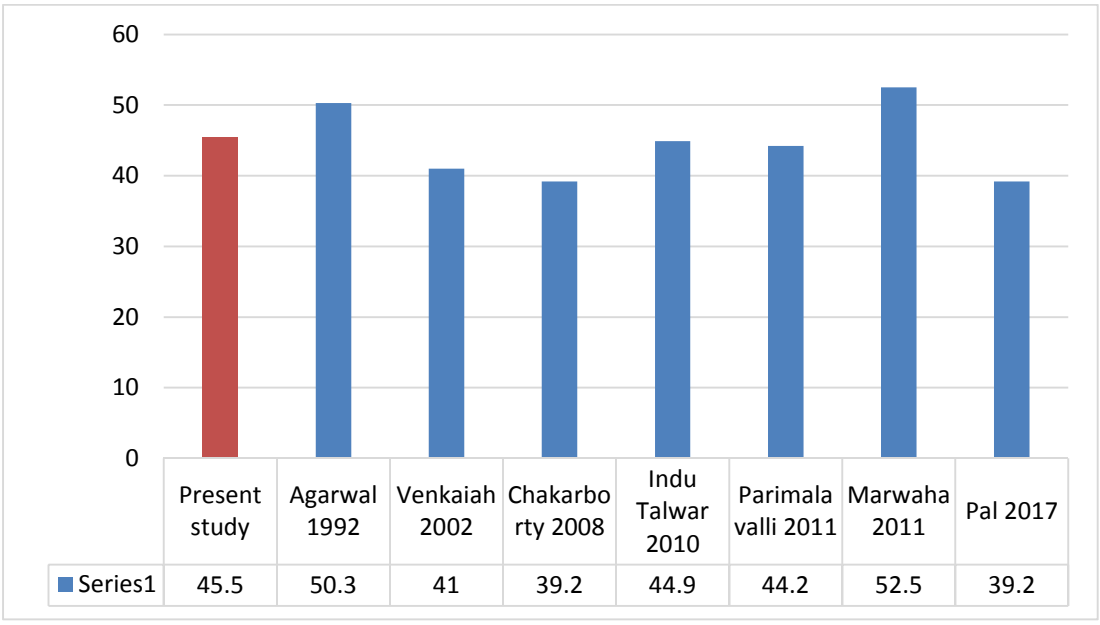

Fig. 5.12 :Comparison of weight of the late adolescent Himachali girls with other Indian studies

1. Agarwal et al.,1992. Affluent school children from urban population of north India.
2. Venkaiahetal., 2002. Rural adolescents from nine Indian states.
3. Chakraborty&Bharti, 2008. Shabar tribal children from Orissa.
4. InduTalwr. 2010. Adolescent Rajput females from Shimla district of Himachal Pradesh.
5. Parimalavalli, 2011. School-going adolescent girls from Tamilnadu.
6. Marwahaetal., 2011. Urban school children from different Indian cities of upper socio-economic strata.
7. Pal etal., 2017. Rural children from West Bengal of lower socioeconomic strata.

5.2 COMPARATIVE DISCUSSION ON MALNUTRITION

The subjects considered in the present study represents a mixed urban and rural population from the non-hilly regions (average altitude 950 meters) of Mandi District of Himachal Pradesh. The states geographical conditions are unique as compared to other states of India because Himachal Pradesh is a hilly state of northern India. As it is a well-known fact that there is a wide range of variation in socio-cultural parameters among the hilly and non-hilly states[13]. It is likely that the lifestyle factors will influence the dietary pattern and food habits which along with the economic factors affect the nutritional status[14-15].

Therefore, for a rational and meaningful description of the prevalence of different categories of malnutrition attempt has been made to compare the prevalence rate of the present study with those reported from different zones of India (East, West, North, South and North-east) and also with the urban and rural population of comparable age group.

5.2.1 PREVALENCE OF STUNTING AMONG HIMACHALI BOYS

In the present, study the rate of stunting among boys was 7.5%. This rate is much lower as reported in different Indian studies covering both urban and rural population from different zones of India. The rate of stunting reported in these studies ranges between 12 to 55%[3,7-8,11,19-23,25-27] as presented in Figure 5.13. However, a study conducted on the rural adolescent boys (11-15 years) from Kullu district of Himachal Pradesh reported a slightly lower rate of stunting (6.9%)[24].

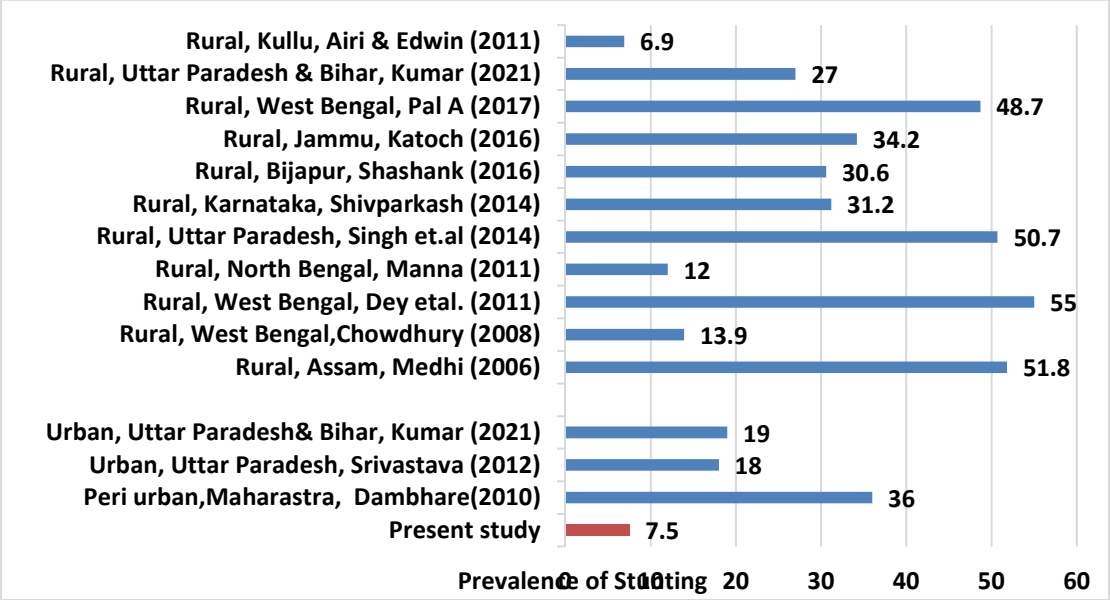

Fig.5.13 :Prevalence of Stunting of Himachali boys as compared to other Indian studies

5.2.2 PREVALENCE OF STUNTING AMONG HIMACHALI GIRLS

The rate of stunting among girls obtained in this studywas 9%. Several Indian studies have reported higher prevalence of stunting among girls with the rate of stunting varied between 12 to 58%[3,11,21-23,25-27,30]. In four studies the rate of stunting among girls were found to be lower as compared to stunting rate of Himachali girls that varied between 2 to 7.6%[7,13,28-29]. This comparison is presented in Figure 5.14.

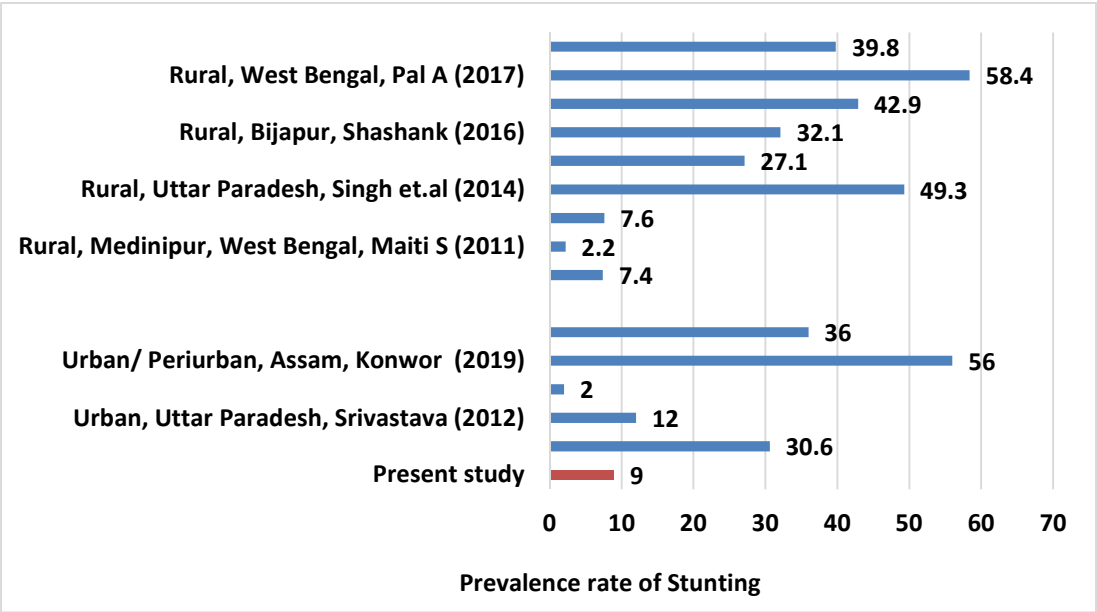

Fig.5.14 :Prevalence of Stunting of Himachali girls as compared to other Indian studies

5.2.3 PREVALENCE OF THINNESS AMONG HIMACHALI BOYS

The rate ofthinness among Himachaliboys was 19.4%, which was lower than the rates reported in most of the Indian studies (prevalence of thinness varied between 20.4% to 54.4%[2,3,8,10,16,20-21,23-25]). Only one study conducted among the rural boys of Jammu[11] reported a lower rate of thinness (2.5%), as compared to the Himachali boys. This comparison is presented in Figure 5.15

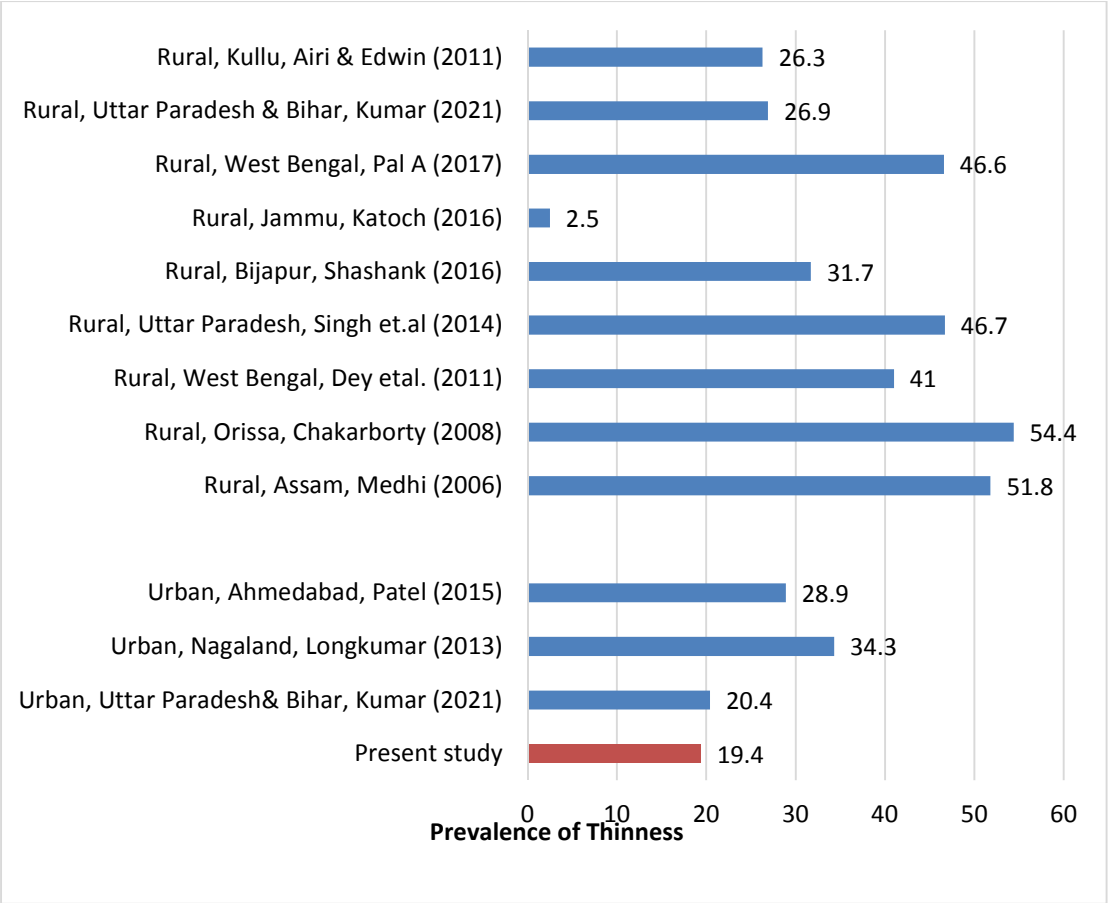

Fig.5.15 :Prevalence of thinness of Himachali boys as compared to other Indian studies

5.2.4 :PREVALENCE OF THINNESS AMONG HIMACHALI GIRLS

Prevalence of thinness in Himachali girls was 17.6%. Almost similar prevalence of 19% was reported among the rural adolescent girls (11-15 years) of Kullu district of Himachal Pradesh[24]and West Bengal[20]. And somewhat lower prevalence rate was obtained for the rural (13.2%), and urban (12.5%) girls Uttar Pradesh and Bihar[25].

Reported prevalence of thinness from other rural and urban population of Indian adolescent girls were much higher than the present findings and varied between 19% to 57%[3,14,20-21,23,28,30-33]. (Fig 5.16).

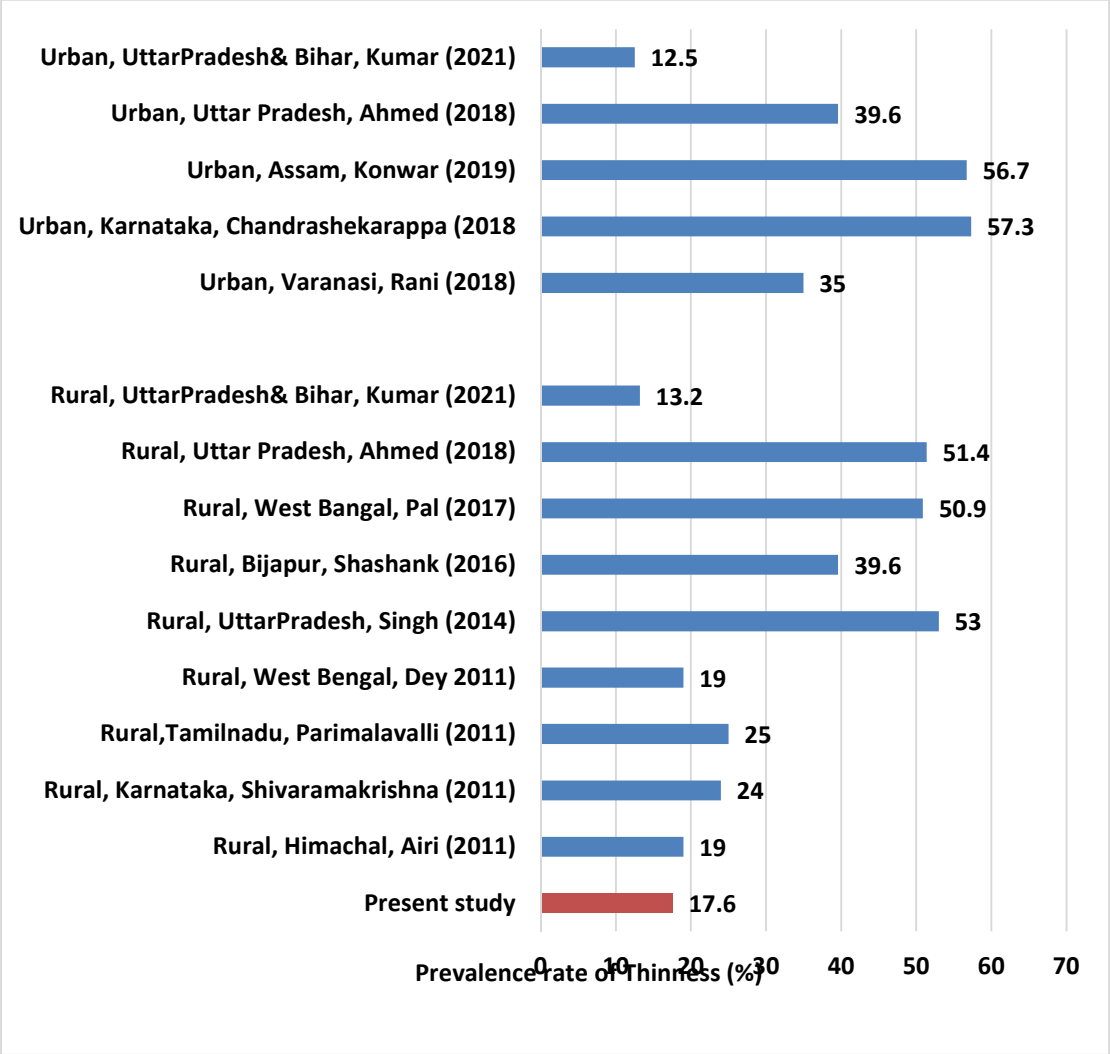

Fig.5.16 :Prevalence of thinness of Himachali girls as compared to other Indian studies

5.2.5 PREVALENCE OF OVER NUTRITION AMONG HIMACHALI BOYS

The prevalence rate of overweight among Himachaliboys was6.1%, this was higher than the rates reported from rural Himachal boys (1.5%)[24], and rural boys of West Bengal (4%)[20], urban boys of Nagaland (2.1%)[16] and urban boys of Gujrat (0.8%)[10], but lower as compared to rates reported for rural boys of West Bengal(6.8%)[3]and 14.9% [34].

The rate of obesity among Himachali boys was 1.5%, which was lower as compared to rural boys of West Bengal (3.8%)[34]. (Fig 5.17)

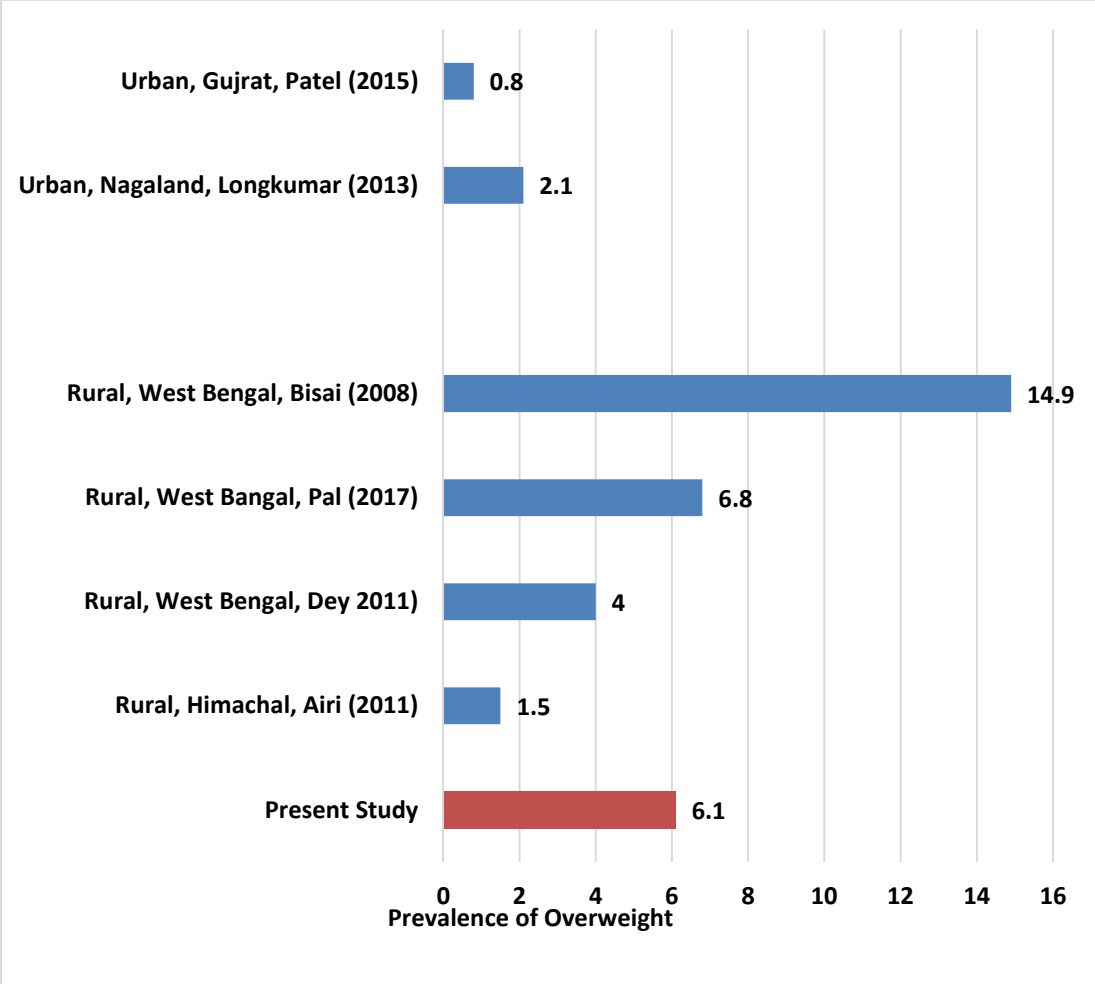

Fig.5.17 :Prevalence of overweight of Himachali boys as compared to other Indian studies

5.2.6 PREVALENCE OF OVER NUTRITION AMONG HIMACHALI GIRLS

The prevalence rate of overweight in Himachali girls was 3.3%. This was higher as compared to most of the studies reported from different Indian population. Higher prevalence rates of overweight were obtained for rural (3.8%) and urban (9.3%) girls of Uttar Pradesh[31]. While all other studies[3,10,16,20,24,32]reported lower prevalence rate of overweight girls as compared to present study findings.(Fig 5.18)

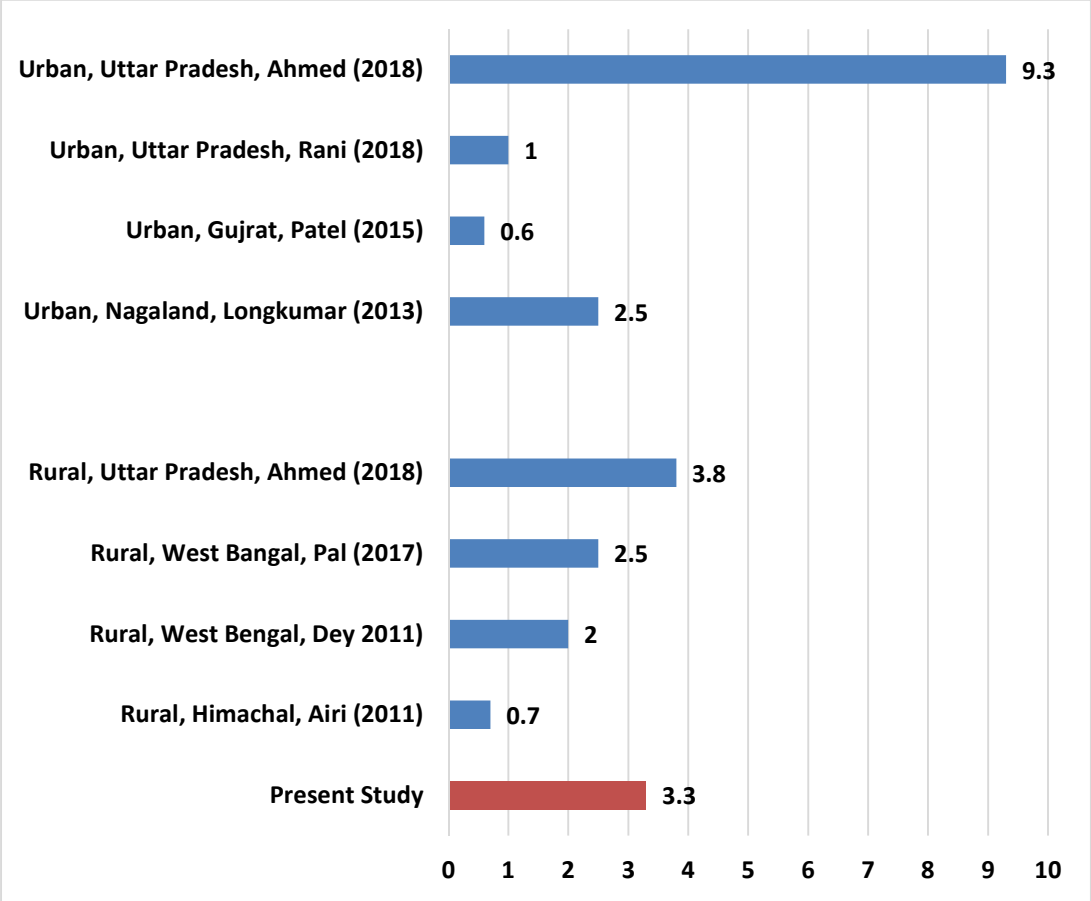

Fig.5.18 :Prevalence of overweight of Himachali girls as compared to other Indian studies

5.2.7 DISCUSSION OF GROWTH VELOCITY

Studies related to physical growth of Indian children found that the growth spurts in girls occur between 8-14 years and that in boys occur between 9-15 years. During this period the height gain can be 24 cm - 26 cm in girls and 27 cm - 29 cm in boys[35].Similar findings were obtained in this present study particularly for the boys where height gain for boys from 10 -15 years was found to be 30.4 cm with the corresponding weight gain of 23.6 kg.

The maximum height gain for Himachaliboys (9.8 cm) was observed between 12 to 13 years. This corroborates with some other studies conducted among a large group of north Indian school children[36] and urban Naga school children[16]which also reported a maximum height gain for boys between 12 to 13 years.

A number of studies reported that adolescents' physical growth metrics accelerate more quickly during puberty[1-6,37-40]. Studies on physical growth status of children reported that age-specific greater growth spurts in anthropometric variables such as

height and weight were seen among adolescent boys as they approached to puberty (13 years)[39-40]. The results in the present study were consistent with these earlier findings.

Among Himachali boys, a larger acceleration in height (24.1 cm) and weight (18 kg) was observed between 10 to 14 years, as compared to later ages (15-17) where this increase in height and weight was 1.6 cm and 3.7 kg respectively. The highest weight gain (6.5 kg) among boys in present study was observed between 12 to13 years. A similar gain in weight was reported for boys from Assam[8].

For the Himachaligirls, maximum gain in height (6 cm) and weight (5.6 kg) was observed between the age group of 11 to 12 years.Maximum gain in height in this age group was also reported among north Indian urban affluent school children (6 cm)[4],urban Naga school children (8.3 cm)[16], and adolescent Rajput females of Shimla district of Himachal Pradesh (5.7 cm)[12]. The maximum weight gain in this age group was reported for north Indian urban affluent school children (5.1 kg)[4] and girls from government school of Jaipur city (3.6 kg)[17]respectively.

5.3 DISCUSSION ON DIETARY PATTERN

5.3.1 BREAKFAST PATTERN OF HIMACHALI CHILDREN

Regular breakfast is essential for the nutritional well-being of children. It is considered as a healthy dietary habit, which not only increases the overall quality of daily diet but also improves the adequacy of nutritional intake[41-42].

Skipping breakfast is associated with health-compromising behaviours in adults and adolescents[43]. Studies related to breakfast pattern reported that among a population of adolescent girls of Mumbai[44], 35.9% skipped breakfast thrice a week, and 14 % of urban adolescents from Kolkatta[45] reported breakfast skipping habits.

In the present study a regular breakfast pattern was observed by most of the subjects with a somewhat lower percentage of girls (75%) reporting regular breakfast pattern as compared to the boys (87%). A study conducted on dietary habit of the adolescent population of Ghana[46] reported that more boys (87.8%) consumed breakfast compared to the girls (83.1%), whichis similar with the gender trend in breakfast habit observed in this study.

In both the sexes the regularity in in breakfast was more in the early adolescent group as compared to theirlate counterpart. A similar trend ofdecrease in regularity of daily

breakfast with increasing age has also been reported in some earlier studies[47-48].A similar finding indicating more regularity in breakfast pattern in younger children (89.3%) as compared to the older (82.8%) has also been reported among the Jordonian school children[48].Breakfast pattern among adolescent and children have been reported in several other studies from India and abroad. A comparative discussion is presented herewith. The percentages of Himachali adolescents with regular breakfast pattern was higher as compared to Kashmiri population (51%)[49], adolescent of Baroda (58%)[50] and overweight adolescent girls of Haryana (59%)[51], and lower as compared tosouth Indian girls (87%)[52] and girls from Bihar (100%)[53].

5.3.2 COMPARATIVE DISCUSSION ON FOOD CONSUMPTION PATTERN

The present study has evaluated two different types of dietary patterns,the habitual diet taken with major meal of the day and the snacking pattern of the children. Food items consumed during meals were nutrient dense,and therefore considered as healthy food items.The food items taken in snacks were energy dense and less in nutrients, so they were considered as unhealthy food items.

A study on Indian dietary pattern suggested that Indian diets are based on fruit, vegetable, pulses and cereals, mostly rice with added dairy products and are mostly vegetarian[54].

5.3.3 COMPARATIVE DISCUSSION ON HEALTHY FOOD CONSUMPTION

Healthy food consumption pattern of Himachali children has been discussed under three headings-

a) Consumption of fruit and vegetable,
b) Consumption of milk and dairy products,
c) Consumption of cereals and pulses.

a. Consumption of fruit and vegetable

The percentage of Himachali boys having vegetables daily is much higher as compared to the Pune, Maharashtrian boys[55] but lower as compared to adolescent boys of Assam and Bihar[56].

The fruit consumption of Himachali boys is almost similar as compared the adolescent boys of Pune, Maharastra[55], but much higher as compared to adolescent boys of Assam and Bihar[56]. (Fig 5.19).

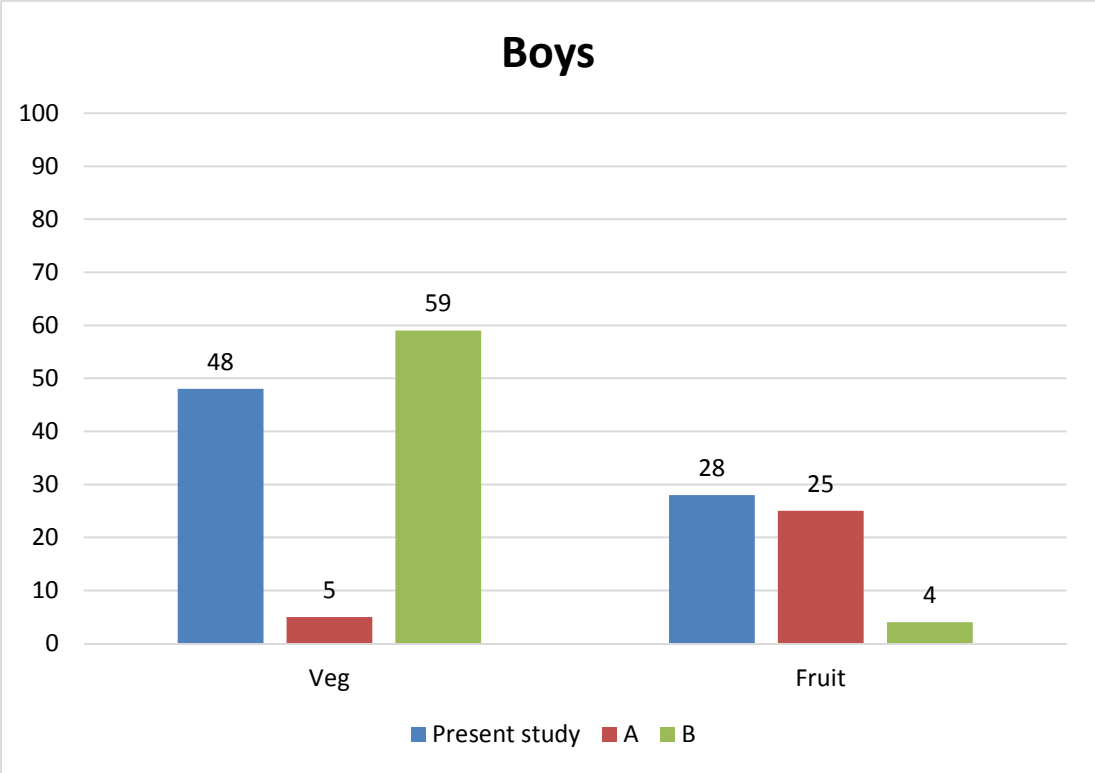

Fig. 5.19 :Percentages of Himachali boys having daily fruit and vegetables consumption as compared to the other studies

A-Adolescent boys (7-11 years) of Pune Maharashtra, India ((Reema Mukherjee,2017)[55].

I- Adolescent boys (10-19 years) of Assam and Bihar (Shantanu Sharma et al,2021)[56].

The percentage of Himachali girls consuming vegetable daily was higher as compared to the adolescent girls from Pune[55] and Varanasi[57-58],but lower as compared to adolescent girls of Bihar[53,56], Agra[59] and Kerala[60].

The percentage of Himachali girls who reported daily fruit consumption was almost similar to the adolescent girls of Pune, Maharstra[55] and Bihar[53], higher as compared to the girls of Varanasi[57], and girls from Assam and Bihar[56] and lower as compared to the girls from Varanasi[58], Agra[59], and Kerala[60]. (Fig 5.20)

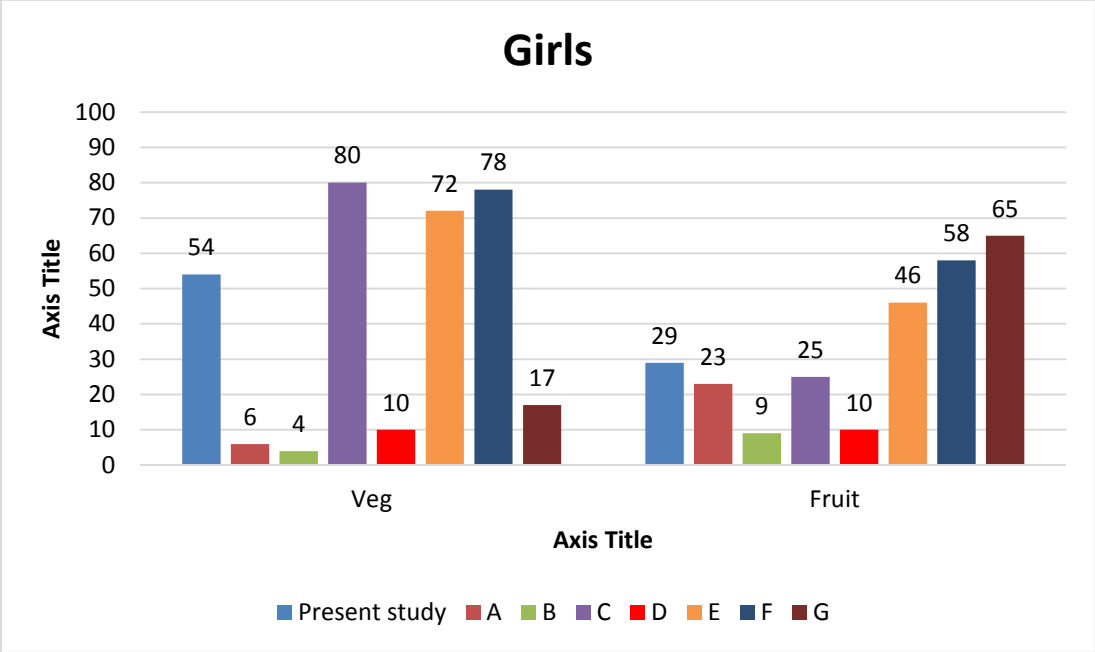

Fig. 5.20 :Percentages of Himachali girls having daily fruit and vegetables consumption as compared to the other studies

1. Adolescent boys and girls (7-11 years) of Pune Maharashtra, India ((Reema Mukherjee,2017)[55]
2. Adolescent boys and girls (10-19 years) of Assam and Bihar (Shantanu Sharma et al.,2021)[56].
3. Adolescent girls (13-18 years) of Motihari town Bihar, India(Twara T et al.,2015)[53]
4. Urban adolescent girls of Varanasi, India (Krishna J et al.,2012)[57]
5. Adolescent Girls (10-19 years) Urban slum Agra (Sarvesh Kumar, Neha Mishra,2019)[59].
6. Adolescent and adult girls (10-28 years) of Mysore urban area (Omidvar S and Begum K, 2014)[60].
7. Teenage adolescent girls (13-19 years) from urban slums of Varanasi (Jitender Kumar et al.,2021)[58].

CONSUMPTION OF MILK AND DAIRY PRODUCTS

The percentage of the Himachali boys (25%) consuming milk and dairy products daily, was lower as compared to boys from Pune, Maharastra (71%)[55]and Assam and Bihar (32%)[56].

The percentage of the Himachali girls (47%) with daily milk and dairy products consumption was lower as compared to adolescents' girls from Pune (70%)[55], and

higher as compared to adolescent girls from Assam and Bihar (29%)[56], and Agra (42%)[59].

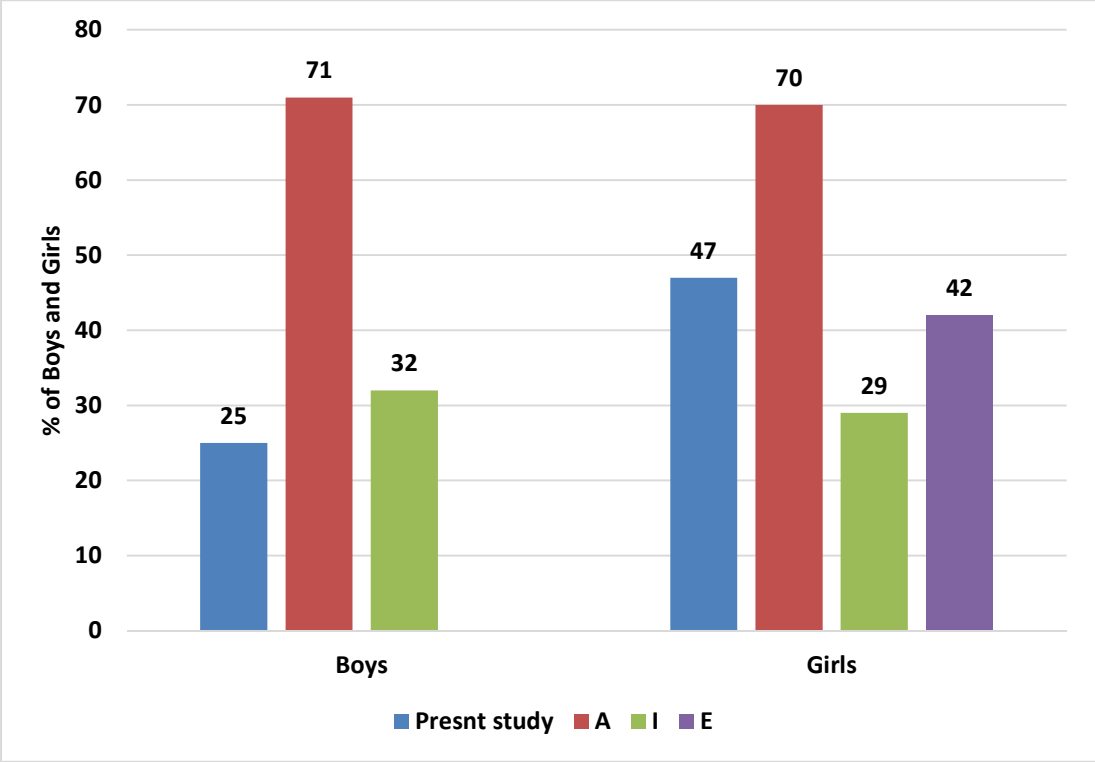

Fig. 5.21 :Consumption Frequency of milk and dairy by Himachali boys and girls as compared to the other studies

1. Adolescent boys and girls (7-11 years) of Pune Maharashtra, India ((Reema Mukherjee,2017)[55]
2. Adolescent Girls (10-19 years) Urban slum Agra (Sarvesh Kumar, Neha Mishra,2019)[59].
3. Adolescent boys and girls (10-19 years) of Assam and Bihar (Shantanu Sharma et al,2021)[56].

CONSUMPTION OF PULSE AND CEREALS

The combined percentage of Himachali boys and girls (86%) having daily consumption of pulses was found to be highest as compared to the five different Indian studies[50,52,56,58,61]as presented in Figure 5.22.

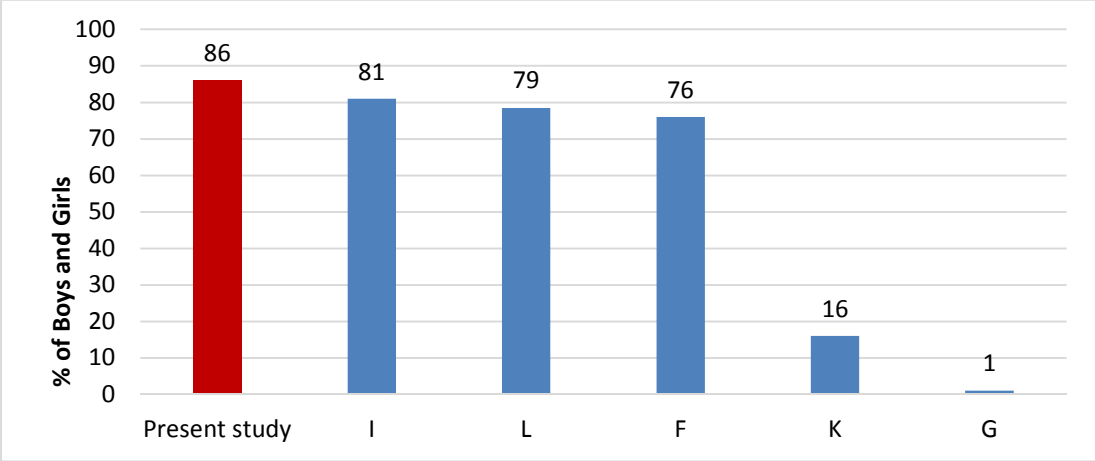

Fig. 5.22 :Consumption Frequency of Pulses by Himachali children (both boys and girls) as compared to the other studies

1. School-going adolescents (10-19 years) of urban Baroda, India (Kotecha et al.,2013)[50].
2. School children (10-12 years) of rural community Kerala (Blossom KL, 2018)[52].
3. Adolescent boys and girls (10-19 years) of Assam and Bihar (Shantanu Sharma et al,2021)[56]
4. School children (7-9 years) in Lucknow (Saxena and Mishra,2014)[61].
5. Teenage adolescent girls (13-19 years) from urban slums of Varanasi (JitenderKumar et al.,2021)[58].

5.3.4 COMPARATIVE DISCUSSION ON UNHEALTHY FOOD CONSUMPTION

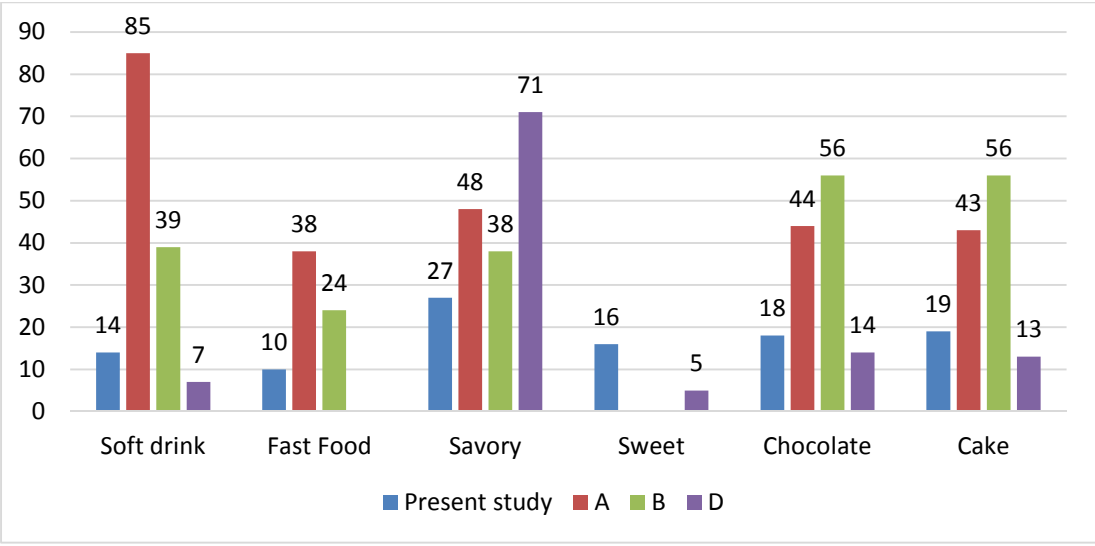

Fig. 5.23 :Overall percentage of Himachali children with high consumption of unhealthy food as compared to the other studies

1. Urban Indian adolescents (14-16 years) of Kolkatta, India(Rathi et al.,2017)[45].
2. School-going adolescents (10-19 years) of urban Baroda, India (Kotecha et al.,2013)[50].
3. School-aged children (12-18 years) in Rural Himachal Pradesh, India (Gupta et al.,2018)[62].

The percentages of Himachali boys and girls having daily consumption of different snacking items have been compared with three different populations, urban adolescents of Kolkata[45], Baroda[50] and rural adolescents from Kullu district of Himachali Pradesh[62] (Figure 5.23). as compared to the reports available from other states namely West Bengal and Gujrat the present Himachali children has lower consumption of all the snack items. However, when compared with the study of Kullu district of Himachal Pradesh a little variation is obtained between the present Himachali children and rural boys of Kullu district; 14% vs 7% for soft drink, 16%vs 5% for sweets, 18% vs 14% for chocolates and candy and 19% vs 13% for cake and pastries. Savory snacks consumption was reported by much higher %age of Kullu adolescents (71%)[62].

Snacking as become a part of the adolescent food habit[57]. A cross country study reporting on the daily snacking pattern of within 9-13 years of age group from Australia, China, Mexico and the US reported that in different countries two to three smacking occasions per day was most common[63].

An Egyptian study has reported that around 70% of the boys and girls are having regular fast food consumption[64].

In a study carried out in Baroda City of India's school children in the age group of 10 to 19 years reported that 30 % of the children consumed fast food and snacks in the preceding 24 hours[50]. An Indian study conducted on adolescence school children of Maharashtra Pune reported that snacks and fast food was preferred by around 80% of the children[55].

In the present study we found that 8 to 19% of the boys and 9 to 40% of the girls had high consumption or frequent consumption of different type of food junk food which is comparatively lower than the earlier studies reported from different parts of India. Present study also showed that percentage of girls having frequent consumption of snacking items was higher as compared to the boys. In a study conducted among the

adolescent boys and girls of Kullu district of Himachal Pradesh the different percentage of boys and girls consuming different fast food and junk food items vary from 4 - 40% in boys and 42-68% in girls which also indicates that girls are more addicted to the junk food which is persistent with the present findings[62]. Other studieshave reported frequent consumption of junk food (daily or thrice a week) by 33% of the girls of the Kurukshetra district of Haryana[51]and 50%[60] of the girls from Kerala. These percentages were comparable with the percentages of Himachali girls having daily consumption of snacking items.

5.3.5 DISCUSSION ON VEG AND NON-VEG PATTERN

The meal pattern of the Himachali adolescents has been assessed in terms of vegetarian and non-vegetarian diet, and attempt has been made to compare this pattern with other Indian studies. The meal pattern of the Himachali boys and girls showed somewhat higher percentages of vegetarian diet (50.3 % boys and 65.7 % girls) as compared to the non-vegetarian diets, with more girls reporting vegetarian meals as compared to the boys.

The present report is inconsistent with one of the other findings from Himachal Pradesh; i.e the report available on the adolescents of the Kullu district[65]reported a veg meal pattern among 20 % of the subjects, which is lower than the present findings. However,one another study reported a 39 % and 63% of veg pattern for adolescent boys and girls respectively from Kangra district[66] of Himachal Pradesh, which is similar for veg- meal pattern of girls reported in present study.

When compared with different states of India, it has been found that vegetarian meal pattern was higher among Himachali adolescents.A higher prevalence of non-vegetarian meal pattern (100%, 77%) was reported among south Indian adolescent populations (Blossom[52] andOmdivar[60]), and among adolescent populations of Pune (93 %) from western part of India[55]. Kashmiri adolescents also reported a much higher percentage (61%) of non-vegetarian meal pattern[49]. Higher percentages of non-vegetarian pattern (76%) were also observed among the adolescent girls of Agra[59].

Lower percentages of non-vegetarian pattern comparable with the present study was reported by the adolescent girls (35%) of Baroda[50]and adolescent girls (59%) of Haryana[51].

5.4 DISCUSSION ON ASSOCIATION OF DIETARY PATTERN WITH MALNUTRITION

Nutritional studies focus on two major areas of diet in the etiology of malnutrition; firstly, the total amount of daily intake of different nutrients which can be obtained through diet survey and secondly, from the consumption pattern of different dietary sources. The second approach was undertaken in this study. The study has obtained self-reported intake pattern on categorized dietary sources (food groups) consumed over a period of two weeks prior to the study.

The dietary pattern of the Himachali children has provided information on the nutritional etiology of different categories of malnutrition. The study found a combined effect of healthy and unhealthy food consumption on different categories of malnutrition.Furthermore, agender difference in dietary pattern for both healthy and unhealthy diet patters was also noticed. This has influenced the nutritional status of the boys and girls differently.These findings were consistent with some earlier studies[67-69].

Studies focussing on daily intake of nutrients had different finding on their role in stunting. While some studies have identified lower daily intake of proteins and calcium as a factor responsible for stunting[70-71],other studies fail to establishsuch relation [72]. However, the later study found significant relation between consumption pattern of food groups (dietary sources) with stunting, particularly the intake pattern of fruit, cooked vegetables and dairy products.

In the present study girls with lower fruit consumption were reported to be more stunted which corroborates this earlier report. However, this is not obtained among the boys. Again, the present Himachali boys who were stunted had significantly lower intake of dairy products and the Himachali girls who were stunted had lower intake of cooked vegetables. This also corroborates with the previous study.

It has been postulated that dairy products and vegetables contains necessary nutrients like calcium that is necessary for promoting height. The present study also found that vegetarian diet pattern was more among the girls and more girls were found to stunted as compared to boys. This point towards the importance of the proteinaceous diet (more in animal protein) in the prevention of stunting which was also reported in previous studies[72-73].

Multiple studies have reported a positive association between the unhealthy dietary pattern and risk of different categories of malnutrition including stunting, overweight and obesity, and an inverse association between healthy dietary pattern with malnutrition. These studies have confirmed the low nutrient content for different fast-food items in terms of different vitamins and mineral content and high sugar content[74] and higher consumption of such items resulted in lower intake of macro and micronutrients. In this study, higher consumption of unhealthy food particularly savory snacks, fast food and soft drinks were associated with higher prevalence of stunting among the boys. This is in agreement with some earlier reports[75-78].

It was also reported that individuals with malnutrition show trends of higher consumption of fast-foods and lower consumption of fruit, vegetables and milk[79-80]. The results of present study are consistent with these findings.

Thinness was prevalent among boys and girls who had lower consumption of fruits, dairy products, cooked vegetables and higher consumption of savory snacks, fast food and soft drinks.Similarly, girls with lower fruit and high fast-food consumption and boys with higher consumption of savory snacks, fast food, sweet and soft drinks have significantly higher proportion of overnutrition.

From the comparative discussion of height and weight and prevalence rates of different categories of malnutrition presented in the earlier section (5.1 and 5.2) it appeared that the nutritional status of Himachali adolescent boys and girls was better than majority of the similar Indian population from different zones of India covering both urban and rural population. Only few urban populations reported similar or slightly better nutritional status as compared to the present Himachali population.

The Himachali adolescent children assessed in this study were selected mainly from the non-hilly regions of Mandi district of Himachal Pradesh that includes mostly urban and peri-urban areas. These subjects mostly represent upper middle and higher socioeconomic class.

Reports are available that opined socioeconomic status had a significant impact on physical health and nutrition[81-82], and boys and girls from higher socioeconomic group were taller, heavier and even fatter than their peers from average and low socioeconomic group[81]. The results were obtained in the present study corroborates

with these findings as boys and girls selected in this study belongs to higher socioeconomic strata as mentioned earlier.

As with urbanization and changes in socio-economic structure of the society we are moving through a stage of nutritional transition[83], snacking habit has become a part of the adolescent food habit30 (Agarwal, 2008)[84]. Reema Mukherjee)[55].

In the present study we found that 10 to 27% of the boys had frequent snacking habits which is much lower whencompared with the snacking pattern of different adolescent population of India as discussed in the previous sections.

Himachal Pradesh is a state in Northern India and as per the 2011 Census it is the least urbanized state in the country. It is one of the few states that has remained untouched by other customs external to the state majorly due to geographical location. This has contributed a lot in preserving the traditional dietary pattern of the state.

A typical daily meal pattern of almost every household of Himachal Pradesh is a vegetarian diet comprising of dal-chawal-subzi-roti' which includes intake of mostly seasonal vegetables.The most striking feature in Himachalidiet, is that a specific kind of pulse is not repeated on a daily basis, instead, the weekly menu consists of different varieties of pulses. A combination of pulses in diet has been proved to be beneficial to meet up the demand for most of the amino acids and provide a balanced intake of carbohydrates proteins and fat[85]. Studies have also reported that as compared to other Indian states the average intake of proteins is highest and average fats intake is also much higher in Himachal Pradesh[86].

Various factors emanating from socio cultural perspective influence children and adolescent behaviour that remain with them throughout their lives[86]. The food behaviour is also not an exception. Factors which strongly influence children food habit include family structure, family food preferences, parental support in developing children food habit. It was also found that consumption of home-cooked meals is a frequent practice among the Himachali children as compared to dining out[87]. Home cooked meals have many proven benefits, such as reduction of excess energy, sugar, and fat intakes and increased vegetable and fruit ingestion[88]

Therefore, it can be opined that the traditional food habits prevalent in Himachali households have definitely influenced the food habits of the children in a positive way which is reflected in a higher consumption of different healthy food items by majority

of the boys and girls. This definitely indicated towards a balanced diet. Additionally, the present study has also revealed that almost 80% or more boys and girls has a lower consumption of different unhealthy food items. This has contributedfor better nutritional status of adolescent Himachalichildren as compared to other states of India.

REFERENCES

1. Venkaiah K., Damayanti K., Nayak M.U. and Vijayaraghavan K. (2002). Diet and nutritional status of rural adolescents in India. *European Journal of Clinical Nutrition,* **56**(11), 1119- 25. doi: 10.1038/sj.ejcn.1601457. PMID: 12428178.
2. Chakrabarty S. and Bharati, P. (2008). Physical growth and nutritional status of the Shabar tribal adolescents of Orissa, India: a cross-sectional study. *Malaysian Journal of Nutrition*, **14**(1), 101-12. Epub 2008 Mar 15. PMID: 22691768.
3. Pal A., Pari A., K., Sinha A., and Dhara P. C. (2017). Prevalence of undernutrition and associated factors: A cross-sectional study among rural adolescents in West Bengal, India. *International Journal of Pediatrics and Adolescent Medicine*, **4**, 9-18.
4. Agarwal D.K., Agarwal K.N., Upadhyay S.K., Mittal R., Prakash R. and Rai S. (1992). Physical and sexual growth pattern of affluent Indian children from 5 to 18 years of age. *Indian Pediatrics,* **29**(10), 1203-82.
5. Anand K., Kant S. and Kapoor S.K. (1999). Nutritional status of adolescent school children in rural north India. *Indian Pediatrics*, **36**, 810- 15.
6. Marwaha R. K., Tandon N., Ganie M. A., Kanwar R., Shivaprasad C., Sabharwal A. and et al. (2011). Nationwide reference data for height, weight and body mass index of Indian schoolchildren. *The National Medical Journal of India*, **24**(5), 269-77.
7. Manna P. K., De D., Bera T. K., Chatterjee K. and Ghosh D. (2011). Anthropometric Assessment of Physical Growth and Nutritional Status among School Children of North Bengal. *Anthropologist*, **13**(4), 299-305.
8. Medhi G. K., Barua A. and Mahaanta J. (2006). Growth and nutritional status of school age Children (6-14 yrs) of Tea Garden Workers of Assam. *Journal of Human Ecology*, **19**(2), 83-5.
9. Mukhopadhyay A., Bhadra M. and Bose K. (2005). Anthropometric assessment of nutritional status of adolescents of Kolkata, West Bengal. *Journal of Human Ecology*,**18**, 213-16.
10. Patel N., Gunjana G., Patel S., Thanvi R., Sathvara P. and Joshi R. (2015). Nutrition and health status of school children in urban area of Ahmedabad,

India: comparison with Indian Council of Medical Research and body mass index standards. *Journal of Natural Science, Biology and Medicine,* **6**(2), 372-77.

11. Katoch O. R. and Sharma A. (2016). Socioeconomic factors, living conditions and child undernutrition among school going children in rural areas of district Doda, Jammu & Kashmir, India: A preliminary study. *Indian Journal of Nutrition*, **3** (1), 123.
12. Talwar I., Sharma K. and Kapur S. (2010). Growth trend in body, fat, circumferential and physiological traits during adolescence among Rajput females of Theog, Shimla District (Himachal Pradesh), India. *Annals of Human Biology*, **37**(4), 536- 53.
13. Maiti S., Chattterjee K., Ali K.M., Ghosh D. and Paul S. (2011). Assessment of nutritional status of early adolescent school girls in Dantan-II block, Paschim Medinipur district, West Bengal. *National Journal of Community Medicine*, **2**(1), 14-18.
14. Parimalavalli R. and Sangeetha M. (2011). Anthropometric Measurements and Nutrient Intake of Adolescent Girls. *Anthropologist*, **13**(2), 111-15.
15. Thakur H. G., Kumar P., Desai V. K. and Srivastava R. K. (2000). Physical growth standards for urban adolescents (10-15 years) from south Gujrat. *Indian Journal of Community Medicine*, **25** (2), 86- 92.
16. Longkumar T. (2013). Physical growth and nutritional status among Ao Naga children of Nagaland, Northeast India. *Journal of Anthropoloy*, **2013**, 1-6. Article ID 291239. doi.org/10.1155/2013/291239.
17. Goel A. (2009). Nutritional status of girls studying in a government school in Jaipur city as determined by anthropometry. Anthropologist,**11**, 225–7.
18. Patil S. S., Patil S. R., Durgawale P. M., Kakade S.V. and Kumar, A. (2013). Study of physical growth standards of adolescents (10-15 years) from Karad, Maharashtra. *International Journal of Collaborative Research on Internal Medicine & Public Health*, **5**(1), 10-18.
19. Chowdhury S. D., Chakraborty T. and Ghosh T. (2008). Prevalence of undernutrition in Santal children of Puruliya district, West Bengal. *Indian Pediatrics*, **45**, 43-46.

20. Dey I., Biswas R., Ray K., Bhattacherjee S., Chakraborty M. and Pal P.P. (2011). Nutritional status of school going adolescents in a rural block of Darjeeling, West Bengal, India. *The Health*, **2**(3):75-77.

21. Singh J.P., Kariwal P., Gupta S.B., Singh A.K. and Imtiaz D. (2014). Assessment of nutritional status among adolescents: a hospital based cross sectional study. *International Journal of Research in Medical Sciences*, **2**, 620-24. doi: 10.5455/2320-6012.ijrms20140547.

22. Shivaprakash N.C. and Joseph R.B. (2014). Nutritional Status of Rural School-Going Children (6-12 Years) of Mandya District, Karnataka. *International Journal of Scientific Study*, **2**(2), 39-43.

23. Shashank K.J. and Chethan T.K. (2016). Nutritional status of school going children between the age group of 6-12 yrs in rural area of Bijpaur district. *National Journal of Community Medicine*, **7**(5),409-12.

24. Airi P. and Edwin C.J. (2011). Anthropometric assessment of nutritional status of adolescent Naggar boys and girls of Himachal Pradesh. *South Asian Anthropologist*, **11**(1), 67-75.

25. Kumar P., Srivastava S., Chauhan S., Patel R., Marbaniang S.P. and Dhillon P. (2021) Associated factors and socio-economic inequality in the prevalence of thinness and stunting among adolescent boys and girls in Uttar Pradesh and Bihar, India. *PLoS ONE*, **16**(2), e0247526. https:// doi.org/10.1371/journal.pone.0247526

26. Dambhare D.G., Bharambe M.S., Mehendale A.M. and Garg, B.S. (2010). Nutritional status and morbidity among school going adolescents in Wardha, a peri-urban area. *Online Journal of Health and Allied Sciences*, **9**(2), 3. http://www.ojhas.org/issue34/2010-2-3.htm

27. Srivastava A., Mahmood S. E., Srivastava P. M., Shrotriya V.P. and Kumar B. (2012). Nutritional status of school-age children - A scenario of urban slums in India. *Archives of Public Health*, **70**,8. doi:10.1186/0778-7367-70-8.

28. Shivaramakrishna H.R., Deepa A.V. and Sarithareddy M. (2011). Nutritional status of adolescent girls in rural area of Kolar district -A Cross-Sectional Study. *Al Ameen Journal of Medical Sciences*, **4** (3), 243 - 46.

29. Dhoundiyal M., and Prithviraj R. (2017). Physical growth pattern of school going urban adolescent girls in Bangalore city. *International Journal of Community Medicine and Public Health,***4**, 2090-93.

30. Konwar P., Vyas N., Hossain S.S., Gore M.N. and Choudhury M. (2019). Nutritional status of adolescent girls belonging to the tea garden estates of Sivasagar district, Assam, India. *Indian Journal of Community Medicine*, **44**,238-42. doi: 10.4103/ijcm.IJCM_357_18.

31. Ahmad S., Shukla N.K., Singh J.V., Shukla R. and Shukla M. (2018). Double burden of malnutrition among school-going adolescent girls in North India: A cross-sectional study. *Journal of Family Medicine and Primary Care*, **7**(6),1417-24. doi: 10.4103/jfmpc.jfmpc_185_18.

32. Rani D., Singh J.K., Srivastava M., Verma P., Srivastava D. and Singh S. (2018). Assessment of nutritional status of teenage adolescent girls in urban slum of Varanasi. *International Journal of Current Research and Review*, **10**(20), 6-10.

33. Chandrashekarappa S.M., Ramakrishnaiah N.M.M. and Manjunath R. (2018). Nutritional status in adolescent girls: Attempt to determine its prevalence and its association with sociodemographic variables. *Family Medicine and Community Health*, **6**(4), 184–190. doi:10.15212/FMCH.2017.0122.

34. Bisai S., Bose K. and Ghosh A. (2008). Nutritional status of Lodha children in a village of Paschim Medinipur district, West Bengal. *Indian Journal of Public Health*, **52** (4), 203-6.

35. Agarwal K.N. and Agarwal D.K. (2020). Adolescence in Indian Children. *Annals of Pediatric Research*, **4**(3), 1040.

36. Dabas A., Khadgawat R., Gahlot M., Surana V., Mehan N. and Ramot R. et al. (2018). Height velocity in apparently healthy north Indian school children. *Indian journal of Endocrinology and Metabolism*, **22**, 256-60. doi: 10.4103/ijem.IJEM_638_17.

37. Sen J. and Mondal N. (2013). Fat mass and fat-free mass as indicators of body composition among Bengalee Muslim children. *Annals of Human Biology*, **40**, 286-93.

38. Mondal N. and Sen J. (2010a). Prevalence of stunting and thinness among rural adolescents of Darjeeling district, West Bengal, India. *Italian Journal of Public Health*, **7**, 54-61.

39. Rengma M.S., Bose K. and Mondal N. (2016). Socio-economic and demographic correlates of stunting among adolescents of Assam, North-east India. *The Annual Review of Anthropology*,**79**, 409–25.

40. Mondal N., Ghosh P., and Sen J. (2017). Physical growth patterns and body composition of Rajbanshi adolescent boys of Eastern India. *Human Biology Review*, **6** (3), 263-83.

41. Gibney M.J., Barr S.I., Bellisle F., Drewnowski A., Fagt S. and Livingstone B. (2018). Breakfast in human nutrition:The international breakfast research initiative. *Nutrients*, **10** (559), 1-12. doi:10.3390/nu10050559.

42. Adolphus K., Lawton C.L. and Dye L. (2013). The effect of breakfast on behaviour and academic performance in children and adolescents. *Frontiers in Human Neuroscience*, **7**(425), 1-28.

43. Keski-Rahkonen A., Kaprio J., Rissanen A., Virkkunen M. and Rose R.J. (2003). Breakfast skipping and health-compromising behaviours in adolescents and adults. *European Journal of Clinical Nutrition,***57**, 842–53.

44. Moitra P., Madan J. and Shaikh N.I. (2020). Eating habits and sleep patterns of adolescents with depression symptoms in Mumbai, India. *Maternal and child nutrition*, **16**, 3. e12998. doi: 10.1111/mcn.12998.

45. Rathi N., Riddell L. and Worsley A. (2017). Food consumption patterns of adolescents aged 14–16 years in Kolkata, India. *Nutrition Journal*, **16**(1), 50. *doi: 10.1186/s12937-017-0272-3.*

46. Intiful F. D. and Lartey A. (2014). Breakfast habits among school children in selected communities in the eastern region of Ghana. *Ghana Medical Journal*, **48** (2), 71-7.

47. Alexy U., Wicher M. and Kersting M. (2010). Breakfast trends in children and adolescents: Frequency and quality. *Public Health Nutrition*, **13**(11), 1795-1802. doi: 10.1017/SI368980010000091.

48. ALBashtawy M. (2017). Breakfast Eating Habits Among Schoolchildren. *Journal of Pediatric Nursing*, **36**,118-123. doi: 10.1016/j.pedn.2017.05.013.

49. Amin T., Choudhary N., Naik H.R., Jabeen A. and Rather A.H. (2017). Study of fast-food consumption pattern in India in children aged 16-20 years. *Internal Journal of Food and Fermentation Technology*, **7**(1), 1-8.

50. Kotecha P.V., Patel S.V., Baxi R.K., Mazumdar V.S., Shobha M. and Mehta K.G. et al. (2013). Dietary pattern of school going adolescents in urban Baroda, India. *Journal of Health, Population and Nutrition,***31**(4),490-96.

51. Goel S., Kaur T. and Gupta M. (2013). Increasing proclivity for junk food among overweight adolescent girls in district Kurukshetra, India. *International Research Journal of Biological Sciences*, **2**(3), 80-4.

52. Blossom K.L., Jose S., and Kappen D.C. (2018). Food consumption pattern among school going children in a rural area of Kerala. *Journal of Extension Education*, **30**(4), 6157-64. doi.org/10.26725/JEE.2018.4.30.6157-6164.

53. Twara T., Dubey R., Singh M., Agrawal A. and Dubey G.P. (2015). Evaluation of dietary intake and food patterns of adolescent girls from Motihari town, Bihar. *Asian Pacific Journal of Health Sciences*, **2**(4S),27-31

54. Green R., Milner J., Joy E.J., Agarwal S. and Dangour A.D. (2016). Dietary patterns in India: a systematic review. *British Journal of Nutrition*, **116**(1),142-48. doi: 10.1017/S0007114516001598.

55. Mukherjee R. and Chaturvedi S. (2017). A study of the dietary habits of school children in Pune city, Maharashtra, India. *International Journal of Community Medicine and Public Health*, **4**(2), 593- 97.

56. Sharma S., Maheshwari S., Kuwatada J., Chandrashekhar and Mehra S. (2021). Assessing dietary intake patterns through cluster analysis among adolescents in selected districts of Bihar and Assam from India: A cross-sectional survey. *Frontiers in Nutrition*, **8**(592581), 1-9. doi: 10.3389/fnut.2021.592581.

57. Krishna J., Mishra C.P. and Singh G.P. (2012). Dietary diversity of urban adolescent girls in Varanasi. *Indian Journal of Preventive and Social Medicine*, **43**(3).

58. Singh J.K., Acharya D., Rani D., Gautam S., Bajgain K.T. and Bajgain B.B. et al. (2021). Underweight and associated factors among teenage adolescent girls in resource-poor settings: A cross-sectional study. *Risk Management and Healthcare Policy*,**14**, 9–19.

59. Kumar S. and Mishra N. (2019). Nutritional status and dietary pattern of adolescent girls: A study from urban slums of Agra. *National Journal of Community Medicine*, **10**(6), 365- 69.

60. Omidvar S. and Begum K. (2014). Dietary pattern, food habits and preferences among adolescent and adult student girls from an uban area, South India. *Indian Journal of Fundamental and Applied Life Sciences*, **4** (2), 465-73.

61. Saxena S. and Mishra S. (2014). Malnutrition among school children of Lucknow. *International Journal of Science and Research,***3**(6),1726-29.

62. Gupta A., Kapil U. and Singh G. (2018). Consumption of junk foods by school-aged children in rural Himachal Pradesh, India. *Indian Journal of Public Health*, **62**, 65-7.

63. Wang D., van der Horst K., Jacquier E.F., Afeiche M.C. and Eldridge A.L. (2018). Snacking Patterns in Children: A Comparison between Australia, China, Mexico, and the US. *Nutrients*,**10**(2), 198. doi: 10.3390/nu10020198. PMID: 29439472; PMCID: PMC5852774.

64. Marzouk S. A., El-sayed Y., Saleh M. A., El- Asheer O. M., Mohmoud T. M. and Mohamed A. M. (2021). Prevalence and association of malnutrition with lifestyle practices of primary school children in Assiut city. *Egyptian Journal of Health Care*,**12** (1), 554-75.

65. Soni R. P. and Katoch M. (2014). Dietary adequacy of school going children in selected areas of Himachal Pradesh. *IOSR Journal Of Humanities And Social Science*, **19**(9), 85-90.

66. Das G., Pathania R. and Das G. (2016). Assessment of dietary pattern of adolescents in Himachal Pradesh of India. *Journal of Paramedical Sciences*, **7**(3), ISSN 2008-4978.

67. Bjelland M., Bergh I.H., Grydeland M., Kleep K.I., Andersen L.F., Andersen S.A., et al. (2011). Changes in adolescents' intake of sugar-sweetened beverages and sedentary behaviour: Result of 8-month mid-way assessment of the HEIA study-a comprehensive, multi-component school-based randmized trial. *International Journal of Behavioural Nutrition PhysicalActivity*, **8**,63.

68. Grydeland M., Bjelland M., Andersen S.A., Kleep K.I., Bergh I.H., Andersen L.F., et al. (2014). Effect of 20-month cluster randomised controlled school-based intervention trial on BMI of school-aged boys and girls: *The HEIA study. British Journal of Sports Medicine*, **48**, 768-73.

69. Deka M. K., Malhotra A.K., Yadav R. and Gupta S. (2015). Dietary pattern and nutritional deficiencies among urban adolescents. *Journal of Family Medicine and Primary Care*, **4**, 364-68. doi: 10.4103/2249-4863.161319.

70. Hizli S., Abaci A., Buyukgebiz B. and Buyukgebiz A. (2007). Nutritional stunting. *Pediatric Endocrinology Reviews*, 4(3), 186-95. PMID: 17551479.

71. Anderson V.P., Jack S., Monchy D., Hem N., Hok P., Bailey K.B. and Gibson R.S. (2008). Co-existing micronutrient deficiencies among stunted Cambodian infants and toddlers. *Asia Pacific Journal of Clinical Nutrition*, **17**(1), 72-9. PMID: 18364330.

72. Esfarjani S., Roustaee R., Mohammadi-Nasrabadi F. and Esmaillzadeh A. (2013). Major dietary patterns in relation to stunting among children in Tehran, Iran. *Journal of Health, Population and Nutrition*, **31**(2), 202-10. doi: 10.3329/jhpn.v31i2.16384.

73. Ibrahim S. A., Abd el-Maksoud A. and Nassar M.F. (2002). Nutritional stunting in Egypt: which nutrient is responsible? *Eastern Mediterranean Health Journal*, **8**, 272-80.

74. Mumena W.A., Ateek A.A., Alamri R.K., Alobaid S.A., Alshallali S.H. and Afifi S.Y. et al. (2022). Fast-Food Consumption, Dietary Quality, and Dietary Intake of Adolescents in Saudi Arabia.*International Journal of Environmental Research and Public Health*, **19**, 15083. https:// doi.org/10.3390/ijerph192215083.

75. Alshammari E., Suneetha E., Adnan M., Khan S., and Alazzeh A. (2017). Growth profile and its association with nutrient intake and dietary *patterns among children and adolescents in Hail region of Saudi Arabia. BioMed Research International*,**2017**, Article ID 5740851, 9 pages. doi.org/10.1155/2017/5740851.

76. Keino S., Plasqui G., Ettyang G., and Van Den Borne B. (2014). "Determinants of stunting and overweight among young children and adolescents in sub-Saharan Africa. *Food and Nutrition Bulletin*, **35**(2),167-78.

77. Shetty P. and Schmidhuber J. (2011). Nutrition, Lifestyle, Obesity Andochronic diseases, United Nations, Department of Economics and social affairs, New York, USA. (2011).

78. Lanigan J. and Singhal A. (2009). "Early nutrition and long-term health: a practical approach," *Proceedings of Nutrition Society*, **68**(4), 422- 29.

79. Li L., Sun N., Zhang L., Xu G., Liu J. and Hu J.et al.(2020). Fast food consumption among young adolescents aged 12-15 years in 54 low- and middle-income countries. *Glob Health Action*, **13**(1),1795438. doi: 10.1080/16549716.2020.1795438. PMID: 32762333; PMCID: PMC7480506.

80. Bohara S.S., Thapa K., Bhatt L.D., Dhami S.S. and Wagle S. (2021). Determinants of Junk Food Consumption Among Adolescents in Pokhara Valley, Nepal. *Frontier Nutrition*, **8**, 644650. doi: 10.3389/fnut.2021.644650.

81. Gómez G., Kovalskys I., Leme A.C.B., Quesada D., Rigotti A. and Cortés Sanabria L.Y. et al. (2021). Socioeconomic status impact on diet quality and body mass index in eight Latin American countries: ELANS Study Results. *Nutrients*,**13**(7), 2404. doi: 10.3390/nu13072404.

82. Wang J. and Geng L. (2019).Effects of Socioeconomic Status on Physical and Psychological Health: Lifestyle as a Mediator. *International Journal of Environmental Research and Public Health*, **16**, 281. doi:10.3390/ijerph16020281.

83. Popkin BM. (2004). The nutrition transition: an overview of world patterns of change. *Nutrition Review*, **62**(7 Pt 2): S140-3. doi: 10.1111/j.1753-4887. 2004.tb00084.x. PMID: 15387480.

84. Agarwal T., Kochar G.K. and Kaur T.J. (2007). Impact of nutrition education on nutrient adequacy of adolescent girls. *Stud Home Community Sciences*,**1**, 51-55.

85. Himachal Pradesh, Himachal Pradesh food and cuisine. Available from:mapsofindia.com/himachal-pradesh/food.html).

86. ShadapM.W.K.A. and PalaV. (2017). Nutritional intake and consumption pattern in thestates of Himachal Pradesh and Meghalaya. *The NEHU Journal*. **15**(2), 15-28.

87. ScaglioniS., De CosmiV., CiappolinoV., ParazziniF., Brambilla P.and AgostoniC. (2018). Factors Influencing Children's Eating Behaviours. *Nutrients*, **10**, 706. doi:10.3390/nu10060706.

88. Chen R., Lee M., Chang Y. and Wahlqvist M. (2012). Cooking frequency may enhance survival in Taiwanese elderly. *Public Health Nutrition*, **15** (7), 1142-49.