Title: Determination of junk food consumption with respect to central and general obesity: a cross-sectional study among Tibetan adolescent girls of India.

Author details: Neelam Singh1, Shweta Singh1*, Gautam Kumar Kshatriya2

1. Senior research fellow, Department of Anthropology, University of Delhi, Delhi-110007; neelu28051993@gmail.com.

1*. Senior research fellow, Department of Anthropology, University of Delhi, Delhi-110007; shweta.ponia@gmail.com.

2. Retd. Professor, Department of Anthropology, University of Delhi, Delhi-110007; g26_51@yahoo.co.in.

*Corresponding author: Shweta Singh

ORCiD of corresponding author: https://orcid.org/0000-0002-5474-4449

Email Id: shweta.ponia@gmail.com

Address: Department of Anthropology, Faculty of Science, University of Delhi, Delhi-110007.
Abstract

Deterioration in health due to junk food consumption has emerged as a global health concern, with adolescents at more risk. A cross-sectional study was conducted to understand the dynamics of junk food consumption with obesity in Tibetan adolescent girls (13-18 years; N=276) of Himachal Pradesh, India. A pre-tested schedule and anthropometric measurements were used for data collection. Descriptive and bivariate analysis, Odds ratio were performed. The study found 45.28% girls were consuming some form of junk food. 25.4% and 16.3% girls were found to be centrally obese according to Waist Hip Ratio (WHR) and Waist-Height Ratio (WHtR) respectively. Girls who were consuming junk food were found to be at greater risk (WHR: OR=7.942, 95% CI=4.132-15.262; WHtR: OR=3.652, 95% CI=1.820-7.327 at p<0.001) of developing abdominal obesity. Frequent consumption of junk food was found to be remarkably high (77.60%) among the studied population. It is of utmost importance to prioritize the implementation of healthy eating promotion programs through various governmental and non-governmental agencies in order to improve health in adolescents.

Keywords: Junk food, General obesity, Central obesity, Adolescent girls, Tibetan.

Introduction
Adolescent obesity has been increasing at an alarming rate worldwide, making it a global public health concern. Recently, 18.4% female adolescents aged 10–19 years were reported to be overweight or obese\(^1\). Adolescent girls form a more vulnerable group because of their increased nutritional needs for future reproductive processes and devalued social powers\(^2\). To combat this building threat, World Health Organization (WHO) endorsed “no increase in childhood overweight by 2025” as one of the six global nutrition targets in the ‘Comprehensive Implementation Plan for Maternal, Infant and Young Child Nutrition’\(^3\). Several factors such as eating habits and disorders may have contributed to the obesity epidemic\(^4\). Junk food consumption has played a significant role in increasing global obesity rates\(^5\), and many scholars have reported strong positive associations between junk food consumption and weight gain during the transition from childhood to adulthood\(^6\)–\(^7\).

Junk food is defined as food which is easily available, usually inexpensive, and has less nutrient value\(^8\). Due to its cheap cost and easy availability, households in both developed and developing nations have been witnessing a shift from traditional diets towards the fast food industry\(^9\). This shift is causing negative nutrition transitions, as these foods contain more calories and salt, have a higher content of saturated fat, and contain less iron, calcium, and dietary fiber\(^10\). Past researches also suggest that fast food consumption is responsible for insulin resistance and type 2 diabetes\(^4\),\(^11\) hypertension and dyslipidemia\(^12\). Studies have revealed that individuals whose junk food intake is once in a week are at a 20% increased risk for developing coronary heart disease and the risk increases with the consumption rates per week\(^6\),\(^13\).

India has recorded a 4% increase in obesity. The obesity prevalence went up in women to 24%\(^14\) from 20.6%\(^15\). It may be added that school going children and adolescents are at a higher risk because of the easy access to and availability of junk
food which has been observed to have positive relationship with weight gain. In this context, there are not many studies in India on adolescent girls in different ethnic groups, which relate obesity with consumption of junk food. An attempt has therefore been made in this study to understand the dynamics of junk food consumption with obesity.

**Material and Methods**

*Study design:* The data were collected on 276 Tibetan adolescent girls (13–18 years) from various schools of Kangra district, Himachal Pradesh, India using stratified random sampling technique. Authorized informed consent was taken from the school management. Sample size of studied population was calculated using formula

\[ N = \frac{z^2 \times p (1-p)}{d^2} \]

where, \( N \) is sample size, \( p = 17.7\% \) (previous prevalence), \( z = 1.96 \) (95% confidence level), \( d \) is relative precision of 5%. Taking 15% as non-response rate, a total sample of 276 girls were taken.

**Anthropometric measurements** (stature, weight, waist circumference and hip circumference) were taken as per the standards and protocols provided by the International Society for the Advancement of Kinanthropometry.

**Assessment of obesity:** The cutoff points recommended by IAP for girls, were used to analyze the general obesity in terms of Body Mass Index (BMI). Similarly for central obesity, WHR and WHtR cutoffs were used.

**Determination of junk food consumption:** A pre-tested schedule was used to determine the consumption of junk food which included questions like type and
frequency of junk food consumption as well as time and reason behind the consumption.

Statistical analysis was done using SPSS Version 20.0 and MS-Excel. The binary logistic regression analysis was done to estimate the odds ratios (ORs) and 95% confidence intervals (CIs) to study the association between junk food consumption and obesity (central and general). A p-value of <0.01 was considered as statistically significant.

Results

Among adolescent girls across the age group, the total junk food consumption on a weekly basis was reported by 45.3% participants (N=125). The frequency of consumption (> 3 days/week) was also high, being 77.6%. Among different reasons behind the consumption of junk food, taste (100%) and convenience (71.2%) were found to be the most common reasons and were generally consumed at evening or in the afternoon (89.6%) as shown in table 1. (Insert table 1 here)

Among different types, salty snacks (96.8%) and fried food (92.8%) were highly popular with the study participants as shown in figure 1. (Insert figure 1 here)

Figure 2 illustrates the prevalence of obesity by general and central obesity, and it can be seen that central obesity is higher than that of general obesity. (Insert figure 2 here)

The association of junk food consumption with obesity predictors among adolescent girls (Table 2) showed that girls consuming junk food exhibited 8 times greater odds
(95% CI=4.132-15.262; p<0.001) of being centrally obese with WHR and 3.7 times (95% CI=1.820-7.327; p<0.001) with WHtR than those not consuming junk food. No significant association of junk food consumption with general obesity was found in the studied population.  

**Discussion**

The prevalence of adolescent obesity in Asia has increased many folds in recent years along with associated diseases such as cardiovascular disease, hypertension, hyperlipidemia, type-2 diabetes, and certain cancers. An attempt has been made in the present study to determine the relationship between junk food consumption among school going Tibetan adolescents with respect to central and general obesity. The prevalence of junk food consumption in the present study based on last week’s reporting was found to be 45.28%. This prevalence is less than the study conducted on adolescents in Nepal, showing 60.3% prevalence of consumption of junk food. Also, 25.4% and 16.3% girls were found to be centrally obese as per WHR and WHtR respectively in the present study. Girls who were consuming junk food exhibited 8 times and 3.7 times greater risk of developing central obesity with WHR and WHtR respectively.

Globally, junk food has almost replaced the traditional home cooked meals as they can be found in ready to eat state in canned form and can be preserved for a long time unlike traditional cooked foods. Also, more girls (77.60%) were frequently consuming junk food over the reported week. Most consumed junk food was salty snacks (96.8%) and fried foods (92.8%), followed by sweetened beverages (82.40%). Adolescents spend the majority of their time outside for tuition and school purposes.
creating meal time constraints, which makes fast food an ideal snack to meet their hunger.

The consumption of junk foods has accelerated in developed countries and now a forward trend in developing countries is being reported continuously\textsuperscript{12}. As a part of this, eating out has emerged as a new trend, which was earlier more prevalent among the higher socio-economic group. Also, new fast city life is demanding people for quick solutions for everything including their meals\textsuperscript{25}. Accompanying changes in lifestyle, continuous advertisements by food outlets has led to popularity of fast food in small towns, making its success inevitable\textsuperscript{26}. In the present study, convenience (100\%) and taste (71.20\%) of the fast foods followed by peer influence (50.40\%) has been reported as the main reason for consumption. This finding is consistent with the findings reported in various previous studies\textsuperscript{27-28,27}. Many studies have found other associated factors such as advertisement, marketing and fast service with the increasing obesity trends\textsuperscript{29,30}.

Majority (89.60\%) of the adolescent girls were found to be consuming junk food in their snack time, which is in accordance with previous studies\textsuperscript{31-32,27}. A study has reported a positive association of sedentary behavior with fast food consumption\textsuperscript{33}. In addition to this, technological advancements in Asian countries has made the leisure time of adolescents more about watching TV and sitting around which used to be their outdoor playing time. Previous studies have found that television viewing has a significant relationship with unhealthy dietary habits among older children and adolescents, which include consumption of junk food, sweetened beverages, and consumption of fewer fruits and vegetables\textsuperscript{34-36}. Researchers have stated that modernization and sedentary lifestyle has amplified the hazards of fast foods for gaining unhealthy and excessive weight\textsuperscript{10}.
The findings of the present study revealed that overall prevalence of general obesity was 23.5%. In 2015, a total of 107.7 million children were obese. Data from different countries namely, Lebanon (32.2%) and United states (52%), shows higher prevalence of obesity as compared to what is observed in the present study. However, lower prevalence was reported from Greece (19.2%), Iran (6.4%) and Peru (8%) when compared with the present findings.

A similar prevalence of central obesity (16.7%) was reported among 1500 Egyptian adolescents by WHtR. A study conducted in Saudi Arabia revealed that children who consume chocolate, sweets, fast food, and soft drinks had an increased risk of being obese. Watching TV while eating and fast-food consumption was associated with increased waist circumference. Consumption of soft drinks was associated with high WHR. Also, increased central obesity was found to be associated with chocolate and sweets consumption.

In the present study, adolescent girls who were consuming junk food were found to be at greater risks of developing abdominal obesity. No such significant association was found between BMI and junk food consumption.

**Conclusion**

Frequent consumption of junk food was found to be remarkably high among the studied population. Junk food consumption was found to be a risk factor for central obesity. A combined effort from school/college authorities and parents should be made to impart adequate knowledge to school going adolescents on harmful consequences of junk food consumption. It is also desirable to prioritize the implementation of healthy eating promotion programs through various governmental and non-governmental agencies in order to achieve better health in adolescents.
Acknowledgments: The authors duly acknowledge all the participants and school authorities for their willing cooperation. We also acknowledge the Department of Anthropology for providing technical support.

Ethical statement: Ethical approval was granted by the Ethical Committee of the Department of Anthropology, University of Delhi.

Declaration of Interest: There is no conflict of interest.

References


15. IIPS and ICF, National Family Health Survey (NFHS-4), 2015-16: India, 2017
Mumbai: IIPS. rchiips.org/nfhs/factsheet_nfhs-4.shtml


23. Sartorius, B., Veerman, L.J., Manyema, M., Chola, L. and Hofman, K., Determinants of obesity and associated population attributability, South


40. Kostopoulou, E., Tsekoura, E., Fouzas, S., Gkentzi, D., Jelastopulu, E. and Varvarigou, A., Association of lifestyle factors with a high prevalence of


Table 1: Characteristics of junk food consumption among Tibetan adolescent girls.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Responses</th>
<th>Frequency (n)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junk food consumption in previous 7 days (n = 276)</td>
<td>Yes</td>
<td>125</td>
<td>45.3</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>151</td>
<td>54.7</td>
</tr>
<tr>
<td>Frequency of Junk food consumption (days/week)</td>
<td>Infrequently (1–3 days/week)</td>
<td>28</td>
<td>22.4</td>
</tr>
</tbody>
</table>
Table 2: Binary logistic regression analysis of junk food consumption with obesity predictors.

<table>
<thead>
<tr>
<th>Variables</th>
<th>WHR</th>
<th>WHtR</th>
<th>BMI</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junk food consumption</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>56</td>
<td>69</td>
<td>32</td>
<td>93</td>
</tr>
<tr>
<td>(44.8)</td>
<td>(55.2)</td>
<td>(25.6)</td>
<td>(74.4)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>69</td>
<td>32</td>
<td>93</td>
<td>35</td>
</tr>
<tr>
<td>(55.2)</td>
<td>(25.6)</td>
<td>(74.4)</td>
<td>(28.0)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Multiple responses
<table>
<thead>
<tr>
<th>No</th>
<th>14</th>
<th>137</th>
<th>13</th>
<th>138</th>
<th>30</th>
<th>121</th>
<th>151</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(9.3)</td>
<td>(90.7)</td>
<td>(8.6)</td>
<td>(91.4)</td>
<td>(19.9)</td>
<td>(80.1)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>70</td>
<td>206</td>
<td>45</td>
<td>231</td>
<td>65</td>
<td>211</td>
<td>276</td>
</tr>
<tr>
<td>OR (CI)</td>
<td>7.942*(4.132-15.262)</td>
<td>3.652*(1.820-7.327)</td>
<td>1.568(0.897-2.742)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

P<0.001*, BMI; Body Mass Index, WHR; Waist-Hip Ratio, WHtR; Waist-Height Ratio.
Fig.1: Prevalence of junk food consumption pattern among Tibetan adolescent girls.
Fig. 2: Prevalence of obesity among Tibetan adolescent girls

Central obesity
Obesity parameters

General obesity
Obese cutoffs: WHR ≥ 0.80; WHtR ≥ 0.50; BMI ≥ 85th percentile