## NUTRITIONAL STATUS AND ITS ASSOCIATED FACTORS AMONG GOVERNMENT SCHOOL-GOING ADOLESCENTS OF BIRENDRANAGAR MUNICIPALITY, SURKHET, NEPAL

Bal Krishna Bhatta, Rupesh Tiwari, Swastika Ghimire, Renu Khadka, Aashish Malasi

Department of Public Health, Nobel College, Sinamangal, Kathmandu, Nepal

#### **ABSTRACT**

A recently published WHO report revealed that a large number of adolescents in the Southeast Asian Region, suffer from malnutrition and anemia, which adversely impacts their health and development. If adolescent malnutrition is not treated on time, it leads to major repercussions such as low birth weight and poor health in adulthood. A survey on the nutritional status of adolescents based in 13 districts of Nepal revealed that almost six out of ten male adolescents and seven out of ten (71.0%) of female adolescents were undernourished. The likelihood of undernutrition was high among adolescents residing in Terai (72.0%), followed by Hill (59.0%) and Mountain (54.0%). A cross-sectional descriptive study was carried out among the adolescents of grade 6 studying in the government school of Birendranagar Municipality from May to October 2023. A total of 240 students were selected from five schools constitute the sample size of the study. The selection was based on stratified random sampling, where each school was considered a stratum. Anthropometric measurement assessed nutritional status based on BMI. Attempts were made to determine the associations between the nutritional status and socio-demographic, behavioral hygiene and diet-related variables. Of the total adolescents, 55.8% were normal, 22.3% were thin and 22.9% were very thin. The nutritional status of the adolescents was observed to be significantly associated with their family type, family income, physical activities, and mother's education. Encouraging physical activities and promoting healthy habits can enhance the nutritional status of adolescents in the population of students of grade 6 at governmental schools of Birendranagar Municipality, Surkhet, Nepal.

#### **KEYWORDS**

Nutritional status, body mass index, adolescents, WHO Anthro+, associated factor, Nepal

Received on: January 31, 2024 Accepted for publication: April 29, 2024

#### **CORRESPONDING AUTHOR**

Mr. Bal Krishna Bhatta Lecturer, Department of Public Health, Nobel College, Sinamangal, Kathmandu, Nepal Email: balkrishnabhatta1991@gmail.com Orcid No: https://orcid.org/0000-0002-7967-6980 DOI: https://doi.org/10.3126/nmcj.v26i2.67211

#### INTRODUCTION

Adolescents account for about one-fourth of the total world's population, and the majority of them live in developing countries.<sup>1</sup> Adolescence is a period of physical, psychological and social maturation which is one-fifth (22.0%) of the total population of Nepal.<sup>2</sup> The United Nations (UN) and WHO define adolescence as a segment of a population group aged from 10-19 years old; this is a transition from childhood to adulthood period has intense physical, psychosocial and cognitive development.<sup>3</sup>

Recent WHO reports indicate that in the Southeast Asian Region a large number of adolescents, who constitute one-fifth (20%) of the population in these countries, suffer from malnutrition and anemia, which adversely impact their health and development, and that anthropometry is a good indicator of nutritional status and health risks in this group.<sup>4</sup> When it comes to nutrition, adolescence is a crucial period since it is a time of fast development and gives previously undernourished children the chance to put on weight and grow taller, so long as their environment is favorable to better nutrition. On the other hand, if adolescent malnutrition is not treated quickly, it might have major repercussions, including poor health in adulthood and low birth weight.<sup>5</sup> During this phase, Adolescents reach 50.0% of adult weight, 45.0% of bone mass growth, and 15% of ultimate adult height, along with other body composition and structure changes.<sup>6</sup>

The burden scope of malnutrition is still unacceptably high, and the progress to reduce it is slow.<sup>7</sup> In many developing countries, stunting, underweight, and micronutrient deficiencies among adolescents frequently result from inadequate nutrition and infections during early childhood combined with a diet insufficient to meet the intense nutritional demands of rapid growth during adolescence.<sup>8</sup> The WHO has reported that poor nutrition is the single most significant threat to the world's health.<sup>9</sup>

According to the Global School-Based Student Health Survey (GSHS) 2015, 10.9% (male 13.8%, female 8.1%) of adolescent students were underweight, 6.7% (male 7.6%, female 5.8%) were overweight and 0.6% (male 0.8% and female 0.4%) of the school going adolescent were obese.<sup>10</sup> An adolescent nutrition survey from 13 districts representing Nepal's three ecological (Mountain, Hill and the Terai) regions revealed that 59.0% of female and 71.0% of male adolescents were undernourished. The likelihood of undernutrition was high among adolescents residing in the Terai 72.0% has the highest level followed by Hill 59.0% and Mountain 54.0%. The prevalence was almost similar among adolescents living in urban areas 63.0% and rural areas 65.0%.<sup>11</sup>

A school-based cross-sectional analytical study was conducted in the public secondary school of Lekhnath Municipality of Kaski District of Nepal showed according to body mass index, half of the respondents (50.6%) were found to be underweight with 38.3% being normal and 11.0% of them overweight.<sup>2</sup> Similarly, another study conducted in Malangwa Municipality, Sarlahi, Nepal revealed 40.1% of adolescents were malnourished out of which 37.6% were underweight and 2.5% were overweight. The mean BMI was  $19.42 \pm 2.5^{12}$ 

Especially, at the provincial level, there is a lack of data available on the nutritional status among adolescents, as most studies focus only on under five-aged children and women. Thus, this study was carried out to assess the nutritional status and its associated factors using WHO AnthroPlus software based on the new WHO Growth Reference 2007<sup>13</sup> among government school-going adolescents of Birendranagar Municipality, Surkhet District.

#### **MATERIALS AND METHODS**

A cross-sectional descriptive study was carried out among the adolescents of grade 6 studying in the government school of Birendranagar Municipality from May to October 2023.<sup>14</sup> Prevalence for computing sample size of the study was based on a previous study conducted in the Dang District,<sup>15</sup> which has similar demographic characteristics as that of Surkhet District. A total of 240 students were selected from five schools constitute the sample size of the study. The selection was based on stratified random sampling, where each school was considered a stratum. The study included adolescents aged above 10 years. Anthropometric measurement assesses nutritional status based on BMI. Attempts were made to determine the associations between the nutritional status and socio-demographic, behavioral and diet-related variables.

Quantitative data for assessing associated factors were collected through selfadministered questionnaires, following clear instructions from the researcher. Initially developed in English, the questionnaire was later translated into Nepali. Anthropometric assessments involved weight and height measurements from adolescents. They were clearly instructed to remove their shoes and step on a digital weighing scale with their hands freely suspended. Height measurements were conducted by a stadiometer, with adolescents standing shoeless and erect on the plank, back parallel to the meter. The researcher entered the obtained readings into the coded questionnaire for each respondent.

Anthropometric assessments were conducted to calculate BMI, by numerical measure utilizing an individual's weight and height to estimate body fat, applicable to both males and females irrespective of age.<sup>16</sup> The BMI calculation involves dividing a person's weight in kilograms by the square of their height in meters, expressed as BMI = weight (in kg) / height<sup>2</sup> (in m<sup>2</sup>). This index serves as a statistical tool for assessing body composition, commonly used in health and nutrition contexts. The WHO AnthroPlus software categorizes BMI into Underweight (BMI below the 5<sup>th</sup> percentile), Healthy weight (between the 5<sup>th</sup> percentile and less than the 85th percentile), and Overweight and Obese (above the 85<sup>th</sup> percentile).<sup>17</sup> The obtained values from WHO AnthroPlus were analyzed using SPSS-26, and the chi-square test was applied to measure the association between two categorical variables: dependent and independent variables. Ethical considerations were obtained from the Institutional Review Committee of Nobel College (Ref. No.: 80/81/246). Written consent was obtained from schools and parents to conduct the study, ensuring the confidentiality of all information and maintaining the respondent's privacy.

#### RESULTS

outlines the sociodemographic Table 1 characteristics of the study adolescents, presenting frequencies and percentages for various variables. The percentage of male (51.7%) and female (48.3%) adolescents were fairly balanced. The age distribution was diverse, with the majority falling into the 11-year-old category (35.0%), followed by 10-year-olds (24.2%), 12-year-olds (29.2%), and 13-year-olds (11.7%), yielding a mean age of 11.28 years with a standard deviation of 0.96. Six out of ten adolescents were Brahmin-Chhetri (60.5%) and one out of ten were Thakuri (10.0%). The majority of respondents identified as *Hindu* (86.3%), followed by Christian (7.5%), Islam (3.3%), and Buddhist (2.9%). Geographically, more participants resided inside the valley (55.8%) than outside the valley (44.2%). Family structures varied, with 67.6% belonging to nuclear families and 32.5% to joint families. Most adolescents reported having siblings (83.8%), and among those with siblings, the distribution was as follows, 45.3% had one sibling, 42.3% had two, and 12.4% had three. Parental occupations showed diversity, with four out of ten respondent fathers engaged in service (41.3%), and one quartile were foreign employment (25.0%). Respondent mothers

#### Table 1: Socio-demographic characteristics of adolescent participants (n=240)

Variables         n         %           Sex	adolescent participants	(n=240)	
Sex         Jale         124         51.7           Female         116         48.3           Age         116         48.3           10         58         24.2           11         84         35.0           12         70         29.2           13         28         11.7           Mean ± SD 11.28 (SD ± 0.96)         Ethnicity         Brahmin           Brahmin         63         26.3           Chhetri         82         34.2           Thakuri         24         10           Dalit         38         15.8           Others         33         13.8           Religion         Hindu         207         86.3           Christian         18         7.5         Islam         8         3.3           Buddhist         7         2.9         Permanent address         Inside valley         106         44.2           Types of family         Nuclear         162         67.6         Joints         78         32.5           Respondent siblings         (n= 201)         1         1         91         45.3           2         2         183.8         No	Variables	n	%
Male       124       51.7         Female       116       48.3         Age	Sex		
Female       116       48.3         Age       10       58       24.2         10       58       24.2         11       84       35.0         12       70       29.2         13       28       11.7         Mean ± SD 11.28 (SD ± 0.96)       Ethnicity       Ethnicity         Brahmin       63       26.3         Chhetri       82       34.2         Thakuri       24       10         Dalit       38       15.8         Others       33       13.8         Religion       Hindu       207       86.3         Christian       18       7.5       Islam         Islam       8       3.3       Buddhist       7       2.9         Permanent address       -       -       Inside valley       106       44.2         Types of family       -       Nuclear       162       67.6       Joints       78       32.5         Respondent siblings       (n= 201)       1       1       45.3       25       12.4         Yes       201       83.8       No       39       16.3       16.3         Number of siblings (n= 201)	Male	124	51.7
Age	Female	116	48.3
10         58         24.2           11         84         35.0           12         70         29.2           13         28         11.7           Mean ± SD 11.28 (SD ± 0.96)         28         11.7           Ethnicity         28         11.7           Brahmin         63         26.3           Chetri         82         34.2           Thakuri         24         10           Dalit         38         15.8           Others         33         13.8           Religion         -         -           Hindu         207         86.3           Christian         18         7.5           Islam         8         3.3           Budhist         7         2.9           Permanent address         -         -           Inside valley         106         44.2           Types of family         -         -           Nuclear         162         67.6           Joints         78         32.5           Respondent siblings         -         -           Yes         201         83.8           No         39	Age		
11         84         35.0           12         70         29.2           13         28         11.7           Mean ± SD 11.28 (SD ± 0.96)         Ethnicity         28           Brahmin         63         26.3           Chhetri         82         34.2           Thakuri         24         10           Dalit         38         15.8           Others         33         13.8           Religion	10	58	24.2
12       70       29.2         13       28       11.7         Mean ± SD 11.28 (SD ± 0.96)       26.3         Ethnicity       82       34.2         Thakuri       24       10         Dalit       38       15.8         Others       33       13.8         Religion       18       7.5         Hindu       207       86.3         Christian       18       7.5         Islam       8       3.3         Buddhist       7       2.9         Permanent address       106       44.2         Types of family       106       44.2         Nuclear       162       67.6         Joints       78       32.5         Respondent siblings       9       16.3         Number of siblings (n= 201)       1       91         1       91       45.3         2       85       42.3         3       25       12.4         Father's occupation       Secondary level         Service       99       41.3         Socoustess       55       22.9         Agriculture       60       25.0	11	84	35.0
13       28       11.7         Mean $\pm$ SD 11.28 (SD $\pm$ 0.96)       26.3         Ethnicity       82       34.2         Brahmin       63       26.3         Chhetri       82       34.2         Thakuri       24       10         Dalit       38       15.8         Others       33       13.8         Religion       Hindu       207       86.3         Christian       18       7.5         Islam       8       3.3         Budhist       7       2.9         Permanent address       Inside valley       106       44.2         Types of family       Nuclear       162       67.6         Nutclear       162       67.6       10ints       78       32.5         Respondent siblings       (n= 201)       1       1       33       33       1.3         Number of siblings (n= 201)       1       1       5.3       2       1.4       33         Seconce       99       41.3       5       32       2.5       1.4         Father's occupation       Foreign employment       60       25.0       25.0       1.3         Secondary	12	70	29.2
Mean $\pm$ SD 11.28 (SD $\pm$ 0.96)       11.7         Ethnicity       82         Brahmin       63       26.3         Chhetri       82       34.2         Thakuri       24       10         Dalit       38       15.8         Others       33       13.8         Religion       18       7.5         Hindu       207       86.3         Christian       18       7.5         Islam       8       3.3         Buddhist       7       2.9         Permanent address       134       55.8         Outside valley       106       44.2         Types of family       104       45.3         Nuclear       162       67.6         Joints       78       32.5         Respondent siblings       Yes       201       83.8         No       39       16.3         Number of siblings (n= 201)       1       15.3         1       91       45.3       25         2       85       42.3       3         3       25       12.4       Father's occupation         Service       99       41.3       50	13	28	11 7
Brahmin         63         26.3           Chhetri         82         34.2           Thakuri         24         10           Dalit         38         15.8           Others         33         13.8           Religion	Mean + SD 11.28 (SD + 0.96)	20	11,7
Brahmin         63         26.3           Chhetri         82         34.2           Thakuri         24         10           Dalit         38         15.8           Others         33         13.8           Religion         18         7.5           Hindu         207         86.3           Christian         18         7.5           Islam         8         3.3           Buddhist         7         2.9           Permanent address         Inside valley         106         44.2           Types of family         Nuclear         162         67.6           Joints         78         32.5         Respondent siblings           Yes         201         83.8         No         39         16.3           Number of siblings (n= 201)         1         91         45.3         2           2         25         12.4         Father's occupation         Secrvice         99         41.3           Foreign employment         60         25.0         Secrvice         34         14.2           Business         30         12.5         Foreign employment         12         5.0	Ethnicity		
Chheri       82       34.2         Thakuri       24       10         Dalit       38       15.8         Others       33       13.8         Religion	Brahmin	63	26.3
Thakwri       24       10         Dalit       38       15.8         Others       33       13.8         Religion	Chhetri	82	34.2
Initial 1       13       15.8         Dalit       38       15.8         Others       33       13.8         Religion	Thakuri	24	10
Differs         33         13.8           Religion	Dalit	38	15.8
Religion       30       10.0         Hindu       207       86.3         Christian       18       7.5         Islam       8       3.3         Buddhist       7       2.9         Permanent address       134       55.8         Inside valley       106       44.2         Types of family       106       44.2         Nuclear       162       67.6         Joints       78       32.5         Respondent siblings       78       32.5         Respondent siblings (n= 201)       1       91         1       91       45.3         2       85       42.3         3       25       12.4         Father's occupation       55       22.9         Agriculture       26       10.8         Mother's occupation       104       43.3         Agriculture       60       25.0         Service       34       14.2         Business       30       12.5         Foreign employment       12       5.0         Father's education       12       5.0         Basic level       75       31.3         Se	Others	33	13.0
Hindu       207       86.3         Christian       18       7.5         Islam       8       3.3         Buddhist       7       2.9         Permanent address	Religion		10.0
Initial       18       7       5         Islam       8       3.3         Buddhist       7       2.9         Permanent address       Inside valley       106       44.2         Types of family       106       44.2         Nuclear       162       67.6         Joints       78       32.5         Respondent siblings       7       83.8         No       39       16.3         Number of siblings (n= 201)       1       91         1       91       45.3         2       85       42.3         3       25       12.4         Father's occupation       55       22.9         Agriculture       26       10.8         Mother's occupation       104       43.3         Agriculture       60       25.0         Service       34       14.2         Business       30       12.5         Foreign employment       12       5.0         Service       34       14.2         Business       30       12.5         Foreign employment       12       5.0         Secondary level       90       37.5 <td>Hindu</td> <td>207</td> <td>86.3</td>	Hindu	207	86.3
Islam       8       3.3         Islam       8       3.3         Buddhist       7       2.9         Permanent address       Inside valley       106       44.2         Types of family       106       44.2         Nuclear       162       67.6         Joints       78       32.5         Respondent siblings       78       32.5         Respondent siblings (n= 201)       1       91       45.3         1       91       45.3       2       3         2       85       42.3       3       25       12.4         Father's occupation       Service       99       41.3       55.0       25.0         Business       55       22.9       Agriculture       26       10.8         Mother's occupation       Household       104       43.3         Agriculture       60       25.0       55       22.9         Agriculture       60       25.0       55       22.9         Agriculture       60       25.0       5       50       25         Secondary level       104       43.3       3       3       25       1.3         Agricult	Christian	18	75
Buildhist       7       2.9         Permanent address       Inside valley       134       55.8         Outside valley       106       44.2         Types of family       Nuclear       162       67.6         Joints       78       32.5         Respondent siblings       78       32.5         Respondent siblings (n= 201)       83.8       No         Number of siblings (n= 201)       91       45.3         1       91       45.3         2       85       42.3         3       25       12.4         Father's occupation       Service       99       41.3         Foreign employment       60       25.0         Business       55       22.9         Agriculture       60       25.0         Service       34       14.2         Business       30       12.5         Foreign employment       12       5.0         Father's education       Basic level       75       31.3         Secondary level       90       37.5       14         Higher secondary level       90       37.5       15         Higher secondary level       53       22.1 </td <td>Islam</td> <td>Q</td> <td>2.2</td>	Islam	Q	2.2
Permanent address       7       2.3         Inside valley       134       55.8         Outside valley       106       44.2         Types of family       Nuclear       162       67.6         Joints       78       32.5         Respondent siblings       78       32.5         Yes       201       83.8         No       39       16.3         Number of siblings (n= 201)       1       91       45.3         1       91       45.3       2       25       12.4         Father's occupation       Service       99       41.3       55.0       25.0       3       25       12.4         Foreign employment       60       25.0       25.0       3       3       25       22.9       4       3.3       3       25       22.9       4       3.3       3       3       25.0       3	Buddhist	0 7	3.3 2 Q
Inside valley       134       55.8         Outside valley       106       44.2         Types of family       162       67.6         Nuclear       162       67.6         Joints       78       32.5         Respondent siblings       9       83.8         No       39       16.3         Number of siblings (n= 201)       1       91         1       91       45.3         2       85       42.3         3       25       12.4         Father's occupation       Service       99         Service       99       41.3         Foreign employment       60       25.0         Business       55       22.9         Agriculture       60       25.0         Service       34       14.2         Business       30       12.5         Foreign employment       12       5.0         Father's education       Basic level       75         Basic level       75       31.3         Secondary level       90       37.5         Higher secondary level       50       20.8         Bachelor and above       25       10.4 <td>Durunisi Dormanont address</td> <td>1</td> <td>2.9</td>	Durunisi Dormanont address	1	2.9
Inside valley       134       33.8         Outside valley       106       44.2         Types of family       78       32.5         Respondent siblings       78       32.5         Respondent siblings (n= 201)       1       83.8         No       39       16.3         Number of siblings (n= 201)       1       91         1       91       45.3         2       85       42.3         3       25       12.4         Father's occupation       Service       99         Service       99       41.3         Foreign employment       60       25.0         Business       55       22.9         Agriculture       60       25.0         Service       34       14.2         Business       30       12.5         Foreign employment       12       5.0         Father's education       Basic level       75         Basic level       75       31.3         Secondary level       90       37.5         Higher secondary level       50       20.8         Bachelor and above       25       10.4         Mother's education	Inside valley	12/	
Outside valley       106       44.2         Types of family	Outside valley	106	55.0 44.2
Types of failingNuclear162 $67.6$ Joints78 $32.5$ <b>Respondent siblings</b> Yes201 $83.8$ No39 $16.3$ Number of siblings (n= 201)1191 $45.3$ 285 $42.3$ 325 $12.4$ <b>Father's occupation</b> Service99 $41.3$ Foreign employment $60$ $25.0$ Business $55$ $22.9$ Agriculture $26$ $10.8$ Mother's occupation $H$ Household $104$ $43.3$ Agriculture $60$ $25.0$ Service $34$ $14.2$ Business $30$ $12.5$ Foreign employment $12$ $5.0$ Father's education $Basic level$ $90$ Secondary level $90$ $37.5$ Higher secondary level $50$ $20.8$ Bachelor and above $25$ $10.4$ Mother's education $102$ $42.5$ Secondary level $53$ $22.1$ Higher secondary level $27$ $11.3$ Bachelor and above $10$ $4.2$ Family income $Below 25,000$ $101$ Below 25,000 $101$ $40.8$ $25000-50,000$ $45$ $18.8$		100	44.2
Nuclear $102$ $07.0$ Joints78 $32.5$ <b>Respondent siblings</b> 78 $32.5$ Yes $201$ $83.8$ No $39$ $16.3$ <b>Number of siblings (n= 201)</b> 11 $91$ $45.3$ 2 $85$ $42.3$ 3 $25$ $12.4$ Father's occupationService99 $41.3$ Foreign employment60 $25.0$ Business $55$ $22.9$ Agriculture $26$ $108$ Mother's occupation $104$ $43.3$ Agriculture $60$ $25.0$ Service $34$ $14.2$ Business $30$ $12.5$ Foreign employment $12$ $5.0$ Father's educationBasic level $75$ $31.3$ Secondary level $90$ $37.5$ Higher secondary level $90$ $37.5$ Higher secondary level $50$ $20.8$ Bachelor and above $25$ $10.4$ Mother's education $102$ $42.5$ Secondary level $53$ $22.1$ Higher secondary level $27$ $11.3$ Bachelor and above $10$ $4.2$ Family incomeBelow $25,000$ $101$ $40.8$ $25000-50,000$ $94$ $39.2$ Above $50,000$ $45$ $18.8$	Types of family	1.00	67.6
Joints78 $32.5$ Respondent siblingsYes201 $83.8$ No3916.3Number of siblings (n= 201)1191 $45.3$ 285 $42.3$ 32512.4Father's occupationService99 $41.3$ Foreign employment6025.0Business5522.9Agriculture2610.8Mother's occupationHousehold104Household10443.3Agriculture6025.0Service3414.2Business3012.5Foreign employment125.0Father's educationBasic level75Basic level7531.3Secondary level9037.5Higher secondary level9037.5Higher secondary level5020.8Basic level10242.5Secondary level5322.1Higher secondary level2711.3Bachelor and above104.2Family incomeEEBelow 25,00010140.825000-50,0009439.2Above 50,0004518.8	Nuclear	102	07.0 22 F
Yes       201       83.8         No       39       16.3         Number of siblings (n= 201)       1       91       45.3         1       91       45.3       2       85       42.3         3       25       12.4       Father's occupation       Service       99       41.3         Foreign employment       60       25.0       Business       55       22.9         Agriculture       26       10.8       Mother's occupation       Household       104       43.3         Agriculture       60       25.0       Service       34       14.2         Business       30       12.5       Foreign employment       12       5.0         Father's education       Basic level       75       31.3       Secondary level       90       37.5         Higher secondary level       90       37.5       Higher secondary level       50       20.8         Bachelor and above       25       10.4       Mother's education       IIIiterate       48       20.0         Basic level       102       42.5       Secondary level       53       22.1       Higher secondary level       27       11.3         Bachelor and above       10<	Juillis Deen on dont eiblinge	/ð	32.5
res $201$ $83.8$ No $39$ $16.3$ Number of siblings (n= 201) $1$ 1 $91$ $45.3$ 2 $85$ $42.3$ 3 $25$ $12.4$ Father's occupationService $99$ $41.3$ Foreign employment $60$ $25.0$ Business $55$ $22.9$ Agriculture $26$ $10.8$ Mother's occupation $104$ $43.3$ Agriculture $60$ $25.0$ Service $34$ $14.2$ Business $30$ $12.5$ Foreign employment $12$ $5.0$ Father's education $8asic level$ $75$ Basic level $75$ $31.3$ Secondary level $90$ $37.5$ Higher secondary level $50$ $20.8$ Bachelor and above $25$ $10.4$ Mother's education $102$ $42.5$ Secondary level $53$ $22.1$ Higher secondary level $27$ $11.3$ Bachelor and above $10$ $4.2$ Family income $80.25,000$ $101$ Below 25,000 $101$ $40.8$ 25000-50,000 $94$ $39.2$ Above 50,000 $45$ $18.8$	Respondent siblings	0.01	00.0
No         39         16.3           Number of siblings (n= 201)         1         91         45.3           1         91         45.3           2         85         42.3           3         25         12.4           Father's occupation         99         41.3           Service         99         41.3           Foreign employment         60         25.0           Business         55         22.9           Agriculture         26         10.8           Mother's occupation         Household         104         43.3           Agriculture         60         25.0         Service         34         14.2           Business         30         12.5         Foreign employment         12         5.0           Father's education         Basic level         75         31.3         Secondary level         90         37.5           Higher secondary level         90         37.5         Secondary level         50         20.8           Bachelor and above         25         10.4         Mother's education         11           Illiterate         48         20.0         Basic level         53         22.1	res	201	83.8 16.2
Number of siblings (n= 201)191 $45.3$ 285 $42.3$ 325 $12.4$ Father's occupationService99 $41.3$ Foreign employment60 $25.0$ Business55 $22.9$ Agriculture26 $10.8$ Mother's occupation $Household$ $104$ Household $104$ $43.3$ Agriculture60 $25.0$ Service $34$ $14.2$ Business $30$ $12.5$ Foreign employment $12$ $5.0$ Father's education $Basic level$ $75$ Basic level75 $31.3$ Secondary level90 $37.5$ Higher secondary level $50$ $20.8$ Bachelor and above $25$ $10.4$ Mother's education $102$ $42.5$ Secondary level $53$ $22.1$ Higher secondary level $27$ $11.3$ Bachelor and above $10$ $4.2$ Family income $80.92$ $40.92$ Below 25,000 $101$ $40.8$ 25000-50,000 $94$ $39.2$ Above 50,000 $45$ $18.8$	NU Number of eiblings (n - 201)	39	10.3
19145.32 $85$ $42.3$ 3 $25$ $12.4$ Father's occupationService $99$ $41.3$ Foreign employment $60$ $25.0$ Business $55$ $22.9$ Agriculture $26$ $10.8$ Mother's occupation $104$ $43.3$ Agriculture $60$ $25.0$ Service $34$ $14.2$ Business $30$ $12.5$ Foreign employment $12$ $5.0$ Father's education $8asic level$ $75$ Basic level $75$ $31.3$ Secondary level $90$ $37.5$ Higher secondary level $50$ $20.8$ Bachelor and above $25$ $10.4$ Mother's education $102$ $42.5$ Secondary level $53$ $22.1$ Higher secondary level $27$ $11.3$ Bachelor and above $10$ $4.2$ Family income $101$ $40.8$ $25000-50,000$ $94$ $39.2$ Above $50,000$ $45$ $18.8$	Number of siblings (n= 201)	01	45.0
28542.3 $3$ 2512.4Father's occupation9941.3Foreign employment6025.0Business5522.9Agriculture2610.8Mother's occupation10443.3Agriculture6025.0Service3414.2Business3012.5Foreign employment125.0Father's education9037.5Higher secondary level9037.5Higher secondary level5020.8Bachelor and above2510.4Mother's education10242.5Secondary level5322.1Higher secondary level2711.3Bachelor and above104.2Family income9439.2Above 50,0004518.8		91 05	45.3
3       25       12.4         Father's occupation       99       41.3         Foreign employment       60       25.0         Business       55       22.9         Agriculture       26       10.8         Mother's occupation       104       43.3         Agriculture       60       25.0         Service       34       14.2         Business       30       12.5         Foreign employment       12       5.0         Service       34       14.2         Business       30       12.5         Foreign employment       12       5.0         Father's education       8       20.0         Basic level       75       31.3         Secondary level       90       37.5         Higher secondary level       50       20.8         Bachelor and above       25       10.4         Mother's education       102       42.5         Secondary level       53       22.1         Higher secondary level       27       11.3         Bachelor and above       10       4.2         Family income       8       2000         Below 25,000 <td></td> <td>80 00</td> <td>42.3</td>		80 00	42.3
Father's occupationService99 $41.3$ Foreign employment $60$ $25.0$ Business $55$ $22.9$ Agriculture $26$ $10.8$ Mother's occupation $104$ $43.3$ Agriculture $60$ $25.0$ Service $34$ $14.2$ Business $30$ $12.5$ Foreign employment $12$ $5.0$ Father's education $8asic level$ $75$ Basic level $75$ $31.3$ Secondary level $90$ $37.5$ Higher secondary level $50$ $20.8$ Bachelor and above $25$ $10.4$ Mother's education $102$ $42.5$ Secondary level $53$ $22.1$ Higher secondary level $27$ $11.3$ Bachelor and above $10$ $4.2$ Family income $101$ $40.8$ $25000-50,000$ $94$ $39.2$ Above $50,000$ $45$ $18.8$	5 Father's compation	25	12.4
Service9941.3Foreign employment $60$ $25.0$ Business $55$ $22.9$ Agriculture $26$ $10.8$ Mother's occupation $104$ $43.3$ Agriculture $60$ $25.0$ Service $34$ $14.2$ Business $30$ $12.5$ Foreign employment $12$ $5.0$ Father's education $8asic level$ $75$ Basic level $75$ $31.3$ Secondary level $90$ $37.5$ Higher secondary level $50$ $20.8$ Bachelor and above $25$ $10.4$ Mother's education $102$ $42.5$ Secondary level $53$ $22.1$ Higher secondary level $27$ $11.3$ Bachelor and above $10$ $4.2$ Family income $101$ $40.8$ $25000-50,000$ $94$ $39.2$ Above $50,000$ $45$ $18.8$	Father's occupation	00	11 0
Foreign employment $60$ $25.0$ Business $55$ $22.9$ Agriculture $26$ $10.8$ Mother's occupation $104$ $43.3$ Agriculture $60$ $25.0$ Service $34$ $14.2$ Business $30$ $12.5$ Foreign employment $12$ $5.0$ Father's education $Basic level$ $75$ Basic level $75$ $31.3$ Secondary level $90$ $37.5$ Higher secondary level $50$ $20.8$ Bachelor and above $25$ $10.4$ Mother's education $102$ $42.5$ Secondary level $53$ $22.1$ Higher secondary level $27$ $11.3$ Bachelor and above $10$ $4.2$ Family income $101$ $40.8$ Below $25,000$ $101$ $40.8$ $25000-50,000$ $94$ $39.2$ Above $50,000$ $45$ $18.8$	Service	99	41.3
Business       55       22.9         Agriculture       26       10.8         Mother's occupation       104       43.3         Agriculture       60       25.0         Service       34       14.2         Business       30       12.5         Foreign employment       12       5.0         Father's education       38       36         Basic level       75       31.3         Secondary level       90       37.5         Higher secondary level       50       20.8         Bachelor and above       25       10.4         Mother's education       102       42.5         Secondary level       102       42.5         Secondary level       53       22.1         Higher secondary level       27       11.3         Bachelor and above       10       4.2         Family income       8       20.00         Below 25,000       101       40.8         25000-50,000       94       39.2         Above 50,000       45       18.8	Professional Province of the second s	60	25.0
Agriculture       26       10.8         Mother's occupation       104       43.3         Agriculture       60       25.0         Service       34       14.2         Business       30       12.5         Foreign employment       12       5.0         Father's education       8       20.0         Basic level       75       31.3         Secondary level       90       37.5         Higher secondary level       50       20.8         Bachelor and above       25       10.4         Mother's education       102       42.5         Secondary level       53       22.1         Higher secondary level       27       11.3         Bachelor and above       10       4.2         Family income       8       20.0         Below 25,000       101       40.8         25000-50,000       94       39.2         Above 50,000       45       18.8	Business	55	22.9
Mother's occupation         Household       104       43.3         Agriculture       60       25.0         Service       34       14.2         Business       30       12.5         Foreign employment       12       5.0         Father's education       8       20.0         Basic level       75       31.3         Secondary level       90       37.5         Higher secondary level       50       20.8         Bachelor and above       25       10.4         Mother's education       102       42.5         Secondary level       102       42.5         Secondary level       53       22.1         Higher secondary level       27       11.3         Bachelor and above       10       4.2         Family income       8       20.00         Below 25,000       101       40.8         25000-50,000       94       39.2         Above 50,000       45       18.8	Agriculture	20	10.8
Household $104$ $43.3$ Agriculture $60$ $25.0$ Service $34$ $14.2$ Business $30$ $12.5$ Foreign employment $12$ $5.0$ Father's education $30$ $12.5$ Basic level $75$ $31.3$ Secondary level $90$ $37.5$ Higher secondary level $50$ $20.8$ Bachelor and above $25$ $10.4$ Mother's education $102$ $42.5$ Secondary level $102$ $42.5$ Secondary level $53$ $22.1$ Higher secondary level $27$ $11.3$ Bachelor and above $10$ $4.2$ Family income $101$ $40.8$ Below 25,000 $101$ $40.8$ 25000-50,000 $94$ $39.2$ Above 50,000 $45$ $18.8$	Mother's occupation	101	40.0
Agriculture $60$ $25.0$ Service $34$ $14.2$ Business $30$ $12.5$ Foreign employment $12$ $5.0$ Father's education $30$ $31.3$ Basic level $75$ $31.3$ Secondary level $90$ $37.5$ Higher secondary level $50$ $20.8$ Bachelor and above $25$ $10.4$ Mother's education $102$ $42.5$ Secondary level $102$ $42.5$ Secondary level $53$ $22.1$ Higher secondary level $27$ $11.3$ Bachelor and above $10$ $4.2$ Family income $101$ $40.8$ Below 25,000 $101$ $40.8$ 25000-50,000 $94$ $39.2$ Above 50,000 $45$ $18.8$	Housenold	104	43.3
Service       34       14.2         Business       30       12.5         Foreign employment       12       5.0         Father's education       Basic level       75       31.3         Secondary level       90       37.5         Higher secondary level       50       20.8         Bachelor and above       25       10.4         Mother's education       102       42.5         Secondary level       102       42.5         Secondary level       53       22.1         Higher secondary level       27       11.3         Bachelor and above       10       4.2         Family income       Below 25,000       101       40.8         25000-50,000       94       39.2       Above 50,000       45       18.8	Agriculture	6U	25.0
Business       30       12.5         Foreign employment       12       5.0         Father's education       Basic level       75       31.3         Basic level       90       37.5         Higher secondary level       90       37.5         Higher secondary level       50       20.8         Bachelor and above       25       10.4         Mother's education       102       42.5         Secondary level       102       42.5         Secondary level       53       22.1         Higher secondary level       27       11.3         Bachelor and above       10       4.2         Family income       Below 25,000       101       40.8         25000-50,000       94       39.2       Above 50,000       45       18.8	Service	34	14.2
Foreign employment12 $5.0$ Father's educationBasic level75 $31.3$ Secondary level90 $37.5$ Higher secondary level $50$ $20.8$ Bachelor and above $25$ $10.4$ Mother's educationIlliterate $48$ $20.0$ Basic level $102$ $42.5$ Secondary level $53$ $22.1$ Higher secondary level $27$ $11.3$ Bachelor and above $10$ $4.2$ Family incomeBelow 25,000 $101$ 40.8 $25000-50,000$ $94$ 39.2Above $50,000$ $45$	Business	30	12.5
Father's education         Basic level       75       31.3         Secondary level       90       37.5         Higher secondary level       50       20.8         Bachelor and above       25       10.4         Mother's education       102       42.5         Basic level       102       42.5         Secondary level       53       22.1         Higher secondary level       27       11.3         Bachelor and above       10       4.2         Family income       8       2000         Below 25,000       101       40.8         25000-50,000       94       39.2         Above 50,000       45       18.8	Foreign employment	12	5.0
Basic level       75       31.3         Secondary level       90       37.5         Higher secondary level       50       20.8         Bachelor and above       25       10.4         Mother's education       102       42.5         Basic level       102       42.5         Secondary level       53       22.1         Higher secondary level       27       11.3         Bachelor and above       10       4.2         Family income       8       2000         Below 25,000       101       40.8         25000-50,000       94       39.2         Above 50,000       45       18.8	Father's education		
Secondary level       90       37.5         Higher secondary level       50       20.8         Bachelor and above       25       10.4         Mother's education       102       42.5         Basic level       102       42.5         Secondary level       53       22.1         Higher secondary level       27       11.3         Bachelor and above       10       4.2         Family income       8       2000         Below 25,000       101       40.8         25000-50,000       94       39.2         Above 50,000       45       18.8	Basic level	75	31.3
Higher secondary level       50       20.8         Bachelor and above       25       10.4         Mother's education       102       42.5         Illiterate       48       20.0         Basic level       102       42.5         Secondary level       53       22.1         Higher secondary level       27       11.3         Bachelor and above       10       4.2         Family income       8       2000         Below 25,000       101       40.8         25000-50,000       94       39.2         Above 50,000       45       18.8	Secondary level	90	37.5
Bachelor and above       25       10.4         Mother's education       Illiterate       48       20.0         Basic level       102       42.5       42.5         Secondary level       53       22.1       11.3         Bachelor and above       10       4.2         Family income       Below 25,000       101       40.8         25000-50,000       94       39.2       Above 50,000       45       18.8	Higher secondary level	50	20.8
Mother's educationIlliterate4820.0Basic level10242.5Secondary level5322.1Higher secondary level2711.3Bachelor and above104.2Family income8Below 25,00010140.825000-50,0009439.2Above 50,0004518.8	Bachelor and above	25	10.4
Illiterate4820.0Basic level10242.5Secondary level5322.1Higher secondary level2711.3Bachelor and above104.2Family incomeBelow 25,00010140.825000-50,0009439.2Above 50,0004518.8	Mother's education		
Basic level       102       42.5         Secondary level       53       22.1         Higher secondary level       27       11.3         Bachelor and above       10       4.2         Family income       8       10         Below 25,000       101       40.8         25000-50,000       94       39.2         Above 50,000       45       18.8	Illiterate	48	20.0
Secondary level       53       22.1         Higher secondary level       27       11.3         Bachelor and above       10       4.2         Family income       8       10       4.2         Below 25,000       101       40.8       40.8         25000-50,000       94       39.2       4bove 50,000       45       18.8	Basic level	102	42.5
Higher secondary level2711.3Bachelor and above104.2Family incomeBelow 25,00010140.825000-50,0009439.2Above 50,0004518.8	Secondary level	53	22.1
Bachelor and above104.2Family income10140.8Below 25,0009439.2Above 50,0004518.8	Higher secondary level	27	11.3
Family incomeBelow 25,00010140.825000-50,0009439.2Above 50,0004518.8	Bachelor and above	10	4.2
Below 25,00010140.825000-50,0009439.2Above 50,0004518.8	Family income		
25000-50,0009439.2Above 50,0004518.8	Below 25,000	101	40.8
Above 50,000 45 18.8	25000-50,000	94	39.2
	Above 50,000	45	18.8

Table 2: Behavior and hygiene characteristics of adolescent participants (n=240)					
Variables	n	%			
Respondent's physical activity s	tatus				
Yes	150	67.1			
No	90	32.9			
Duration of physical activity (n=	=150)				
Less than 30 minutes	35	23.3			
30minutes – 1 Hour	63	42.0			
More than 1 Hour	52	34.7			
Sleep duration (Hours)					
7	45	18.8			
8	128	53.3			
9	67	27.9			
Hand-washing before and after	meals				
Yes	134	55.8			
No	106	44.2			
Types of hand wash (n=134)					
Clean tap water	41	30.6			
Life-buoy soap	68	50.7			
Dettol soap	25	18.7			
Source of drinking water					
Clean tap water	76	31.7			
Filtration	140	50			
Jar water	44	18.3			

were predominantly involved in household activities (43.3%), followed by agriculture (25.0%). The educational level of parents varied, with respondent fathers distributed more across the basic level (31.3%) and secondary level (37.5%). Adolescent mothers exhibited educational levels of illiterate (20.0%), and basic level (42.5%). In terms of family income, a significant proportion of the family's income was below Rs. 25,000.

Table 2 shows the Behavior and hygiene characteristics of the surveyed adolescents. A notable 67.1% of respondents reported engaging in regular physical activity. Among those participating in physical activity (n=150), the duration varied with, 42.0% allocating 30 minutes to 1 hour, and 34.7% engaging for over 1 hour. Sleep patterns were explored, with 53.3% indicating 8 hours, and 27.9% indicating 9 hours of sleep. Hygiene practices, specifically hand-washing before and after meals, were prevalent among 55.8% of respondents. Analysis of hand-wash practices (n=240) revealed 30.6% using clean tap water, 50.7% employing Life-boy soap, and 18.7% opting for Detrol soap. Additionally, the source of drinking water varied, with 31.7% relying on clean tap water, 50.0% using filtration methods, and 18.3% choosing jar water.

Table 3: Dietary-related characteristics ofadolescent participants (n=240)				
Variables	n	%		
Dietary pattern				
Vegetarian	45	18.8		
Non-vegetarian	195	81.3		
Number of meals in a day				
3	107	44.6		
4	98	40.8		
5	35	14.6		
Consumption of junk food sta	tus			
Yes	196	81.7		
No	44	18.3		
Frequency of junk food consum	ption (	n=196)		
Daily	64	33.0		
Alternative	54	27.8		
Once a week	16	8.2		
Twice a week	60	30.9		
Frequency of Fruits consump	tion			
Daily	42	17.5		
Once a week	111	46.3		
Alternative	17	7.1		
Twice a week	70	29.2		
Frequency of green leafy	vege	tables		
Daily	129	53.8		
Alternative	92	38.3		
Once a week	19	7.9		
Mid-day meal of respondents				
Roti/Paratha and vegetables from Home	62	25.8		
Packed food (Noodles/ Biscuits)	30	12.5		
Fast-Food from canteen	73	30.4		
Noon / Skips	75	31.3		



**Fig 1:** Nutritional status of respondents (n=240) by using BMI for age (Percentile – WHO Anthro+)

# Table 4: Association between demographic, family, behavior, lifestyle variables and<br/>nutritional status of adolescent participants

Under-weight (Very thin + Thin)Normal WeightAge 1021 (36.2%)37 (63.8%)1143 (51.2%)41 (48.8%)3.4420.3321229 (41.4%)41 (58.6%)1313 (46.4%)15 (53.6%)Sex $(55.2.5\%)$ 1.213Bale59 (47.6%)69 (59.5%)Ethnicity $(74.0.5\%)$ 69 (59.5%)Brahmin38 (60.3 %)25 (39.7%)Cherri34 (41.5%)48 (58.5%)Cherri34 (41.5%)48 (58.5%)Cherri12 (31.6%)26 (68.4%)Others13 (39.4%)20 (60.6%)Brainin92 (44.4%)115 (55.6%)Others13 (39.4%)20 (60.6%)Religion10 (57.9%)0.828Non-Hindu14 (42.4%)19 (57.9%)Permanent address10Inside valley49 (36.6%)32 (41%)Stolley28 (71.8%)10.27Nuclear60 (37%)102 (63%)Ioint46 (59%)32 (41%)Stollings10 (28.2%)28 (71.8%)Yes95 (47.3%)106 (52.7%)4.81No11 (28.2%)29 (58%)Basic Level39 (52%)36 (48%)Secondary Level17 (41.1%)53 (38.9%)2.978Higher Secondary Level19 (33.3%)16 (64%)Education status of father Basic Level33 (68.8%)15 (31.3%)Bachelor and above9 (33.3%)18 (66.7%)Secondary Level19 (33.3%)18 (66	Variables	Nutritional Status		Chi-sq. value	P-value
Age1021 (36.2%)37 (63.8%)1143 (51.2%)41 (48.8%)3.4420.3321229 (41.4%)41 (58.6%)151313 (46.4%)15 (53.5%)SexTemale59 (47.6%)69 (59.5%)EthnicityBrahmin38 (60.3 %)25 (39.7%)Chetri 34 (41.5%)48 (58.5%)Datit9 (37.5%)10.0860.39Datit12 (31.6%)26 (68.4%)Others13 (39.4%)20 (60.6%)8ReligionHindu9 (37.5%)10.0860.39Datit19 (57.9%)0.470.828Non-Hindu19 (57.9%)0.470.828Permanent addressInside valley57 (53.8%)49 (46.2)Parament addressInside valley59 (47.3%)106 (52.7%)4.810.028*Outside valley57 (53.8%)49 (46.2)SiblingsTest colspan="2">Paramet addressInside valley37 (54.3%)10.6 (52.7%)4.810.028*No11 (28.2%)28 (71.8%)29 (85%)Backeloan ad bove9 (36%)16 (44%)15 (31.3%)Backeloan ad above9 (33.3%)18 (66.7%)2.9780.395Backeloan ad above9 (3		Under-weight (Very thin + Thin)	Normal Weight		
10       21 (36, 2%)       37 (63, 3%)         11       43 (51, 2%)       31 (44, 8%)       3, 442         12       29 (41, 4%)       41 (48, 8%)       3, 442         13       13 (46, 4%)       15 (53, 6%)       Sex         Male       59 (47, 6%)       65 (52, 5%)       1.213       0.271         Female       47 (40, 5%)       69 (59, 5%)       Ethnicity         Brahmin       38 (60, 3%)       25 (39, 7%)       Chiteri         Chiteri       34 (41, 5%)       48 (58, 5%)       0.086         Chiteri       24 (44, 5%)       15 (62, 5%)       10.086       0.39         Dalit       12 (31, 6%)       26 (68, 4%)       0.0086       0.39         Dalit       12 (31, 6%)       26 (68, 4%)       0.086       0.39         Parmaent address       11 (42, 4%)       19 (57, 9%)       0.088       0.088         Non-flindu       14 (42, 4%)       19 (57, 9%)       10.027       0.001*         Permaent address       100       10.27       0.001*       0.028*         Noutside valley       57 (53, 8%)       49 (46, 2)       10.27       0.001*         Siblings       12 (42, 4%)       106 (52, 7%)       4.81       0.028*     <	Age		/>		
11       43 ( $51,2\%$ )       41 ( $48,8\%$ )       3.442       0.332         12       29 ( $41,4\%$ )       41 ( $58,6\%$ )       13         13       13 ( $46,4\%$ )       15 ( $53,6\%$ )       58x         Sex         Male       59 ( $47,6\%$ )       65 ( $52,5\%$ )       1.213       0.271         Female       47 ( $40,5\%$ )       69 ( $59,5\%$ )       1.213       0.271         Ethnicity         Brahmin       38 ( $60,3\%$ )       25 ( $39,7\%$ )       Ch(fertrither)       14 ( $41,5\%$ )       48 ( $58,5\%$ )       10.086       0.39         Dalit       12 ( $31,6\%$ )       26 ( $68,4\%$ )       0.086       0.39         Dalit       12 ( $31,6\%$ )       20 ( $60,6\%$ )       Religion	10	21 (36.2%)	37 (63.8%)	0.440	
12       29 (41.4%)       41 (58.6%)         Sex       13 (46.4%)       15 (53.6%)         Male       59 (47.6%)       65 (52.5%)       1.213       0.271         Female       47 (40.5%)       69 (59.5%)       1.213       0.271         Ethnicity       Brahmin       38 (60.3%)       25 (39.7%)       0.271         Chhetri       34 (41.5%)       48 (58.5%)       10.086       0.39         Dalit       12 (31.6%)       26 (68.4%)       0       0.39         Dalit       12 (31.6%)       26 (68.4%)       0.47       0.828         Nerrenanet address       13 (39.4%)       20 (60.6%)       8       0.47       0.828         Non-Hindu       92 (44.4%)       115 (55.6%)       0.47       0.828         Non-Hindu       92 (44.4%)       19 (57.9%)       Permanet address         Inside valley       49 (36.6%)       85 (63.4%)       7.105       0.008*         Outside valley       49 (36.6%)       85 (63.4%)       7.105       0.008*         Nouclear       60 (37%)       102 (63%)       10.27       0.001*         Joint       46 (59%)       32 (41%)       53 (58.9%)       2.978       0.395         Stblings <t< td=""><td>11</td><td>43 (51.2%)</td><td>41 (48.8%)</td><td>3.442</td><td>0.332</td></t<>	11	43 (51.2%)	41 (48.8%)	3.442	0.332
13       13 (46.4%)       15 (53.6%)         Male       59 (47.6%)       65 (52.5%)       1.213       0.271         Female       47 (40.5%)       69 (59.5%)       1.213       0.271         Brahmin       38 (60.3%)       25 (39.7%)       5 (62.5%)       10.086       0.39         Chhetri       34 (41.5%)       48 (58.5%)       Thakuri       9 (37.5%)       15 (62.5%)       10.086       0.39         Dalit       12 (31.6%)       26 (68.4%)       0.47       0.828         Non-Hindu       12 (44.4%)       19 (57.9%)       0.47       0.828         Non-Hindu       92 (44.4%)       115 (55.6%)       0.47       0.828         Non-Hindu       14 (42.4%)       19 (57.9%)       0.008*       0.008*         Outside valley       49 (36.6%)       85 (63.4%)       7.105       0.008*         Notiside valley       57 (53.8%)       49 (46.2)       49 (36.6%)       85 (63.4%)       10.27       0.001*         Siblings       11 (28.2%)       22 (41.%)       10.27       0.001*       51 (31.3%)       86 (48%)       52 (47.6%)       60 (52.7%)       4.81       0.028*       0.028*       0.028*       0.028*       0.028*       0.021*       28 (41.62)	12	29 (41.4%)	41 (58.6%)		
Sex           Male         59 (47.6%)         65 (52.5%)         1.213         0.271           Female         47 (40.5%)         69 (59.5%)         0.271           Ethnicity $Farahmin$ 38 (60.3%)         25 (39.7%)         Chetri           Chhetri         34 (41.5%)         48 (58.5%)         0.086         0.39           Dalit         12 (31.6%)         26 (68.4%)         0.086         0.39           Dalit         12 (31.6%)         26 (68.4%)         0.086         0.39           Dalit         12 (31.6%)         26 (68.4%)         0.47         0.828           Non-Hindu         92 (44.4%)         115 (55.6%)         0.47         0.828           Non-Hindu         92 (44.4%)         19 (57.9%)         7.105         0.008*           Outside valley         57 (53.8%)         49 (46.2)         7.105         0.008*           Sublings         T         102 (63%)         10.27         0.001*           Siblings         11 (28.2%)         28 (71.8%)         0.028*           No         11 (28.2%)         28 (48%)         5         66.3.9%)         2.978         0.395           Higher Secondary Level         37 (41.1%)         53 (58.9%) </td <td>13 Som</td> <td>13 (46.4%)</td> <td>15 (53.6%)</td> <td></td> <td></td>	13 Som	13 (46.4%)	15 (53.6%)		
Mate35 (47,0%) $05 (22,3%)$ $1.215$ $0.271$ Female47 (40,5%)69 (59,5%) $10.285$ $0.271$ Brahmin38 (60,3%)25 (39,7%) $Chetri$ $34 (41,5%)$ $48 (58,5%)$ Thakuri9 (37,5%)15 (62,5%) $10.086$ $0.39$ Dalit12 (31,6%)26 (68,4%) $00.086$ $0.39$ Dalit12 (31,6%)26 (68,4%) $00.47$ $0.828$ Non-Hindu92 (44,4%)19 (57,9%) $0.47$ $0.828$ Non-Hindu14 (42,4%)19 (57,9%) $0.47$ $0.828$ Non-Hindu14 (42,4%)19 (57,9%) $0.47$ $0.828$ Non-Hindu92 (44,4%)115 (55,6%) $0.47$ $0.828$ Non-Hindu14 (42,4%)19 (57,9%) $0.008*$ $00.08*$ Outside valley57 (53,8%)49 (46,2) $0.008*$ $0.008*$ Sublings $000 (52,7%)$ $10.27$ $0.001*$ $0.001*$ Joint46 (59%)32 (41%) $0.028*$ $0.028*$ No11 (28,2%)28 (71.8%) $0.928*$ $0.395$ Higher Scondary Level39 (52%)36 (48%) $8.9\%$ $2.978$ $0.395$ Higher Secondary Level39 (52%)36 (48%) $8.8\%$ $8.8\%$ Secondary Level39 (52%)43 (64.2%) $15.719$ $0.003*$ Higher Secondary Level9 (36.8%)15 (31.3%) $8.8\%$ $8.8\%$ Bachelor and above9 (36.8%)15 (31.3%) $8.8\%$ $8.8\%$ Secondary level9 (33.3%)<	Sex	EQ (47 604)	6E (E2 E04)	1 9 1 9	0 271
Initial $T(40.3.0)$ $00(05.3.0)$ Brahmin38 (60.3.%)25 (39.7%)Chhetri34 (41.5%)48 (58.5%)Thakuri9 (37.5%)15 (62.5%)Dalit12 (31.6%)26 (68.4%)Others13 (39.4%)20 (60.6%)Religion115 (55.6%)0.47Hindu92 (44.4%)19 (57.9%)Permanent address1Inside valley49 (36.6%)85 (63.4%)Outside valley57 (53.8%)49 (46.2)Family type10.270.001*Nuclear60 (37%)102 (63%)Ioint46 (59%)32 (41%)Siblings936 (48%)Yes95 (47.3%)106 (52.7%)No11 (28.2%)28 (71.8%)Education status of father10Basic Level39 (52%)36 (48%)Secondary Level37 (41.1%)53 (58.9%)Bachelor and above9 (36%)16 (64%)Education status of mother11Iltiterate33 (68.8%)15 (31.3%)Basic level9 (33.3%)18 (66.7%)Basic level9 (33.3%)18 (66.7%)Bachelor and above3 (30%)7 (70%)Monthly income of family9Below 25,00072 (73.5%)26 (26.5%)25,000-50,00029 (30.5%)66 (69.5%)25,000-50,00029 (30.5%)66 (69.5%)25,000-50,00029 (30.5%)66 (69.5%)25,000-50,00029 (30.5%)66 (69.5%)25,000-50,00029 (3	Fomalo	39 (47.0%) 17 (10.5%)	69 (52.5%)	1.215	0.271
Brahmin38 (60.3 %)25 (39.7%)Chhetri34 (41.5%)48 (58.5%)Thakuri9 (37.5%)15 (62.5%)10.0860.39Dalit12 (31.6%)26 (68.4%)00.860.39Others13 (39.4%)20 (60.6%)8Religion115 (55.6%)0.470.828Non-Hindu14 (42.4%)19 (57.9%)9Permanet address19 (57.9%)0.008*Inside valley49 (36.6%)85 (63.4%)7.1050.008*Outside valley57 (53.8%)49 (46.2)49Siblings50 (37%)102 (63%)10.270.001*Joint46 (59%)32 (41%)3236Siblings51 (21.3%)28 (71.8%)29 (58%)2.9780.395Basic Level39 (52%)36 (48%)2.9780.39535Secondary Level37 (41.1%)53 (58.9%)2.9780.395Basic level39 (68.8%)15 (31.3%)3636Basic level42 (41.2%)60 (58.8%)55Bachelor and above9 (36%)16 (64%)40.03*43Higher Secondary level19 (35.8%)43 (66.7%)5.7190.003*Basic level32 (30%)7 (70%)4.81 (66.7%)5.7190.003*Basic level42 (41.2%)60 (58.8%)5.7170.001*Basic level39 (30.5%)66 (69.5%)62.7170.001*Basic level9 (30.5%)66 (69.5%)62.7170.001*	Fthnicity	17 (10.370)	00 (00.070)		
Chhetri $34 (41.5\%)$ $48 (58.5\%)$ Thakuri9 (37.5\%)15 (62.5\%)10.0860.39Dalit12 (31.6\%)26 (68.4%)0Others13 (39.4%)20 (60.6%)8Religion14 (42.4%)115 (55.6%)0.470.828Non-Hindu14 (42.4%)19 (57.9%)0.008*Outside valley49 (36.6%)85 (63.4%)7.1050.008*Outside valley57 (53.8%)49 (46.2)0.001**Family type102 (63%)10.270.001**Nuclear60 (37%)102 (63%)10.270.001**Joint46 (59%)32 (41%)32 (41%)Siblings95 (47.3%)106 (52.7%)4.810.028*No11 (28.2%)28 (71.8%)2.9780.395Education status of father9 (36%)16 (64%)53 (58.9%)2.9780.395Basic Level39 (52%)36 (48%)58 (64.8%)58 (64.9%)53 (58.9%)2.9780.395Bachelor and above9 (36%)16 (64%)Education status of mother1119 (35.8%)43 (64.2%)15.7190.003*Higher secondary Level42 (41.2%)60 (58.8%)15.7190.003*16 (66.7%)26 (26.5%)25.0002.7170.001*Basic level42 (33.3%)18 (66.7%)36 (48.9%)55 (22.9%)35 (14.6%)15.7190.003*Higher secondary level19 (35.8%)43 (64.2%)15.7190.003*16 (66.7%)Basic level42 (21.	Brahmin	38 (60.3 %)	25 (39.7%)		
Thakuri       9 (37.5%)       15 (62.5%)       10.086       0.39         Dalit       12 (31.6%)       26 (68.4%)       0         Others       13 (39.4%)       20 (60.6%)       0.47       0.828         Non-Hindu       92 (44.4%)       115 (55.6%)       0.47       0.828         Non-Hindu       14 (42.4%)       19 (57.9%)       7.105       0.008*         Permanent address       1000000000000000000000000000000000000	Chhetri	34 (41.5%)	48 (58.5%)		
Dalit12 (31.6%)26 (68.4%)Others13 (39.4%)20 (60.6%)Religion13 (39.4%)20 (60.6%)Hindu92 (44.4%)115 (55.6%)0.47Non-Hindu14 (42.4%)19 (57.9%)Permanent address1Inside valley49 (36.6%)85 (63.4%)7.105Outside valley57 (53.8%)49 (46.2)Family type $V$ 102 (63%)10.270.001*Nuclear60 (37%)102 (63%)10.270.001*Joint46 (59%)32 (41%) $V$ $V$ Siblings $V$ $V$ $V$ $V$ $V$ Yes95 (47.3%)106 (52.7%) $4.81$ $0.028*$ No11 (28.2%)28 (71.8%) $V$ $V$ Education status of father $V$ $V$ $V$ $V$ Basic Level39 (52%)36 (48%) $S$ $S$ Secondary Level37 (41.1%)53 (58.9%) $2.978$ $0.395$ Higher Secondary21 (42%)29 (58%) $S$ $S$ Bachelor and above9 (36%)16 (64%) $E$ $V$ Higher secondary level19 (35.8%)13 (64.2%)15.719 $0.003*$ Basic level3 (30%)7 (70%) $V$ $V$ Monthly income of family $V$ $V$ $V$ $V$ Below 25,0005 (10.6%)42 (89.4%) $V$ $V$ Physical activity $V$ $V$ $V$ $V$ $V$ No55 (22.9%)35 (48.9%)	Thakuri	9 (37.5%)	15 (62.5%)	10.086	0.39
Others         13 (39.4%)         20 (60.6%)           Religion $Hindu$ 92 (44.4%)         115 (55.6%)         0.47         0.828           Non-Hindu         14 (42.4%)         19 (57.9%) $Permanent address$ $I$ Inside valley         49 (36.6%)         85 (63.4%)         7.105         0.008*           Outside valley         57 (53.8%)         49 (46.2) $I$ $I$ Family type $I$	Dalit	12 (31.6%)	26 (68.4%)		
Religion $Hindu$ 92 (44.4%)115 (55.6%)0.470.828 $Hindu$ 14 (42.4%)19 (57.9%) $0.47$ 0.828Non-Hindu14 (42.4%)19 (57.9%) $0.008^*$ Permanent address $0.14 (42.4\%)$ 19 (57.9%) $0.008^*$ Outside valley57 (53.8%)45 (63.4%) $7.105$ $0.008^*$ Outside valley57 (53.8%)49 (46.2) $0.001^*$ $0.001^*$ Family type $0.002 (63\%)$ 10.27 $0.001^*$ Nuclear60 (37%)102 (63%)10.27 $0.001^*$ Joint46 (59%)32 (41%) $0.028^*$ Siblings $0.028^*$ $0.028^*$ $0.028^*$ Reading status of father $0.028^*$ $0.028^*$ Basic Level39 (52%)36 (48%) $0.028^*$ Secondary Level37 (41.1%)53 (58.9%) $2.978$ $0.395$ Higher Secondary Level9 (36%)16 (64%) $0.003^*$ Education status of mother $0.003^*$ $0.003^*$ $0.003^*$ Illiterate33 (68.8%)15 (31.3%) $0.003^*$ Basic level42 (41.2%)60 (58.8%) $0.003^*$ Secondary level9 (33.3%)18 (66.7%) $0.003^*$ Bachelor and above $3 (30\%$ $7 (70\%)$ $0.003^*$ Monthly income of family $0.003^*$ $0.003^*$ $0.003^*$ Below 25,000 $2 (73.5\%)$ $26 (26.5\%)$ $62.717$ $0.001^*$ Above 50,000 $5 (10.6\%)$ $99 (41.3\%)$ $16.766$ $0.001^*$ No	Others	13 (39.4%)	20 (60.6%)		
Hindu92 (44.4%)115 (55.6%) $0.47$ $0.828$ Non-Hindu14 (42.4%)19 (57.9%) $0.47$ $0.828$ Non-Hindu14 (42.4%)19 (57.9%) $0.001^{*}$ Permanent address $49 (36.6\%)$ $85 (63.4\%)$ $7.105$ $0.008^{*}$ Outside valley $57 (53.8\%)$ $49 (46.2)$ $0.001^{*}$ $0.001^{*}$ Family type $0.001^{*}$ $0.001^{*}$ $0.001^{*}$ $0.001^{*}$ Nuclear $60 (37\%)$ $102 (63\%)$ $10.27$ $0.001^{*}$ Joint $46 (59\%)$ $32 (41\%)$ $0.028^{*}$ $0.028^{*}$ Siblings $11 (28.2\%)$ $28 (71.8\%)$ $0.028^{*}$ Yes $95 (47.3\%)$ $106 (52.7\%)$ $4.81$ $0.028^{*}$ No $11 (28.2\%)$ $28 (71.8\%)$ $0.395$ Education status of father $39 (52\%)$ $36 (48\%)$ $58.9\%$ $2.978$ $0.395$ Bachelor and above $9 (36\%)$ $16 (64\%)$ $16 (64\%)$ $16 (64\%)$ Education status of mother $11 (28.2\%)$ $29 (58\%)$ $83 (66.7\%)$ $83 (66.7\%)$ Basic level $42 (41.2\%)$ $60 (58.8\%)$ $5.719$ $0.003^{*}$ Higher secondary level $9 (33.3\%)$ $18 (66.7\%)$ $15.719$ $0.003^{*}$ Higher secondary level $9 (30.5\%)$ $66 (69.5\%)$ $62.717$ $0.001^{*}$ Monthly income of family $19 (35.8\%)$ $26 (26.5\%)$ $25,000 (29 (30.5\%)$ $62 (25.5\%)$ $25,000 - 50,000$ $29 (30.5\%)$ $66 (69.5\%)$ $62.717$ $0.001^{*}$	Religion	i i i	i i i		
Non-Hindu14 (42.4%)19 (57.9%)Permanent address $I$ Inside valley49 (36.6%)85 (63.4%)7.1050.008*Outside valley57 (53.8%)49 (46.2) $F$ $F$ Family type $I$	Hindu	92 (44.4%)	115 (55.6%)	0.47	0.828
Permanent addressInside valley49 (36.6%)85 (63.4%)7.105 $0.008^*$ Outside valley57 (53.8%)49 (46.2) $49$ (46.2)Family typeNuclear60 (37%)102 (63%) $10.27$ $0.001^*$ Joint46 (59%)32 (41%) $32$ (41%) $32$ (41%)SiblingsYes95 (47.3%)106 (52.7%)4.81 $0.028^*$ No11 (28.2%)28 (71.8%) $28$ (71.8%) $85$ (63.4%) $56$ (48%)Education status of father39 (52%)36 (48%) $36$ (48%) $53$ (58.9%) $2.978$ $0.395$ Basic Level39 (52%)36 (48%) $29$ (58%) $86$ -condary $21$ (42%) $29$ (58%) $86$ -condary $29$ (36%) $16$ (64%)Education status of mother11 $23$ (68.8%)15 (31.3%) $8asic level$ $32$ (64.2%) $15.719$ $0.003^*$ Higher secondary level9 (33.3%)18 (66.7%) $86$ -condary level $9$ (33.3%)18 (66.7%)Bachelor and above3 (30%)7 (70%) $72$ (73.5%) $26$ (26.5%) $25,000$ .50,000 $29$ (30.5%) $66$ (69.5%) $62.717$ $0.001^*$ Monthly income of family $85$ $21$ (21.3%) $99$ (41.3%) $16.766$ $0.001^*$ No51 (21.3%) $99$ (41.3%) $16.766$ $0.001^*$ No55 (22.9%) $35$ (14.6%) $102$ (52%) $6.236$ $0.013^*$ Ves94 (48%)102 (52%) $6.236$ $0.013^*$ <td>Non-Hindu</td> <td>14 (42.4%)</td> <td>19 (57.9%)</td> <td></td> <td></td>	Non-Hindu	14 (42.4%)	19 (57.9%)		
Inside valley49 ( $36.6\%$ )85 ( $63.4\%$ )7.1050.008*Outside valley57 ( $53.8\%$ )49 ( $46.2$ )7.1050.008*Family type60 ( $37\%$ )102 ( $63\%$ )10.270.001*Joint46 ( $59\%$ )32 ( $41\%$ )32 ( $41\%$ )0.028*Siblings95 ( $47.3\%$ )106 ( $52.7\%$ )4.810.028*Yes95 ( $47.3\%$ )106 ( $52.7\%$ )4.810.028*No11 ( $28.2\%$ )28 ( $71.8\%$ )2.9780.395Education status of father39 ( $52\%$ )36 ( $48\%$ )2.9780.395Basic Level37 ( $41.1\%$ )53 ( $58.9\%$ )2.9780.395Higher Secondary21 ( $42\%$ )29 ( $58\%$ )8achelor and above9 ( $36\%$ )16 ( $64\%$ )Education status of mother1111100 ( $52.7\%$ )0.003*Illiterate33 ( $68.8\%$ )15 ( $31.3\%$ )5Basic level42 ( $41.2\%$ )60 ( $58.8\%$ )5Secondary level19 ( $35.8\%$ )43 ( $64.2\%$ )15.7190.003*Higher secondary level19 ( $35.3\%$ )18 ( $66.7\%$ )2525,00025 ( $20.5\%$ )62.7170.001*Bachelor and above3 ( $30\%$ )7 ( $70\%$ )70%)70%)70%70%Monthly income of family99 ( $30.5\%$ )66 ( $69.5\%$ )62.7170.001*Below 25,0005 ( $10.6\%$ )42 ( $89.4\%$ )16.7660.001*No55 ( $22.9\%$ )35 ( $14.6\%$ )16.7660.001*No55 ( $22.9\%$ )55 ( $12.7\%$ ) <td< td=""><td>Permanent address</td><td></td><td></td><td></td><td></td></td<>	Permanent address				
Outside valley $57 (53.8\%)$ $49 (46.2)$ Family type $1021 (63\%)$ $10.27$ $0.001^*$ Nuclear $60 (37\%)$ $102 (63\%)$ $10.27$ $0.001^*$ Joint $46 (59\%)$ $32 (41\%)$ $32 (41\%)$ $0.028^*$ Siblings $32 (41\%)$ $106 (52.7\%)$ $4.81$ $0.028^*$ No $11 (28.2\%)$ $28 (71.8\%)$ $4.81$ $0.028^*$ Baic Level $39 (52\%)$ $36 (48\%)$ $58 condary$ $2.978$ $0.395$ Higher Secondary $21 (42\%)$ $29 (58\%)$ $2.978$ $0.395$ Bachelor and above $9 (36\%)$ $16 (64\%)$ $16 (64\%)$ Education status of mother $11 (28.2\%)$ $29 (58\%)$ $36 (48.2\%)$ Biliterate $33 (68.8\%)$ $15 (31.3\%)$ $83 cic level$ $9 (33.3\%)$ $18 (66.7\%)$ Bachelor and above $3 (30\%)$ $7 (70\%)$ $0.003^*$ $16 (64\%)$ Higher secondary level $9 (33.3\%)$ $18 (66.7\%)$ $25,000$ $25,000$ $25,000$ $25 (2.5\%)$ $25,000$ $25 (2.5\%)$ $25 (2.5\%)$ $25 (2.5\%)$ $25 (2.5\%)$ $25 (2.5\%)$ $25 (2.5\%)$ $25 (2.5\%)$ $25 (2.717)$ $0.001^*$ No $55 (22.9\%)$ $55 (14.6\%)$ $16.766$ $0.001^*$ $10 (25\%)$ $6.236$ $0.013^*$	Inside valley	49 (36.6%)	85 (63.4%)	7.105	0.008*
Family typeNuclear $60 (37\%) & 102 (63\%) & 10.27 & 0.001^*$ Joint $46 (59\%) & 32 (41\%)$ Siblings	Outside valley	57 (53.8%)	49 (46.2)		
Nuclear $60 (37\%)$ $102 (63\%)$ $10.27$ $0.001^{*}$ Joint $46 (59\%)$ $32 (41\%)$ $10.27$ $0.001^{*}$ Siblings $32 (41\%)$ $106 (52.7\%)$ $4.81$ $0.028^{*}$ No $11 (28.2\%)$ $28 (71.8\%)$ $28 (71.8\%)$ $28 (71.8\%)$ Education status of fatherBasic Level $39 (52\%)$ $36 (48\%)$ Secondary Level $37 (41.1\%)$ $53 (58.9\%)$ $2.978$ $0.395$ Higher Secondary $21 (42\%)$ $29 (58\%)$ $8achelor and above$ $9 (36\%)$ $16 (64\%)$ Education status of mother $110 (35.8\%)$ $15 (31.3\%)$ $8asic level$ $42 (41.2\%)$ $60 (58.8\%)$ Baschelor and above $3 (30\%)$ $7 (70\%)$ $15.719$ $0.003^{*}$ Higher secondary level $19 (35.8\%)$ $43 (64.2\%)$ $15.719$ $0.003^{*}$ Higher secondary level $9 (33.3\%)$ $18 (66.7\%)$ $8achelor and above$ $3 (30\%)$ $7 (70\%)$ Monthly income of family $8elow 25,000$ $29 (30.5\%)$ $66 (69.5\%)$ $62.717$ $0.001^{*}$ Above $50,000$ $29 (30.5\%)$ $66 (69.5\%)$ $62.717$ $0.001^{*}$ No $55 (22.9\%)$ $35 (14.6\%)$ $16.766$ $0.001^{*}$ No $55 (22.9\%)$ $35 (14.6\%)$ $16.766$ $0.013^{*}$ Yes $94 (48\%)$ $102 (52\%)$ $6.236$ $0.013^{*}$	Family type		400 (000)	40.07	0.004*
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Nuclear	60 (37%)	102 (63%)	10.27	0.001*
ShiftingsYes $95 (47.3\%)$ $106 (52.7\%)$ $4.81$ $0.028^*$ No $11 (28.2\%)$ $28 (71.8\%)$ $E$ Education status of father $39 (52\%)$ $36 (48\%)$ Basic Level $37 (41.1\%)$ $53 (58.9\%)$ $2.978$ $0.395$ Higher Secondary $21 (42\%)$ $29 (58\%)$ $0.395$ Bachelor and above $9 (36\%)$ $16 (64\%)$ $0.028^*$ Education status of mother $11 (28.2\%)$ $29 (58\%)$ $0.395$ Bachelor and above $9 (36\%)$ $16 (64\%)$ $0.395$ Education status of mother $11 (28.2\%)$ $29 (58\%)$ $0.395$ Basic level $32 (68.8\%)$ $15 (31.3\%)$ $0.003^*$ Basic level $42 (41.2\%)$ $60 (58.8\%)$ $0.003^*$ Secondary level $19 (35.8\%)$ $43 (64.2\%)$ $15.719$ $0.003^*$ Higher secondary level $9 (33.3\%)$ $18 (66.7\%)$ $0.003^*$ Bachelor and above $3 (30\%)$ $7 (70\%)$ $0.001^*$ Monthly income of family $0.000 (29 (30.5\%)$ $62.717 (0.001^*)$ Below 25,000 $5 (10.6\%)$ $42 (89.4\%)$ $0.02 (52\%)$ Physical activity $19 (27.3\%)$ $99 (41.3\%)$ $16.766 (0.001^*)$ No $55 (22.9\%)$ $35 (14.6\%)$ $102 (52\%)$ $6.236 (0.013^*)$ Junk food status $19 (427.2\%)$ $29 (27.0\%)$ $0.27.0\%$ $0.013^*$	Joint	46 (59%)	32 (41%)		
Tes $33 (47.5\%)$ $100 (32.7\%)$ $4.81$ $0.028$ No $11 (28.2\%)$ $28 (71.8\%)$ $0.028$ Education status of father $39 (52\%)$ $36 (48\%)$ $36 (48\%)$ Basic Level $37 (41.1\%)$ $53 (58.9\%)$ $2.978$ $0.395$ Higher Secondary $21 (42\%)$ $29 (58\%)$ $0.395$ Bachelor and above $9 (36\%)$ $16 (64\%)$ $0.028$ Education status of mother $11 (28.2\%)$ $29 (58\%)$ $0.395$ Higher Secondary $21 (42\%)$ $29 (58\%)$ $0.395$ Bachelor and above $9 (36\%)$ $16 (64\%)$ $0.003^*$ Higher secondary level $42 (41.2\%)$ $60 (58.8\%)$ $0.003^*$ Secondary level $19 (35.8\%)$ $43 (64.2\%)$ $15.719$ $0.003^*$ Higher secondary level $9 (33.3\%)$ $18 (66.7\%)$ $0.003^*$ Bachelor and above $3 (30\%)$ $7 (70\%)$ $0.001^*$ Monthly income of family $0.003^*$ $0.003^*$ Below 25,000 $29 (30.5\%)$ $66 (69.5\%)$ $62.717$ $25,000-50,000$ $5 (10.6\%)$ $42 (89.4\%)$ $0.001^*$ Above 50,000 $5 (12.3\%)$ $99 (41.3\%)$ $16.766$ $0.001^*$ No $55 (22.9\%)$ $35 (14.6\%)$ $102 (52\%)$ $6.236$ $0.013^*$ Yes $94 (48\%)$ $102 (52\%)$ $6.236$ $0.013^*$	Siblings	OE(47.206)	106 (52 7%)	1 01	0 020*
HO       11 (28,2%)       28 (71.8%)         Education status of father       39 (52%)       36 (48%)         Basic Level       37 (41.1%)       53 (58.9%)       2.978       0.395         Higher Secondary Level       37 (41.1%)       53 (58.9%)       2.978       0.395         Higher Secondary       21 (42%)       29 (58%)       0.395         Bachelor and above       9 (36%)       16 (64%)       0.395         Education status of mother       11       11       11.1%)       53 (58.9%)       2.978       0.395         Basic level       21 (42%)       29 (58%)       16 (64%)       0.395       16 (64%)       0.395         Basic level       42 (41.2%)       60 (58.8%)       53 (64.2%)       15.719       0.003*         Basic level       19 (35.8%)       43 (64.2%)       15.719       0.003*         Bachelor and above       3 (30%)       7 (70%)       0.003*         Monthly income of family       18 (66.7%)       26 (26.5%)       25,000       25,000       29 (30.5%)       66 (69.5%)       62.717       0.001*         Above 50,000       5 (10.6%)       42 (89.4%)       10.001*       28 (41.3%)       16.766       0.001*         No       55 (22.9%)       <	No	33 (47.370) 11 (28 20%)	100(32.770) 28(71.806)	4.01	0.028
Basic Level $39 (52\%)$ $36 (48\%)$ Secondary Level $37 (41.1\%)$ $53 (58.9\%)$ $2.978$ $0.395$ Higher Secondary $21 (42\%)$ $29 (58\%)$ Bachelor and above $9 (36\%)$ $16 (64\%)$ Education status of motherIlliterate $33 (68.8\%)$ $15 (31.3\%)$ Basic level $42 (41.2\%)$ $60 (58.8\%)$ Secondary level $19 (35.8\%)$ $43 (64.2\%)$ $15.719$ Bachelor and above $3 (30\%)$ $7 (70\%)$ Monthly income of familyBelow 25,000 $72 (73.5\%)$ $26 (26.5\%)$ $25,000-50,000$ $29 (30.5\%)$ $66 (69.5\%)$ $62.717$ Above 50,000 $5 (10.6\%)$ $42 (89.4\%)$ Physical activityYes $51 (21.3\%)$ $99 (41.3\%)$ $16.766$ $0.001^*$ No $55 (22.9\%)$ $35 (14.6\%)$ $Junk food status$ $102 (52\%)$ $6.236$ $0.013^*$	Education status of father	11 (20.2 /0)	20 (/1.070)		
Secondary Level       37 (41.1%)       53 (58.9%)       2.978       0.395         Higher Secondary       21 (42%)       29 (58%)       2.978       0.395         Bachelor and above       9 (36%)       16 (64%)       16 (64%)       16 (64%)         Education status of mother       33 (68.8%)       15 (31.3%)       15 (31.3%)         Basic level       42 (41.2%)       60 (58.8%)       15.719       0.003*         Secondary level       19 (35.8%)       43 (64.2%)       15.719       0.003*         Higher secondary level       9 (33.3%)       18 (66.7%)       0.003*         Bachelor and above       3 (30%)       7 (70%)       0.001*         Monthly income of family       9       10.6%)       42 (89.4%)       0.001*         Physical activity       Yes       51 (21.3%)       99 (41.3%)       16.766       0.001*         No       55 (22.9%)       35 (14.6%)       102 (52%)       6.236       0.013*         Yes       94 (48%)       102 (52%)       6.236       0.013*	Basic Level	39 (52%)	36 (48%)		
Bigher Secondary       21 (42%)       29 (58%)         Bachelor and above       9 (36%)       16 (64%)         Education status of mother       33 (68.8%)       15 (31.3%)         Basic level       42 (41.2%)       60 (58.8%)         Secondary level       19 (35.8%)       43 (64.2%)       15.719       0.003*         Higher secondary level       9 (33.3%)       18 (66.7%)       3 (30%)       7 (70%)         Monthly income of family       9       30%)       7 (70%)       0.001*         Monthly income of family       99 (30.5%)       66 (69.5%)       62.717       0.001*         Above 50,000       5 (10.6%)       42 (89.4%)       0.001*       0.001*         Monthly income of family       99 (41.3%)       16.766       0.001*         Junk food status       94 (48%)       102 (52%)       6.236       0.013*	Secondary Level	37 (41.1%)	53 (58.9%)	2.978	0.395
Bachelor and above9 (36%)16 (64%)Education status of mother1000000000000000000000000000000000000	Higher Secondary	21 (42%)	29 (58%)	21070	0.000
Education status of motherIlliterate33 (68.8%)15 (31.3%)Basic level42 (41.2%)60 (58.8%)Secondary level19 (35.8%)43 (64.2%)15.719Higher secondary level9 (33.3%)18 (66.7%)Bachelor and above3 (30%)7 (70%)Monthly income of familyBelow 25,00072 (73.5%)26 (26.5%)25,000-50,00029 (30.5%)66 (69.5%)62.717Above 50,0005 (10.6%)42 (89.4%)Physical activityYes51 (21.3%)99 (41.3%)16.7660.001*No55 (22.9%)35 (14.6%)102 (52%)6.2360.013*Yes94 (48%)102 (52%)6.2360.013*	Bachelor and above	9 (36%)	16 (64%)		
Illiterate33 (68.8%)15 (31.3%)Basic level42 (41.2%)60 (58.8%)Secondary level19 (35.8%)43 (64.2%)15.719Higher secondary level9 (33.3%)18 (66.7%)Bachelor and above3 (30%)7 (70%)Monthly income of familyBelow 25,00072 (73.5%)26 (26.5%)25,000-50,00029 (30.5%)66 (69.5%)62.717Above 50,0005 (10.6%)42 (89.4%)Physical activityYes51 (21.3%)99 (41.3%)16.7660.001*Junk food status94 (48%)102 (52%)6.2360.013*	Education status of mother				
Basic level $42 (41.2\%)$ $60 (58.8\%)$ Secondary level19 (35.8%) $43 (64.2\%)$ $15.719$ $0.003^*$ Higher secondary level9 (33.3%) $18 (66.7\%)$ $0.003^*$ Bachelor and above $3 (30\%)$ $7 (70\%)$ $7 (70\%)$ Monthly income of family $0.003^*$ $0.003^*$ Below 25,000 $72 (73.5\%)$ $26 (26.5\%)$ $25,000-50,000$ $29 (30.5\%)$ $66 (69.5\%)$ $62.717$ $0.001^*$ $42 (89.4\%)$ $0.001^*$ Physical activity $99 (41.3\%)$ $16.766$ $0.001^*$ No $55 (22.9\%)$ $35 (14.6\%)$ $102 (52\%)$ $6.236$ $0.013^*$ Yes $94 (48\%)$ $102 (52\%)$ $6.236$ $0.013^*$	Illiterate	33 (68.8%)	15 (31.3%)		
Secondary level $19 (35.8\%)$ $43 (64.2\%)$ $15.719$ $0.003^*$ Higher secondary level $9 (33.3\%)$ $18 (66.7\%)$ $0.003^*$ Bachelor and above $3 (30\%)$ $7 (70\%)$ $7 (70\%)$ Monthly income of family $72 (73.5\%)$ $26 (26.5\%)$ Below 25,000 $29 (30.5\%)$ $66 (69.5\%)$ $62.717$ $25,000-50,000$ $5 (10.6\%)$ $42 (89.4\%)$ Physical activity $72 (73.5\%)$ $26 (26.5\%)$ Yes $51 (21.3\%)$ $99 (41.3\%)$ $16.766$ Junk food status $55 (22.9\%)$ $35 (14.6\%)$ Yes $94 (48\%)$ $102 (52\%)$ $6.236$ $0.013^*$	Basic level	42 (41.2%)	60 (58.8%)		
Higher secondary level $9 (33.3\%)$ $18 (66.7\%)$ Bachelor and above $3 (30\%)$ $7 (70\%)$ Monthly income of familyBelow 25,000 $72 (73.5\%)$ $26 (26.5\%)$ $25,000-50,000$ $29 (30.5\%)$ $66 (69.5\%)$ $62.717$ Above 50,000 $5 (10.6\%)$ $42 (89.4\%)$ Physical activityYes $51 (21.3\%)$ $99 (41.3\%)$ $16.766$ $0.001^*$ Junk food statusYes $94 (48\%)$ $102 (52\%)$ $6.236$ $0.013^*$	Secondary level	19 (35.8%)	43 (64.2%)	15.719	0.003*
Bachelor and above $3 (30\%)$ $7 (70\%)$ Monthly income of familyBelow 25,000 $72 (73.5\%)$ $26 (26.5\%)$ $25,000-50,000$ $29 (30.5\%)$ $66 (69.5\%)$ $62.717$ $Above 50,000$ $5 (10.6\%)$ $42 (89.4\%)$ Physical activityYes $51 (21.3\%)$ $99 (41.3\%)$ $16.766$ $0.001^*$ NoJunk food statusYes $94 (48\%)$ $102 (52\%)$ $6.236$ $0.013^*$	Higher secondary level	9 (33.3%)	18 (66.7%)		
Monthly income of familyBelow 25,000 $72 (73.5\%)$ $26 (26.5\%)$ $25,000-50,000$ $29 (30.5\%)$ $66 (69.5\%)$ $62.717$ $Above 50,000$ $5 (10.6\%)$ $42 (89.4\%)$ Physical activityYes $51 (21.3\%)$ $99 (41.3\%)$ $16.766$ $0.001^*$ NoJunk food statusYes $94 (48\%)$ $102 (52\%)$ $6.236$ $0.013^*$	Bachelor and above	3 (30%)	7 (70%)		
Below 25,000 $72 (73.5\%)$ $26 (26.5\%)$ $25,000-50,000$ $29 (30.5\%)$ $66 (69.5\%)$ $62.717$ $0.001^*$ Above 50,000 $5 (10.6\%)$ $42 (89.4\%)$ $Physical activity$ Yes $51 (21.3\%)$ $99 (41.3\%)$ $16.766$ $0.001^*$ No $55 (22.9\%)$ $35 (14.6\%)$ $I02 (52\%)$ $6.236$ $0.013^*$ Junk food status $94 (48\%)$ $102 (52\%)$ $6.236$ $0.013^*$	Monthly income of family				
25,000-50,000       29 (30.5%)       66 (69.5%)       62.717       0.001*         Above 50,000       5 (10.6%)       42 (89.4%)       0.001*         Physical activity       99 (41.3%)       16.766       0.001*         No       55 (22.9%)       35 (14.6%)       16.766       0.001*         Junk food status       94 (48%)       102 (52%)       6.236       0.013*	Below 25,000	72 (73.5%)	26 (26.5%)	00 545	0.004*
Above 50,000     5 (10.6%)     42 (89.4%)       Physical activity       Yes     51 (21.3%)     99 (41.3%)     16.766     0.001*       No     55 (22.9%)     35 (14.6%)       Junk food status       Yes     94 (48%)     102 (52%)     6.236     0.013*	25,000-50,000	29 (30.5%)	66 (69.5%)	62.717	0.001*
Physical activity         Yes       51 (21.3%)       99 (41.3%)       16.766       0.001*         No       55 (22.9%)       35 (14.6%)       102 (52%)       6.236       0.013*         Junk food status       94 (48%)       102 (52%)       6.236       0.013*	Above 50,000	5 (10.6%)	42 (89.4%)		
100       51 (21.5%)       99 (41.5%)       10.706       0.001         No       55 (22.9%)       35 (14.6%)       0.001         Junk food status       94 (48%)       102 (52%)       6.236       0.013*         Ves       94 (48%)       102 (52%)       6.236       0.013*		E1 (01 00/)	00(41.20)	16 766	0.001*
No         53 (22.3 %)         53 (14.0 %)           Junk food status         94 (48%)         102 (52%)         6.236         0.013*           Yes         94 (48%)         102 (52%)         6.236         0.013*	No	51(21.5%) 55(22.0%)	99 (41.3%) 25 (14 60%)	10.700	0.001
Yes $94 (48\%)$ $102 (52\%)$ $6.236$ $0.013^*$ 12 (37.20%)22 (72.70%)	Iunk food status	33 (22.370)	33 (14.070)		
	Ves	94 (48%)	102 (52%)	6 2 3 6	0 013*
1/(1/(3)) $3/(1/(3))$	No	12 (27.3%)	32(72.7%)	0.230	0.015
Break-time tiffin	Break-time tiffin				
Roti/Paratha and vegetables from home 21 (33.9%) 41 (61.1%)	Roti/Paratha and vegetables from home	21 (33.9%)	41 (61.1%)		
Packed food (Noodles/Biscuits) 16 (53.3%) 14 (46.7%) 15.085 0.002*	Packed food (Noodles/Biscuits)	16 (53.3%)	14 (46.7%)	15.085	0.002*
Fast-food from canteen       24 (32.9%)       49 (67.1%)	Fast-food from canteen	24 (32.9%)	49 (67.1%)		
Noon / Skips 45 (60%) 30 (40%)	Noon / Skips	45 (60%)	30 (40%)		

\*Percentage values are based on column totals.

Table 3 is a comprehensive examination of respondents' dietary patterns and lifestyle choices. The data reveals that a significant majority of adolescents identified as nonvegetarian (81.3%). The frequency of meals per day varied, with 44.6% opting for three meals, and 40.8% for four meals a day. Notably, 81.7% of respondents reported consuming junk food, among whom 33.0% did so daily, and 27.8% on alternate days. Fruits consumption frequency varied, with 17.5% consuming them daily, and 46.3% weekly. Green leafy vegetables were more prominently included in daily diets, with 53.8% consuming them daily, 38.3% alternately, and 7.9% weekly. Mid-day meal preferences indicated that 30.4% preferred fast food from canteens, while 31.3% either skipped or had no specific mid-day meals.

Fig. 1 shows the nutritional status of the respondents according to the WHO AnthroPlus software, BMI for age. Regarding nutritional status, 56.0% of the participants had normal weight, whereas 23.0% were very thin and 21.0% were thin. Altogether 44.0% of the participants were underweight.

An attempt was made to examine the association between the dependent variable (nutritional status) and the explanatory variables in table 4 where the chi-square test was applied. highly significant association between Α (p =0.001), physical activity family type (p = 0.001), and family income (p = 0.001) with nutritional status was observed. Furthermore, a statistically significant association was found between junk food status and break-time tiffin [*Roti/Paratha* and vegetables from home, packed food (Noodles/Biscuits), Fast-food from canteen] and Noon/Skips and nutritional status (p =0.045 and 0.004, respectively). This study also found a significant association between the mother's education status and nutritional status (p =0.003).

### DISCUSSION

In the study conducted in 2023 AD in rural Ghana, 137 young adolescents were enrolled, WHO AnthroPlus software was used to measure the BMI. A large proportion 88.4% had a normal BMI status while 5.8% each were overweight and underweight but differed in this study, more than fifty percent 55.8% were normal and 44.2% were underweight. Likewise, the meal frequency of adolescents was three times in more than 70.0% of adolescents followed by 4 times the meal frequency (15.32%) of respondents but in this study, the majority of the respondents (44.6%) had meal frequency three times followed by four times a day (40.8%).<sup>18</sup> Likewise, as compared to the prevalence of underweight was higher in males (24.5%) than

in females (19.58%) which shows consistency in this study as the prevalence of underweight was higher in males (32.4%) than in females (10.4%).<sup>3</sup>

In the present study among adolescents, 57.2% of adolescents were normal weight followed by underweight (42.2%). The findings in this study were a different to the study conducted in the Dang District as 74.3% of adolescents were normal weight, followed by underweight (21.8%), overweight (3.1%) and obesity (0.8%).<sup>15</sup> Similarly, a study conducted in the Kaski District showed 50.6% of adolescents were underweight followed by normal weight (38.3%) and overweight (11.0%) which was different from this study where more than fifty percent 55.8% were normal and 44.2% were underweight. In the same study conducted in Kaski District showed that there is a significant association between nutrition status and ethnicity, type of family which is similar to this study as there is a significant association between nutrition status and ethnicity (p = 0.039) and type of family (p = 0.039).<sup>2</sup>

The present study showed the prevalence of underweight (42.2%), and (57.8%) normal weight is consistent to the study conducted in the Western Region of Nepal, more than half of the respondents (69.64%) were normal weight, and (30.45%) were underweight.<sup>18</sup> The Crosssectional study conducted on the Government School of Solukhumbu District, Nepal showed that the prevalence of underweight was 40.0% followed by normal weight (40.0%) and overweight (6.36%) but in this study, the prevalence of underweight was slightly higher (44.2%) whereas more than fifty percent (55.8%) were of normal weight.<sup>5</sup>

Adolescent Nutrition Survey in Nepal 2014 showed 79.5% of adolescents were under-weight followed by 20.1% were normal weight and 0.9% were overweight which showed contrast in the study as prevalence of underweight is 42.2% and normal weight is 57.8%.<sup>10</sup> The study was conducted in the Dang district, where the majority of the respondents (51.4%) were male. The majority of the respondents (42.7%) belonged to the Brahman-Chhetri ethnicity. Likewise, the majority of the respondents belonged to a nuclear family (64.3%) which showed consistent to the study as the majority of the respondents were males (51.7%) where as the majority of the respondents (60.5%) were *Brahmin-Chhetri*. Likewise, the majority of the respondents belonged to the nuclear family (73.8%).15

Furthermore, the study showed nutritional status of adolescents was significantly associated with family monthly income (p =0.001), permanent address (p =0.008), mother education (p =0.003), physical activity

(p =0.001), number of siblings (p =0.004), junk food status (p =0.001) and break-time tiffin (p =0.002). These findings highlight the multifaceted nature of factors influencing the nutritional status of adolescents. Addressing these factors, such as promoting healthy eating habits, encouraging physical activity, and considering socioeconomic factors, could improve adolescents' overall health and wellbeing.

*Limitations of the study:* As the study is based on food consumption of the past, recall bias might affect the precision of findings. However, efforts were made to minimize such bias.

#### ACKNOWLEDGEMENT

The authors would like to acknowledge all the adolescents and their parents who participated in the study without any personal benefit. We would also like to acknowledge Birendranagar Municipality for providing such a cooperative environment and authorities of selected schools to conduct the study.

**Conflict of interests:** None **Source of research fund:** None

#### REFERENCES

- Kahssay M, Mohamed L, Gebre A. Nutritional status of school going adolescent girls in Awash Town, Afar Region, Ethiopia. J Environ Public Health 2020; 2020: 1–9. DOI: 10.1155/2020/7367139
- Puri A, Adhikari C. Nutritional status and its associated factors among adolescents. J Health Allied Sci 2019; 7: 15–26. DOI: 10.37107/jhas.18
- Damie T, Kbebew M, Teklehaymanot A. Nutritional status and associated factors among school adolescents in Chiro Town, West Hararge, Ethiopia. *Gaziantep Med J* 2015; 21: 32. DOI: 10.5455/GMJ-30-169505
- 4. Shaikh R, Haboubi G. A comparison of the nutritional status of adolescents from selected schools of South India and UAE : A cross-sectional study. *Indian J Community Med* 2009; 34: 108. DOI: 10.4103/0970-0218.51230
- Sherpa AT, Singh N, Basnet PB, Sherpa MC. Nutritional status assessment of adolescent school going children in Solukhumbu, Nepal. *Nepal Med J* 2019; 2: 155–9. DOI: 10.3126/nmj. v2i1.24488
- Roba KT, Abdo M. Nutritional status and its associated factors among school adolescent girls in Adama City, Central Ethiopia. DOI: 10.417/2155-9600.1000493
- Pal A, Pari AK, Sinha A, Dhara PC. Prevalence of undernutrition and associated factors: a crosssectional study among rural adolescents in West Bengal, India. *Int J Pediatr Adolesc Med* 2017; 4: 9–18. DOI: 10.1016/j.ipam.2016.08.009
- 8. Cusick SE, Kuch AE. Determinants of Undernutrition and overnutrition among adolescents in developing countries. *Adolesc Med State Art Rev* 2012; 23: 440–56.
- Waslien CI, Stewart LK. Nutrition of the Asian adolescent girl. Asia Pac J Public Health 1994; 7: 31–3.DOI: 10.1177/101053959400700106
- 10. Aryal KK, Mehta RK, Chalise B *et al.* Adolescent Nutrition Survey in Nepal, 2014. Kathmandu, Nepal: Nepal Health Research Council, 2016.

- 11. Ministry of Health and Population, Nepal; New ERA; and ICF. 2022. Nepal Demographic and Health Survey 2022: Key Indicators Report. Kathmandu, Nepal: Ministry of Health and Population, Nepal. Nepal Demographic and Health Survey 2022.
- Dhobi S, Giri M. Food habits and nutritional status of adolescents in Malangwa Municipality, Sarlahi, Nepal: a cross-sectional study. *MedS Alliance J Med Med Sci* 2021; 1: 20–4. DOI: 10.3126/mjmms.vli1.42997
- 13. Nr RM. Ramesh Masthi NR, Madhusudan M, Gangaboraiah. Nutritional status of school age children (6-15 years) using the new WHO growth reference in a rural area of Bengaluru, South India. *Nat'l J Res Com Med* 2017; 6: 144-50.
- 14. Welcome to Birendranagar Municipality, Office of Municipal Executive | Birendranagar Municipality, Office of Municipal Executive [Internet]. [cited 2023 Dec 18]. Available from: https://birendranagarmun.gov.np/en
- 15. Bhattarai S, Bhusal CK. Prevalence and associated factors of malnutrition among school going adolescents of Dang District, Nepal. *AIMS Public Health* 2019; 6: 291–306.
- 16. Weir CB, Jan A. BMI Classification Percentile And Cut Off Points. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 [cited 2024 Jan 3].
- Nemous TeensHealth [Internet]. [cited 2024 Jan 3]. Body Mass Index (BMI) (for Teens) - Nemours KidsHealth. Available from: https://kidshealth. org/en/teens/bmi.html
- 18. Wiafe MA, Apprey C, Annan RA. Dietary diversity and nutritional status of adolescents in rural Ghana. *Nutr Metab Insights* 2023 DOI:10.1177/1178638823115848
- 19. Hs J. Determinants of nutritional status of school children - a cross sectional study in the western region of Nepal. 2. eISSN: 0975-9840