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**Original Research Article**

# Patterns of lifestyle behaviors, self-efficacy for nutrition, and dietary diversity among adolescents of the Chamba and Mandi districts of Himachal Pradesh

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## ABSTRACT

**Background:** The growing unhealthy lifestyle among adolescents, including decreased vegetable intake, high calorie-rich diet, and inadequate physical activity, are posing challenges. However, there is a lack of data on how dietary diversity and self-efficacy, crucial in determining food intakes, are interlinked and affect body mass index (BMI), an indicator of malnutrition. Hence, we aimed to assess unmarried boys' and girls' (10-19 years) lifestyle behaviors, self-efficacy for nutrition, dietary diversity, and their association with BMI in Himachal Pradesh.
**Methods:** It was a cross-sectional quantitative study conducted in the Mandi and Chamba districts using a structured questionnaire. Self-efficacy was measured using a five-point Likert-scale-based tool, and dietary diversity was calculated from 10 major food groups consumed in the last 24h. Besides socio-demographic details, weight and height measurements were obtained to calculate the BMI. We performed linear regression analysis to assess the associations of self-efficacy, BMI, and dietary diversity with socio-demographic determinants.
**Results:** Out of 942 adolescents, 473 (50.2%) were girls and 469 (49.8%) were boys. Marginalized populations had lower dietary diversity than the non-marginalized. Girls had a lower dietary diversity than boys. Adolescents possessing below-the-poverty-line cards had a lower self-efficacy than those possessing above-the-poverty-line cards. Adolescents who had higher dietary diversity had a lower BMI compared to their counterparts (beta coefficient (95% confidence interval); p value -0.30 (-0.51, -0.10); 0.004).
**Conclusions:** Dietary diversity and BMI are affected by socio-demographic characteristics like education, income, religion, and social caste. BMI is inversely associated with dietary diversity and conversely, positively associated with self-efficacy.

**Keywords:** Adolescent, Diet, Food quality, Nutritional status, Self-efficacy

## INTRODUCTION

Adolescence (10-19 years) is a period of growth and development. Pubertal growth spurt demands an increased supply of nutrients and food intake.[1] The national institute of nutrition recommends an intake of 2490 kcal for girls and 3300 kcal for boys and a higher intake of calcium and iron for adolescents.[2] However, it is crucial to note that more than one-third of adolescents (36%) had folate deficiency, around 31% had zinc and vitamin B12 deficiencies, nearly one-fourth (24%) were vit D deficient, and around 28% were anemic in India.[3] As a result, 27% of adolescents were stunted, 24% were thin for their age, and 5% were overweight or obese.[4]

There has been a growing focus on improving dietary diversity among populations. Dietary diversity, defined as the number of food groups consumed during a given

period (most commonly 24 h), is inadequately covered in our national surveys. This highlights the gap in widespread knowledge about dietary habits in different segments of populations, particularly adolescents.[5] Due to cultural, social, and ethnic variations, dietary habits and intakes differ across regions and states, which results in differences in nutritional inadequacies across regions.[6] Dietary diversity is a good proxy tool to measure nutritional adequacy, besides the ease and simplicity with which it could be measured, making it a successful tool for large-scale data collection.[7]

A growing concern about increasing unhealthy lifestyle behaviors among adolescents, like inactive sedentary habits, consumption of unhealthy snacks, increased mobile screen time, smoking, and drinking habits, has been identified in previous studies.[8,9] An increase in the prevalence of diabetes and hypertension has been reported in the studies.[10] Gupta et al found that nearly 12% of adolescents were hypertensives, and around 1.3% were smoking in Kolkata.[11] Hence, any health and nutrition promotion intervention for adolescents should aim at improving their lifestyles and dietary intake.

In the process of nutrition behaviour change intervention, improving self-efficacy is critical.[12] Self-efficacy is directly associated with health-promoting behavior.[13] Improving self-efficacy for healthy dietary intakes is important for preventing chronic diseases like diabetes and hypertension.[14] Self-efficacy is a bridging step between improved knowledge and practices.[15] However, self-efficacy is not measured in most of the surveys and is inadequately highlighted or addressed in health education interventions.

Considering the need and lack of adequate data on self-efficacy, lifestyle behaviours, and dietary intake among adolescents, we conducted a study in two districts of Himachal Pradesh. The present study aimed to assess unmarried boys' and girls' (10-19 years) lifestyle behaviors, self-efficacy for nutrition, dietary diversity, and their association with anthropometry in two districts of Himachal Pradesh.

## METHODS

### *Study site and population*

The present study was cross-sectional and quantitative. It was conducted in the two districts of Himachal Pradesh, India, namely Mandi and Chamba. These areas were selected since they are the intervention sites of the project. The study population consisted of unmarried girls and boys (10-19 years) residing in the study areas for at least the past 1 year. All the individuals who did not provide consent or assent (for adolescents) to participate in the study were excluded. All those individuals who had suffered a major illness in the past 1 year were excluded. The study was conducted between October 2021 and November 2021.

### *Sample size*

The sample size was calculated using the below-mentioned formula:

$$n=1.96 \times \frac{2(pq)}{d2}$$

Where, n=required sample size

p=the prevalence of girls who received iron-folic acid tablets (33%)

q=1-p

d=absolute error of 5%

After adjusting the design effect of 1.2 and a non-response rate of 10%, the sample size turned out to be 467. The sample size was the same for boys and girls.

### *Study instrument*

A predesigned, pre-tested, semi-structured questionnaire containing items on a) identification data, i.e., age, gender, educational status, occupational status, area of residence, type of family, religion, caste, type of toilet used, socio-economic status of the person, etc. b) health, nutrition, and hygiene indicators were used. The questionnaires were in the local language (Hindi). The questionnaire also consisted of questions on the consumption of alcohol and tobacco, dietary intake, and dietary self-efficacy. Besides, anthropometric details were collected. Socio-economic status was calculated using a modified Kuppuswamy scale. Adolescents were asked about their perceptions of consuming healthy diets.

Self-efficacy was measured using a pre-tested five-point Likert scale that had five items. The responses of each of the five items varied from very confident (score of 5) to not confident at all (score of 1). The scores of all the items were summed up to calculate the cumulative score of self-efficacies. We measured the height and weight of the participants. The BMI was calculated using the formula:

$$BMI = (\frac{(Weight\ in\ Kg)}{height\ in\ meters * height\ in\ meters})$$

Dietary diversity was obtained using a pre-test and validated tool. We asked for the consumption of 10 major food groups in the last 24 hour (cereals, pulses or legumes, nuts or seeds, milk or milk products, meat, eggs, dark leafy vegetables, vitamin A-rich vegetables and fruits, other vegetables, and fruits). The yes responses of all the food groups were summed up to calculate the cumulative dietary diversity score. A modified version of the physical activity questionnaire was used wherein only the practice of vigorous and moderate-intensity work and

sports and travel to and from places were obtained without the number of hours.

### *Sampling*

The intervention areas in Chamba and Mandi were selected for the study. The sample size was distributed equally across study areas. Each of these blocks was divided into 4 zones (North, South, East, and West) from the center of the area. In each of these zones, nearly 40-50 households were selected using systematic random sampling. From each household, one mother and/or one young boy/girl and/or one adult were interviewed. The first household was selected randomly, and subsequent households were selected using the '$k^{th}$' interval.

### *Data collection and ethical considerations*

There was a team of 4 investigators supervised by a coordinator who was trained and standardized at the MAMTA office for a period of one week in various techniques of investigations, including demographic surveys, anthropometry, and administration of various questionnaires before the initiation of the survey. During the training, emphasis was placed on achieving the maximum intra and inter-individual agreement with respect to all the measurements. During the training, the teams carried out mock surveys. The ethical approval was obtained from the MAMTA Ethical Review Board and informed written consent was obtained from the parents of adolescents and assent from adolescents (MIRB/October-2021/001).

### *Data analysis*

We expressed numerical data as mean (SD) and median (Interquartile range; IQR) and categorical data as frequency and percentages. The data were segregated for girls and boys. The analysis was conducted in STATA version 14. Linear regression was performed to assess the effect of various socio-demographic determinants on three major outcomes, namely dietary diversity score, self-efficacy score, and BMI. We adjusted for age, sex, socio-economic status, education status, religion, type of family, type of ration card, type of toilet used, and social castes in the model for dietary diversity and self-efficacy. However, in the model for BMI, we adjusted for dietary diversity and self-efficacy additionally. The strength of association was reported as a beta coefficient (β) and 95% confidence interval (CI). A $p<0.05$ was considered a statistically significant value.

## RESULTS

In total, there were 942 adolescents from Mandi and Chamba districts. Out of 942, 473 (50.2%) were girls and 469 (49.8%) were boys. The mean (SD) age of boys and girls was similar, i.e., 14.5 (2.5) years (Table 1). Nearly 36% of boys and 35% of girls had below-the-poverty-line or extremely below-the-poverty-line cards. More than one-fourth of adolescent boys and girls were not doing moderate-intensity work, and more than three-fourths of boys and girls were not doing moderate-intensity sports (Table 2).

The mean BMI among boys was 18.9 kg/m$^2$, and for girls was 18.5 kg/m$^2$. Marginalized populations had lower dietary diversity than the non-marginalized (Table 3). Girls had a lower dietary diversity than boys. Self-efficacy was positively associated with BMI (β (95%CI); p=0.13 (0.05, 0.22); 0.002). On contrary, adolescents who had higher dietary diversity had lower BMI compared to their counterparts (β (95% CI); p=-0.30 (-0.51, -0.10); 0.004).

**Table 1: Sociodemographic characteristics of adolescent boys and girls in the two districts of Himachal Pradesh.**

| Variables | Adolescent boys (n=469), (%) | Adolescent girls (n=473), (%) |
|---|---|---|
| **Age; mean (SD) (in years)** | 14.5 (2.5) | 14.5 (2.5) |
| **Socio-economic status** | | |
| Lower | 5 (1.1) | 10 (2.1) |
| Lower middle | 106 (22.6) | 112 (23.7) |
| Upper lower | 295 (62.9) | 276 (58.4) |
| Upper middle | 63 (13.4) | 75 (15.9) |
| **Education status** | | |
| Illiterate | 1 (0.2) | 0 |
| Primary | 50 (10.7) | 54 (11.4) |
| Middle | 175 (37.3) | 195 (41.2) |
| Secondary | 108 (23.0) | 68 (1.4) |
| Senior secondary | 105 (22.4) | 130 (27.5) |
| Graduation and above | 30 (6.4) | 26 (5.5) |
| **Type of ration cards** | | |
| Above the poverty line card | 234 (49.9) | 234 (49.5) |
| Below the poverty line card | 111 (23.7) | 114 (24.1) |
| Extremely below the poverty line card | 58 (12.4) | 51 (10.8) |
| No card | 66 (14.1) | 74 (15.6) |

Continued.

| Variables | Adolescent boys (n=469), (%) | Adolescent girls (n=473), (%) |
|---|---|---|
| **Head of the family** | | |
| Father | 375 (80.0) | 381 (80.5) |
| Grandfather | 54 (11.5) | 53 (11.2) |
| Grandmother | 20 (4.26) | 23 (4.86) |
| Mother | 15 (3.20) | 13 (2.75) |
| Others | 5 (1.06) | 3 (0.64) |
| **Religion** | | |
| Hindu | 454 (96.8) | 453 (95.8) |
| Muslim | 13 (2.8) | 18 (3.81) |
| Others | 2 (0.4) | 2 (0.42) |
| **Caste** | | |
| General | 341 (72.7) | 324 (68.5) |
| Scheduled caste | 58 (12.4) | 74 (15.6) |
| Scheduled tribe | 47 (10.0) | 51 (10.8) |
| Other backward classes | 23 (4.9) | 24 (5.1) |
| **Type of family** | | |
| Nuclear | 348 (74.2) | 336 (71.0) |
| Joint | 121 (25.8) | 137 (29.0) |
| **Type of toilets used** | | |
| Flush toilets | 292 (92.3) | 305 (64.4) |
| Slab pit latrine | 123 (26.2) | 120 (25.4) |
| Slab less put latrine | 46 (9.8) | 42 (8.9) |
| Open defecation | 8 (1.7) | 6 (1.3) |

**Table 2: Perception of a healthy diet, self-efficacy, lifestyle, as well as anthropometry of the adolescent girls and the boys.**

| Variables | Adolescent boys, (n=469) (%) | Adolescent girls, (n=473) (%) |
|---|---|---|
| **Perceptions of a healthy diet** | | |
| Consume four-five meals a day | | |
| Yes | 350 (74.6) | 350 (74.0) |
| No | 119 (25.4) | 123 (26.0) |
| Eat food items from the five food groups | | |
| Yes | 373 (79.5) | 362 (76.5) |
| No | 96 (20.5) | 111 (23.5) |
| Avoid food items rich in fats or oils or cold drinks | | |
| Yes | 171 (36.5) | 194 (41.0) |
| No | 298 (36.5) | 279 (59.0) |
| Avoid skipping meals | | |
| Yes | 31 (6.6) | 36 (7.61) |
| No | 438 (93.4) | 437 (92.4) |
| **Number of major meals a day** | | |
| Three or less than three | 314 (67.0) | 330 (69.8) |
| More than three | 155 ((33.0) | 143 (30.2) |
| **Self-reported smoking** | | |
| Yes | 14 (3.0) | 4 (0.8) |
| No | 455 (97.0) | 469 (99.2) |
| **Self-reported consumption of the alcohol** | | |
| Yes | 5 (1.0) | 2 (0.42) |
| No | 464 (99.0) | 471 (99.6) |
| **Self-reported consumption of tobacco** | | |
| Yes | 8 (1.71) | 3(0.63) |
| No | 461 (98.3) | 470 (99.4) |

Continued.

| Variables | Adolescent boys, (n=469) (%) | Adolescent girls, (n=473) (%) |
|---|---|---|
| **Physical activity** | | |
| Any kind of physical exertion | | |
| Yes | 298 (63.5) | 288 (60.9) |
| No | 171 (36.5) | 185 (39.1) |
| Vigorous-intensity work | | |
| Yes | 197 (42.0) | 159 (33.6) |
| No | 272 (58.0) | 314 (66.4) |
| Moderate-intensity work | | |
| Yes | 351 (74.8) | 335 (70.8) |
| No | 118 (25.1) | 138 (29.2) |
| Travel to from places | | |
| Yes | 335 (71.4) | 310 (65.5) |
| No | 134 (28.6) | 163 (34.5) |
| Vigorous intensity sport | | |
| Yes | 239 (50.9) | 166 (35.1) |
| No | 230 (49.1) | 307 (64.9) |
| Moderate-intensity sport | | |
| Yes | 162 (34.5) | 80 (17.0) |
| No | 307 (65.5) | 393 (83.0) |
| **Self-efficacy score** | | |
| Median (IQR) | 17 (14-18) | 17 (14-18) |
| **Dietary diversity score** | | |
| Median (IQR) | 9 (8-10) | 8 (8-10) |
| **Dietary diversity** | | |
| High (8-10) | 367 (78.3) | 369 (78.0) |
| Low (less than 8) | 102 (21.7) | 104 (22.0) |
| **BMI (kg/m$^2$); mean (SD)** | 18.9 (3.4) | 18.5 (3.3) |
| Missing | 179 | 170 |
| **BMI** | | |
| Less than or equal to 24.9 kg/m$^2$ | 276 (95.2) | 292 (96.4) |
| More than 24.9 kg/m$^2$ | 14 (4.8) | 11 (3.6) |
| Missing | 179 | 170 |

**Table 3: Linear regression between outcomes and socio-demographic determinants.**

| Variables | Self-efficacy β (95% CI); p | Dietary diversity β (95% CI); p | BMI β (95% CI); p |
|---|---|---|---|
| **Age (in years)** | 0.05 (-0.12, 0.23); 0.52 | 0.17 (0.09, 0.25); <0.001 | 0.12 (-0.12, 0.36); 0.32 |
| **Sex** | | | |
| Girl | 0.25 (-0.15, 0.65); 0.22 | -0.22 (-0.41, -0.05); 0.01 | -0.45 (-0.99, 0.08); 0.09 |
| Boy | Reference | Reference | Reference |
| **Socio-economic status** | | | |
| Lower middle | 0.41 (-1.27, 2.08); 0.63 | 0.12 (-0.61, 0.86); 0.74 | 0.94 (-1.03, 2.92); 0.35 |
| Upper lower | 0.25 (-1.37, 1.87); 0.76 | 0.50 (-0.21, 1.22); 0.17 | 1.28 (-0.63, 3.19); 0.19 |
| Upper middle | 0.37 (-1.34, 2.08); 0.67 | 0.29 (-0.46, 1.05); 0.44 | 1.74 (-0.29, 3.77); 0.09 |
| Lower | Reference | Reference | Reference |
| **Religion** | | | |
| Others* | -0.14 (-1.25, 0.97); 0.80 | -0.25 (-0.74, 0.24); 0.31 | -2.05 (-3.74, -0.35); 0.018 |
| Hindus | Reference | Reference | Reference |
| **Caste** | | | |
| Marginalized[#] | -0.07 (-0.52, 0.37); 0.75 | -0.33 (-0.53, -0.14); <0.001 | 0.49 (-0.13, 1.12); 0.12 |
| Non-marginalized | Reference | Reference | Reference |
| **Education status** | | | |
| Middle | 0.32 (-0.44, 1.09); 0.41 | 0.08 (-0.25, 0.42); 0.62 | -0.49 (-1.62, 0.63); 0.39 |
| Secondary | 0.56 (-0.53, 1.66); 0.31 | -0.49 (-0.97, -0.008); 0.04 | -0.70 (-2.25, 0.84); 0.37 |
| Senior secondary | -0.001 (-1.31, 1.31); 0.99 | -0.77 (-1.35, -0.18); 0.01 | -0.97 (-2.77, 0.83); 0.29 |
| Graduation | 1.77 (0.05, 3.48); 0.04 | -0.78 (-1.54, -0.02); 0.04 | -0.63 (-3.04, 1.78); 0.60 |
| Illiterate and primary[¥] | Reference | Reference | Reference |

Continued.

| Variables | Self-efficacy β (95% CI); p | Dietary diversity β (95% CI); p | BMI β (95% CI); p |
|---|---|---|---|
| **Card** | | | |
| EBPL card | -1.81 (-2.50, -1.12); <0.001 | 0.41 (0.11, 0.72); 0.007 | -0.10 (-0.98, 0.76); 0.81 |
| BPL card | -0.59 (-1.19, -0.032); 0.038 | 0.26 (0.01, 0.51); 0.04 | -0.61 (-1.40, 0.17); 0.12 |
| None | 0.83 (0.19, 1.47); 0.011 | 1.24 (0.96, 1.52); <0.001 | -0.72 (-1.51, -0.06); 0.07 |
| APL card | Reference | Reference | Reference |
| **Type of family** | | | |
| Nuclear | -0.04 (0.51, 0.43); 0.86 | 0.06 (-0.14, 0.27); 0.54 | 0.63 (-0.01, 1.27); 0.05 |
| Joint | Reference | Reference | Reference |
| **Type of toilet** | | | |
| Slab pit latrine | -1.39 (-1.87, -0.91); <0.001 | -0.21 (-0.42, 0.005); 0.05 | 1.11 (0.40, 1.81); 0.002 |
| Slab less pit latrine | -0.97 (-1.71, -0.23); 0.01 | -1.55 (-1.87, -1.22); <0.001 | -0.10 (-1.19, 0.98); 0.85 |
| Open defecation | -0.30 (-1.98, 1.37); 0.72 | 0.10 (-0.64, 0.84); 0.79 | 3.09 (1.19, 5.00); 0.002 |
| Flush latrine | Reference | Reference | Reference |
| **Self-efficacy score** | | | 0.13 (0.05, 0.22); 0.002 |
| **Dietary diversity score** | | | -0.30 (-0.51, -0.10); 0.004 |
| **Adjusted $R^2$** | 9.67% | 21.1% | 7.2% |

APL: Above the poverty line; β: Beta-coefficient; BMI: body mass index; CI: Confidence Interval; EBPL: Extremely below the poverty line; BPL: below the poverty line; $R^2$: Regression coefficient. *all other religions except Hindus were merged together into one category; #all castes other than general like scheduled caste, tribe, and other backward classes were merged together; ¥illiterate and primary education categories were merged together; A p<0.05 was highlighted in bold.

## DISCUSSION

We assessed lifestyle behaviour, self-efficacy for nutrition, dietary diversity, and their association with anthropometric measures among adolescents in two districts, Mandi and Chamba, of Himachal Pradesh. The results offered meaningful insights into the dietary and lifestyle practices of adolescent boys and girls aged 10-19 years. The findings are useful for intervention to promote healthy behaviour among adolescents.

Dietary diversity was high in our study participants, contrary to many other studies.[5,16,17] This could probably be due to the higher socio-economic status of the participants, easy access to fruits and vegetables in the hilly areas, and improved perceptions about healthy diets among adolescents.[18] Likewise, other social determinants of health, like education and access to toilets, were higher in the study population. However, Khandelwal et al found that more than 50% of boys and girls had a deficient intake of iron, and more than 50% of girls had a deficient intake of zinc and calories in the Shimla district of Himachal Pradesh.[19] The plausible explanation could be prevalent vegetarian diets among women and adolescents in the state with low intake of micronutrients, including iron, in the diet against the recommended intakes.[20]

Around 78% of both boys and girls in our study reported eating foods from at least eight food groups, indicating a relatively diverse diet. However, the study also revealed that dietary diversity is notably lower in marginalized groups compared to others, with a beta coefficient of -0.42 (95% CI: -0.64 to -0.21). Our findings are comparable to the other studies that reported a lack of food intake, increased malnutrition prevalence, and lower adequate dietary intakes among marginalized populations compared to the non-marginalized populations.[21,22]

Most of the adolescents consumed at least three meals a day, and another one-third had more than 3 meals a day in the present study. Another study from Himachal reported that vegetarianism was the most common dietary pattern among adolescents in Himachal Pradesh, and the majority of them consumed 3 or more than 3 meals a day.[20] This is supported by the findings of the national sample survey organization, which reported that there has been a decline in the expenditure on the consumption of meat and eggs contrary to an increase in the expenditure on buying vegetables, pulses, milk, and milk products in Himachal Pradesh.[23]

Our results are congruent with the other studies that found gender differences in dietary diversity and BMI.[5,16] Girls were found to have lower dietary diversity and BMI than boys in our study, but the association with BMI was statistically insignificant. Gender differences are primary to the social structure of our society, where boys are given preference over girls. However, Vaidya et al reported a declining gender disparity in Himachal Pradesh over three decades and, in fact, reported Himachal as the number 1 state in terms of gender equality.[24]

The inclusion of diverse diets in daily routine helps control obesity. Our finding of the inverse association between dietary diversity and BMI is congruent with others.[16,25,26] Likewise, middle- or upper-socio-economic status groups had a higher BMI than the lower socio-economic group; however, it was statistically insignificant. This observation agrees with other studies documenting a direct association between income and BMI. This could be understood as thinness or

malnutrition being more prominent among people from lower socio-economic groups, and conversely, obesity is common among higher-income categories.[27,28] Less than 5% of adolescents had a BMI>24.9 kg/m$^2$ in our study.

Contrary to the established results, adolescents with higher education status and those with above-the-poverty-line cards had a lower dietary diversity compared to their counterparts. There could be two plausible explanations for this association. First, adolescents with higher education and with above-the-poverty-line cards have greater consumption of unhealthy foods from the market, thereby limiting the intake of fruits and diverse food items. Second, adolescents with below-the-poverty-line cards are provided take-home rations under the public distribution system, making food items like cereals, oils, and pulses available freely.[29,30]

The use of a pit latrine was inversely associated with dietary diversity and self-efficacy compared to the use of a flush latrine. This association could reflect the use of latrines affected by the socio-economic status coupled with the education status.[31] Self-efficacy, which refers to the confidence individuals have in their ability to make changes in their daily routines, is critical in determining health-promoting behaviours among adolescents.[31] Congruent with the other studies, we found a higher self-efficacy among educated adolescents and a positive association between self-efficacy and BMI.[12,15,32]

However, we did not find any association of social castes or economic status with self-efficacy like the study by Efthymiou et al.[12] Adolescents who possessed extremely below-the-poverty-line card or below-the-poverty-line card had a lower self-efficacy compared to those possessing above-the-poverty-line card in our study. The findings should be interpreted with the understanding that self-efficacy is a complex variable determined by multiple factors, including knowledge, cognitive, behavioural, social, and emotional skills, and self-beliefs. Hence, socio-demographic determinants may have a limited role in determining self-efficacy.[33]

Our study also revealed alarming levels of physical inactivity among adolescents, with over 40% of participants not participating in any physical exertion. This sedentary lifestyle, coupled with unhealthy habits such as excessive screen time and substance use, presents serious health risks, including obesity and an increased likelihood of non-communicable diseases.[5] The growing physical inactivity among adolescents has also been reported by Bhawra et al in their study as high as 25%.[34]

### *Strength and limitations*

The advantages of this study contribute to its credibility and relevance. Firstly, the research employed a robust methodology, utilizing a pretested semi-structured questionnaire that addressed multiple aspects of adolescent health, including diet, physical activity, and self-efficacy. This comprehensive approach afforded a detailed understanding of factors that influence health behaviours among adolescents. Secondly, the research sampled 942 adolescents, which enhances the applicability of the results to the populations of the Mandi and Chamba districts. The sufficient sample size ensures dependable estimates of relationships between socio-demographic factors and health outcomes. Thirdly, focusing on marginalized populations sheds light on a frequently neglected demographic, illustrating disparities in both dietary diversity and health outcomes and informing targeted interventions aimed at promoting health equity among adolescents.

However, the results should be understood considering a few limitations. First, the study had a higher proportion of participants from the general category compared to other social categories (scheduled caste/scheduled tribe/other backward classes), which may not accurately reflect the true distribution of the population. This uneven representation could limit the external validity and generalizability of the results. Another limitation is the belief in self-reported data for dietary habits, physical activity, and substance use, which may lead to response bias, as participants might overstate positive behaviours or underreport negative ones, resulting in inaccuracies. Additionally, while the study assessed dietary diversity, it did not examine overall diet quality or specific nutrient intake, limiting understanding of nutritional adequacy. The study's focus on Mandi and Chamba districts also restricts the generalizability of findings to other regions with different cultural and socio-economic contexts.

## CONCLUSION

Our study concluded that adolescents in Mandi and Chamba had high dietary diversity and self-efficacy for nutrition. Higher education status was found to be associated with higher self-efficacy. Marginalized populations and girls had lower dietary diversity than their counterparts. Adolescents possessing below-the-poverty-line cards had a lower self-efficacy but a higher dietary diversity than those possessing above-the-poverty-line cards. BMI had a positive association with self-efficacy and a negative relation with BMI. In addition, most of the adolescents had low physical activity.

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## REFERENCES

1. Soliman AT, Alaaraj N, Noor Hamed, Alyafei F, Ahmed S, Shaat M, et al. Review Nutritional interventions during adolescence and their possible effects. Acta Biomed. 2022;93(1):e2022087.

2. National Institute of Nutrition. Dietary guidelines for Indians. ICMR. 2024.
3. Ministry of Health and Family Welfare (MoHFW), Government of India, UNICEF and Population Council. Comprehensive National Nutrition Survey (CNNS) National Report. New Delhi. 2019.
4. Pandurangi R, Mummadi MK, Challa S, Reddy NS, Kaliaperumal V, Khadar Babu C, et al. Burden and predictors of malnutrition among Indian adolescents (10-19 years): insights from Comprehensive National Nutrition Survey Data. Front Publ Heal. 2022;10:877073.
5. Vispute S, Mandlik R, Sanwalka N, Gondhalekar K, Khadilkar A. Dietary diversity and food variety scores and their association with nutrition and health status of Indian children and adolescents: A multicenter study. Nutrition. 2023;111:112039.
6. Green R, Milner J, Joy EJ, Agrawal S, Dangour AD. Dietary patterns in India: a systematic review. Brit J Nutrit. 2016;116(1):142-8.
7. Verger EO, Le Port A, Borderon A, Bourbon G, Moursi M, Savy M, et al. Dietary diversity indicators and their associations with dietary adequacy and health outcomes: a systematic scoping review. Adv Nutrit. 2021;12(5):1659-72.
8. Singh AP, Misra G. Adolescent lifestyle in India: Prevalence of risk and promotive factors of health. Psychol Developing Societies. 2012;24(2):145-60.
9. Seema S, Rohilla KK, Kalyani VC, Babbar P. Prevalence and contributing factors for adolescent obesity in present era: Cross-sectional Study. J Family Med Primary Care. 2021;10(5):1890-4.
10. Ramadass, S, Gupta, Sanjeev Kumar, Nongkynrih, Baridalyne. Adolescent health in urban India. J Family Med Prim Care. 2017;6(3):468-76.
11. Gupta A, Sarker G, Das P, Shahnawaz K, Pal R. Prevalence of lifestyle associated cardiovascular risk factors among adolescent students of rural Bengal. J Integrated Heal Sci. 2013;1(2):69-75.
12. Efthymiou V, Charmandari E, Vlachakis D, Tsitsika A, Pałasz A, Chrousos G, et al. Adolescent self-efficacy for diet and exercise following a school-based multicomponent lifestyle intervention. Nutrients. 2021;14(1):97.
13. Park J, Lee H. The relationship between depression, self-efficacy, social support, and health-promoting behaviors in Korean single-household women. Preventive Med Rep. 2023;32:102156.
14. Tavakoly Sany SB, Ahangari H, Rasoulifar A, Salimi M, Jamali J, Tehrani H. Nutrition self-efficacy intervention to improve nutritional status of Iranian older adults. J Health Popul Nutr. 2024;43(1):22
15. Sharma S, Akhtar F, Singh RK, Mehra S. Relationships between nutrition-related knowledge, attitude, and self-efficacy among adolescents: A community-based survey. J Family Med Prim Care 2019;8:2012-6.
16. Nithya DJ, Bhavani RV. Dietary diversity and its relationship with nutritional status among adolescents and adults in rural India. J Biosocial Sci. 2018;50(3):397-413.
17. Aurino E. Do boys eat better than girls in India? Longitudinal evidence on dietary diversity and food consumption disparities among children and adolescents. Economics Human Biol. 2017;25:99-111.
18. Government of Himachal Pradesh. Economic Survey 2022-23. Available at: https://himachalservices.nic.in/economics/en-IN/eco-survey-2022-23.html. Accessed on 04 November 2024.
19. Khandelwal R, Gupta A, Singh G, Kapil U, Pandey RM, Upadhyay AD. Nutrient intake of adolescents in rural area of Himachal Pradesh. Indian J Community Heal. 2017;29(2):194-7.
20. Das G, Pathania R, Das G. Assessment of dietary pattern of adolescents in Himachal Pradesh of India. J Paramed Sci. 2016;7(3):1-7
21. Biswas S, Pramanik KR, Sonowal CJ. Marginalised social groups differentials in nutritional status (BMI) among reproductive-aged women in West Bengal. BMC Public Health. 2023;23(1):842.
22. Bhati D, Tripathy A, Mishra PS. Contribution of socio-economic and demographic factors to the trend of adequate dietary diversity intake among children (6-23 months): evidence from a cross-sectional survey in India. BMC Nutr. 2022;8(1):153.
23. Shadap AM, Pala VE. Nutritional intake and consumption pattern in the states of Himachal Pradesh and Meghalaya. NEHU J. 2017;15(2):15-28.
24. Vaidya V. A situation analysis of women and girls in Himachal Pradesh: 2004. Available at: https://ncwapps.nic.in/pdfReports/Gender_Profile_Himachal_Pradesh.pdf. Accessed on November 4, 2024.
25. Oldewage-Theron WH, Egal AA. A cross-sectional baseline survey investigating the relationship between dietary diversity and cardiovascular risk factors in women from the Vaal Region, South Africa. J Nurs Educ Pract. 2013;4:50.
26. Azadbakht L, Esmaillzadeh A. Dietary diversity score is related to obesity and abdominal adiposity among Iranian female youth. Public Health Nutr. 2011;14:62-9.
27. Sung M, Jain A, Kumar A, Kim R, Kulkarni B, Subramanian SV. Patterns of change in the association between socioeconomic status and body mass index distribution in India, 1999-2021. J Global Health. 2024;14:04171.
28. Sung M, Kumar A, Mishra R, Kulkarni B, Kim R, Subramanian SV. Temporal change in prevalence of BMI categories in India: patterns across States and Union territories of India, 1999-2021. BMC Public Health. 2024;24(1):1322.
29. Sharma S, Akhtar F, Singh RK, Mehra S. Dietary Intake across Reproductive Life Stages of Women in India: A Cross-Sectional Survey from 4 Districts of India. J Nutr Metab. 2020;2020:9549214.

30. Raj BM, Suhasini K, Lavanya T, Reddy DS, Supriya K. Dietary Diversity Score among Beneficiaries and Non-beneficiaries of Public Distribution System in Rural and Urban Telangana. Eur J Nutrit Food Safety. 2024;16(6):18-25.
31. Pandey K. Socio-Economic Background and Use of Latrine in Rural India: An In-Depth Analysis. J Rural Development. 2016;35(3):421-34.
32. Prestwich A, Kellar I, Parker R, MacRae S, Learmonth M, Sykes B, et al. How can self-efficacy be increased? Meta-analysis of dietary interventions. Heal Psychol Rev. 2014;8(3):270-85.
33. Kasmaei P, Mirzajanzadeh P, Rouhani-Tonekaboni N. Self-efficacy and nutritional behaviors in young adolescents: A Model-guided Study. Medical Sci. 2019;23(98):432-0.
34. Bhawra J, Khadilkar A, Krishnaveni GV, Kumaran K, Katapally TR. The 2022 India Report Card on physical activity for children and adolescents. J Exerc Sci Fit. 2023;21(1):74-82.

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