



## Analysis of eating pattern in adolescent and young adult college students in Pune City

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### Abstract

*Women's Adolescent students need more energy, proteins, vitamins, and minerals because they grow to maturity at this age. A balanced diet plays an important role in their well-being and health. The study conducted showed that 48% of students are not normal in their height and weight. 26% of students were found underweight, 18% overweight and 4% students found obese. The annual income group of underweight students was below 7 Lac, and more than 90% of students were staying at their home. The researcher has analyzed the eating patterns of these students and concluded that there is a need for awareness among the parents and students about balanced diet and nutrition. The present research will help students improve their dietary habits and health, increase the number of attendees, and achieve academic excellence*

**Keywords:** Balanced diet, Nutrition, Malnutrition, Obesity, Health Education, Higher Education

### 1. INTRODUCTION

The word 'adolescence' means "grow to maturity" and is a transitional stage of life between childhood and adulthood when kids grow rapidly and develop physically and psychologically [1], where they need more energy, proteins, vitamins, and minerals. Adolescent children are aged 13–19 years. Food plays a major role in Indian culture, as do the habits and etiquette of serving and eating it. In India, a study shows that adolescents (aged 13–16) consumed less fruit, green leafy vegetables, non-green leafy vegetables, and dairy and consumed energy-dense foods more frequently than recommended [2]. With increasing, easy access to fast food, outside food, and hoteling culture, more than 50% of adolescents consumed chocolate and soft drinks, and over one-third were taking fast food [3]. In the study conducted by indianyouth.net, many adolescent girl students do not eat enough food due to maintaining their figure [4]. Many times, students fail to gain the required amount of nutrients, causing several other health issues, stress, and sleep disorders. On the other hand, sometimes there are students who are junk food savvy and do not eat a balanced diet, becoming overweight and inviting various diseases at a young age. Therefore, it affects the attendance and results of such students. A major public health issue among college students is poor eating habits due to stress and lack of time [5]. A high rate of faulty eating habits was observed in boys. Higher scores on depression and suicidal

ideation were reported in the population with faulty eating habits [6]. The teenagers and young adults have more nutritional requirements, and a balanced diet and intake of the right amount of nutrients like proteins, vitamins, minerals, carbohydrates, and fats helps them be fit and free from any diseases.

If we check the nutritional status of students in colleges worldwide, then it is observed that in Saudi Arabia's King Saud University (students of ages 18 to 35 years), an average of 80.53% of males had very high knowledge (4.07) and 65.65% had medium level (3.24) awareness of calorie labelling, while 83.73% of females had very high knowledge (4.17) and 66.50% had medium level (3.32) awareness of calorie labelling [7]. Therefore the knowledge of females students regarding balanced diet is more than male students may be because females cook or help in kitchen. It is observed that in Seoul, students' stress levels and dietary habits had a significant relationship [8]. Socio-demographic factors, body mass index (BMI), or nutritional habits impacted due to consumption of fast food in university students, and it was evaluated by [9]. Night Eating Syndrome (NES) is an eating disorder that is common among Palestinian university students, and they have mental problems [10]. It is the case in other countries too, where students stay in hostels and watch TV or use their phones for longer hours at night. During the COVID-19 pandemic, researchers from the "Yangtze River Delta" region of China observed that college students with lower dairy consumption showed higher detection rates of psychological symptoms [11]. Therefore, increased knowledge of dietary guidance appears to be positively related to more healthful eating patterns [12].

Parental education is important index of socioeconomic status on which students/ children's educational and behavioral outcome is depends on [13]. From Anganwadi or nursery to higher secondary education of the children frequent parents meetings are conducted in schools and different aspects of child development is discussed. Parents are made aware of their child's health and diet issues. But when these children admitted to the college, parents and teachers interactions rarely happens and parents watch on their child reduces in respect of diet of eating habits as these students eats outside food too and don't carry tiffin. Therefore many college going students lose weight or gain weight too much. It was observed that educated parents make efforts to provide enabling education atmosphere to their children at home where as uneducated parents fail to provide friendly environment at home [14]. There was large correlation was there between parents' education and students' academic achievement. Therefore, home environment is very important student's proper nourishment and development.

For this research, researcher have selected one of the reputed and well-known autonomous college in Pune City and in India too where students come from varied cultures and socio-economic backgrounds. About 60% of students are coming from rural areas in Maharashtra state and underprivileged areas of Pune city. The students from rural areas are staying in hostels or paying guests where they do not get sufficient nutrients from the food. The student's attendance and also result is decreasing day by day. Therefore it is necessary to study their BMI, nutritional status, eating patterns and suggest changes in their present diet as per RDA 2020 which will help them to improve their health and diet. The nutritional education plan designed by the researchers will surely increase their attendance and also their score in examinations.

In this research, the investigator would like to study the eating pattern and nutritional status of first year students. These students are adolescents/teenagers and young adults (aged between 17yrs -21yrs) where unhealthy eating habits and disorders are still very much prevalent. Data regarding their BMI, socioeconomic condition, and the eating pattern is collected using Google Forms. Their height and weight was measured in the Sports department of the college. The collected data was analyzed using R software.

## **I. OBJECTIVES**

The main objectives of this study are

- To analyze BMI and eating patterns according to their social economic and geographical conditions
- To study their diet pattern
- To give them recommendations to improve their diet as per Recommended Dietary Allowance (RDA) 2020

## **II. METHODOLOGY**

- Place of the study: Reputed College in Pune City
- Sample Size: 102 students of first year were interviewed and asked to fill the questionnaire irrespective of their height, weight, gender, socio-economic condition.
- Questionnaires and interview techniques were used for this study.
- Google Forms were circulated among the first year students to collect data related to their socio-economic condition and diet and food habits.
- Body Mass Index (BMI) of these students were calculated by taking their height and weight physically at Physical Education Department. Following formula was used to calculate BMI from their Height and Weight
  - $BMI = \text{kg/m}^2$
- As per Age and Gender of the students, calculated BMI and RDA 2020, their health condition was decided Normal or Underweight or Malnourished or Overweight or Obese.
- Descriptive analysis of data carried out using R software. Welch Two Sample t-test and Pearson Chi Square Test was applied for hypothesis testing. For graphical representation of the data was done using MS-Excel software.
- On the basis of collected analysed data, interviews were conducted to know students diet plan, nutritional status (height, weight, age, gender), and socioeconomic condition (annual income).
- Recommendations for change in food habits was given to the underweight students as per RDA

## **III. RESEARCH SAMPLE**

For this study, researcher identified the sample of first year students of one autonomous college in Pune City, India. The Questionnaire was circulated among 102 students' participants and their height and weight were measured for BMI calculation. Out of 102 students participants 43% were female and 57% were male students.

## **IV. DATA ANALYSIS, FINDINGS AND DISCUSSION**

The data for this research was collected by questionnaire method and in person for BMI calculation.

The questions and their data analysis are given below. Data of 102 students of first year students was collected. Out of 102 students 58 Boys and 44 girls students were there from different faculties like Arts, Science, Commerce and Computer Science.

The college selected is a reputed and well-known college in Pune City and in India too, where students come from varied cultures and socio-economic backgrounds. About 60% of students are coming from rural areas in Maharashtra state and underprivileged areas of Pune city. The students from rural areas are staying in hostels or as paying guests, where they do not get sufficient nutrients from the food. The student's attendance is also decreasing day by day. Therefore, it is necessary to study their BMI, nutritional status, and eating patterns and suggest changes in their present diet as per RDA 2020, which will help them improve their health and diet. The nutritional education plan designed by the researchers will surely increase their attendance and their score in examinations.

In this project, the investigator studied the eating patterns and nutritional status of first-year students. These students are adolescents and young adults (aged between 17 and 21 years) where unhealthy eating habits and disorders are still very prevalent. Data regarding their BMI, socioeconomic condition, and eating patterns are collected using Google Forms. Their height and weight were measured in the sports department of the college. The collected data was analysed using R software and graphical representation of the data was done using MS-Excel software.

### Graphical Representation and Interpretation of the Data:

**1. Socioeconomic Condition:** To know their socioeconomic condition, annual income options were given to them, and the researcher found that 65% of students had an annual income below \$7,000. 17% students were below 1 Lac annual income, 8% students were from below 15 Lacs, 2% from below 25 Lacs and 1% above 25 Lacs and 1% would selected not to disclose it.

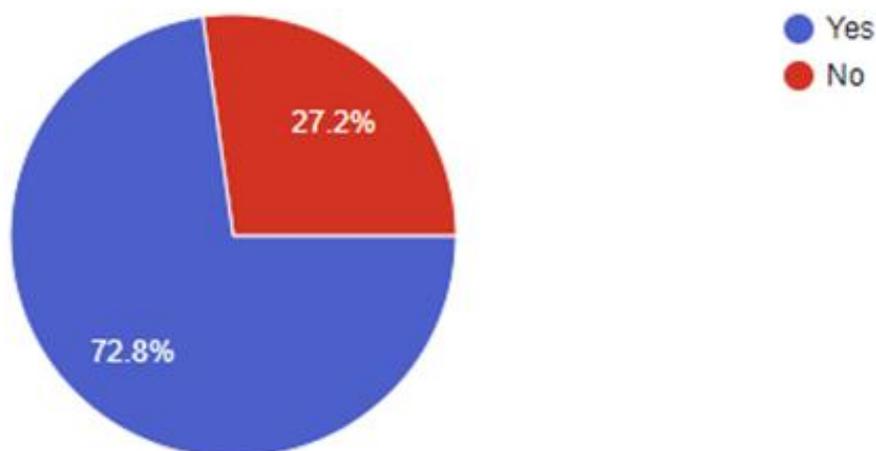


Figure. 1. Socio-economic condition of students

**2. Place of Residence:** 8.2% of students were residents of Pune City, and 27.2% were from outside Pune City and were living either in a hostel or as a paying guest.

**3. Resident type:** 6% of students were staying at their own home, 8.7% were staying in the hostel, and 90% were staying as paying guests.

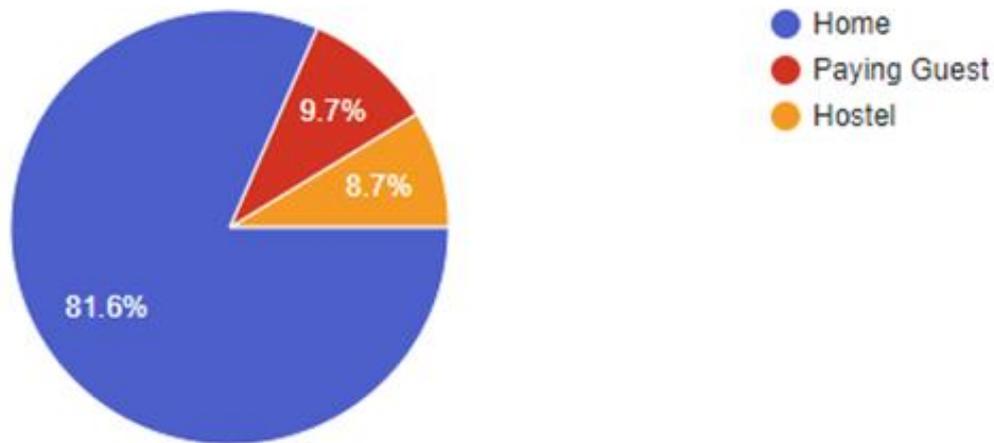


Fig. 2. Residential type of the Students

**4. Age of students:** Out of 102 student participants, 6 were of 18yrs age, 59 were of 19yrs age, 18 were of 20yrs age, 10 were of 21yrs age, and 3 were of 22yrs and 6 were of 23yrs old. 65 students were adolescent students, and 37 were young adults.

### Nutritional status of students of age 18-23yrs

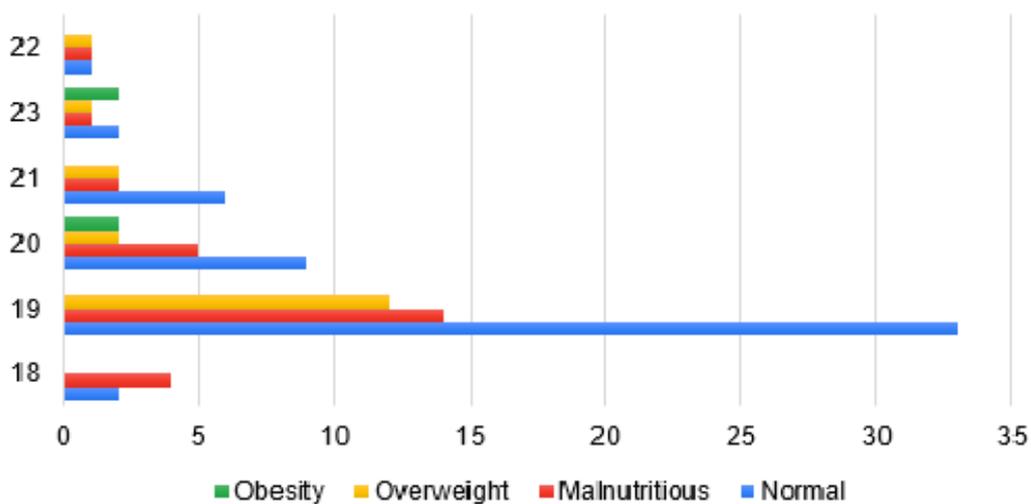


Figure. 3. Age wise student's number

**5. Income group:** It is observed that 65% students were from the families having below 7Lac annual income. 17% student's family income was below 1Lac we can say them as below poverty. 6% student's family income was below 2Lacs, 8% student's annual income was below 15 Lacs, 1% student's family income was below 25 Lacs and 0.01% student's income was above 25Lacs. 0.01%, i.e., one student, selected the option not to disclose family income. It also shows that 85% of malnourished and underweight students were from low-income groups below \$7,000.

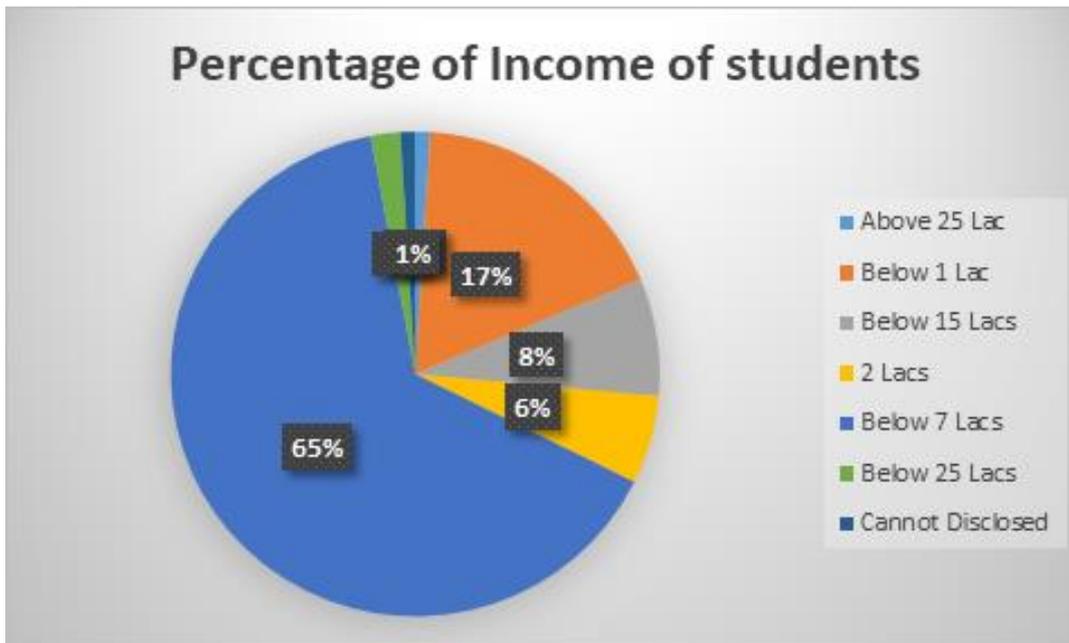


Figure. 4. Percentage of Annual Income of students

**6. Nutritional Status of Students:** After calculating the BMI of students, it was observed that, in 18-year-old adolescents, 67% were malnourished or underweight and 33% were normal. In 19yrs old adolescents 56% students were normal, 24% students were malnutrition/underweight and 20% were overweight. In 20yrs old young adults 50% students were normal and out of remaining 50% students 28% students were malnutrition/underweight, 11% overweight and 11% were with obesity. In 21-year-old young adults, it was observed that 60% of students were normal, 20% had malnutrition or were underweight, and 20% were overweight. In 22yrs old students, 34% students were normal, 33% malnutrition/underweight and 33% overweight. In 23yrs old students, 33% students were Normal, 33% students were obese, 17% students were overweight and 17% students were malnutrition/underweight. It is shown in the below graph.

### Nutritional status of students of age 18-23yrs

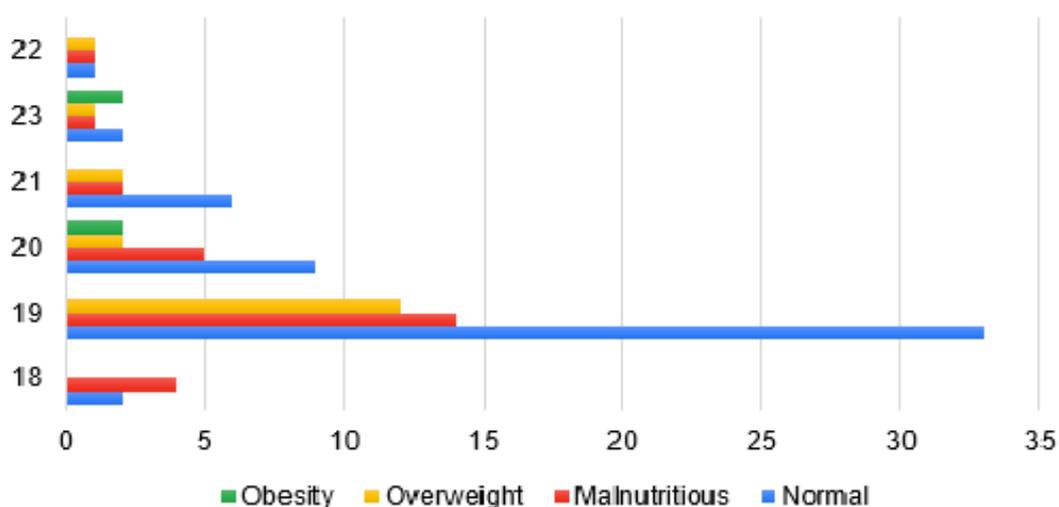


Figure. 5. Nutritional status of the students

As shown in below graph, out of 102 students 52% students were Normal, 26% students were Malnutrition/underweight, 18% overweight and 4% obese.

### Nutritional Status of First Year Students

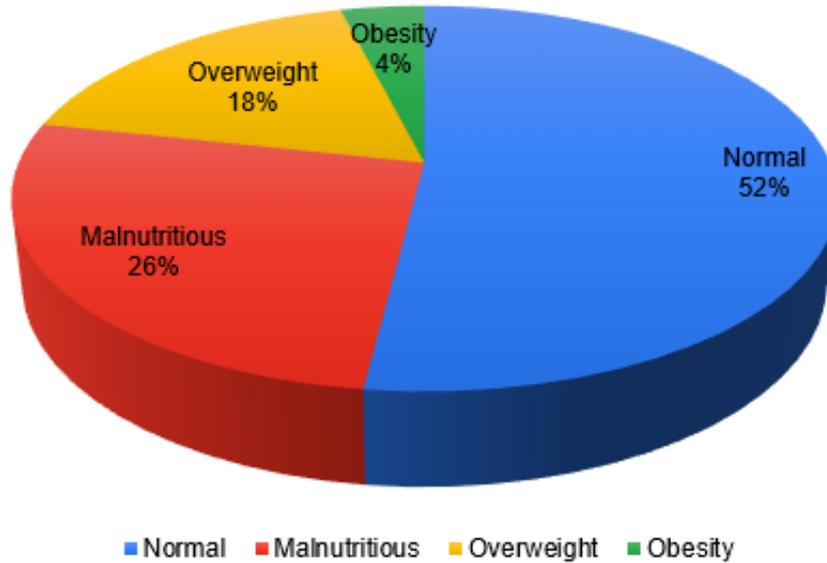


Figure.6. Nutritional status of the first year students

**7. Food Choices of the Students:** It was observed that, out of 53 normal students, 32 students were having both vegetarian and non-vegetarian food, 17 were having only vegetarian food, 3 were non-vegetarian and one was eggetarian. Out of 27 malnourished or underweight students, 15 were eating non-vegetarian or vegetarian food. From 4 Obese students 2 were completely non-vegetarian and one both and one was eggetarian. From 18 overweight students, 11 were both vegetarian and non-vegetarian, 3 were non-vegetarian, one was eggetarian, and 3 were vegetarian.

### Food Choices Vs Nutritional Status of the Student

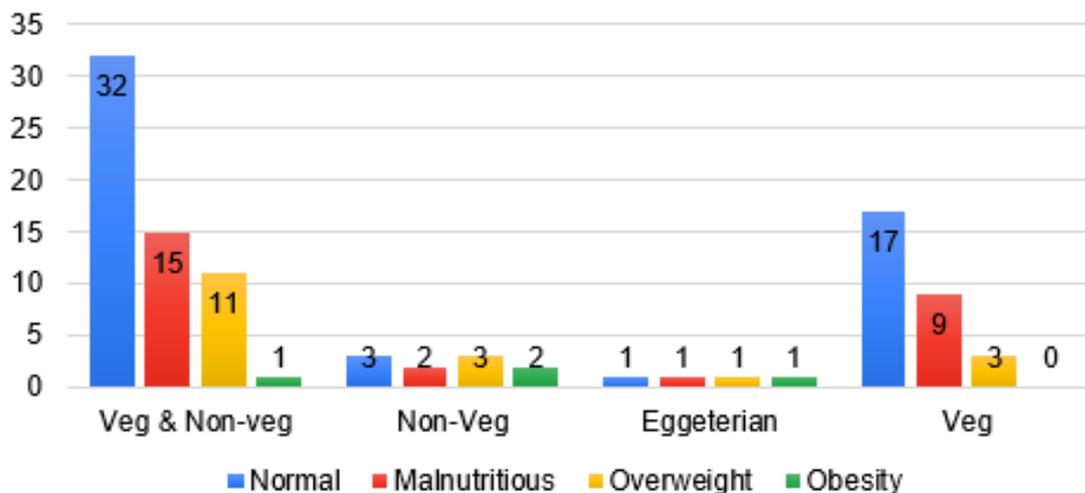


Figure. 7. Food choices of students as per their nutritional status

It shows that the obesity rate is high among non-vegetarian students and zero percent among vegetarian students.

**8. Nutritional Status of Different Age Groups of Students:**

**Nutritional status of students of age 18-23yrs**

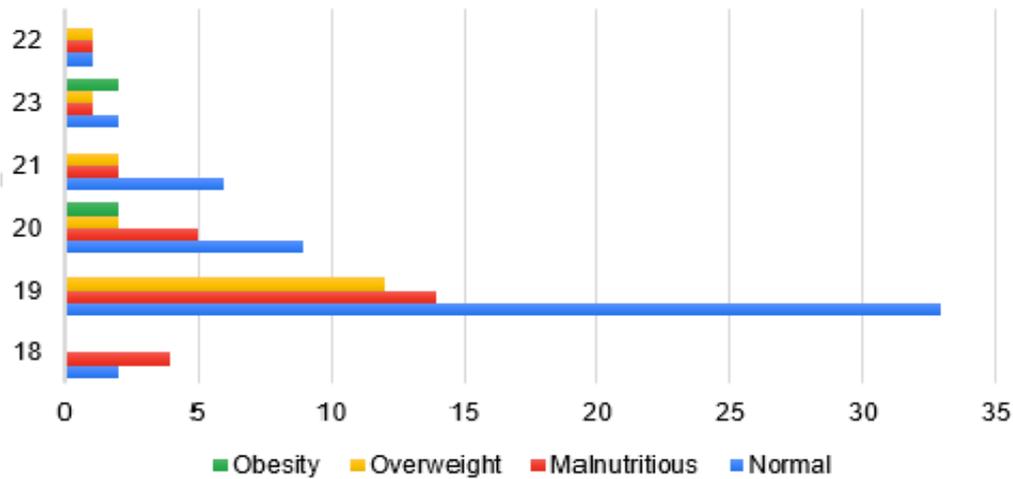


Fig. 8. Nutritional status of students of different age groups

The above graph shows that for an 18-year-old student, malnutrition or underweight percent is high. In 22-year-old students, the percentages of normal, underweight, and overweight students are the same. In 23 year old students obesity percent is high. In all age groups of 18–23, underweight students were there. At 18 years old, the percentage of overweight and obese students was zero.

**9. Fast/Outside food intake by the students:**

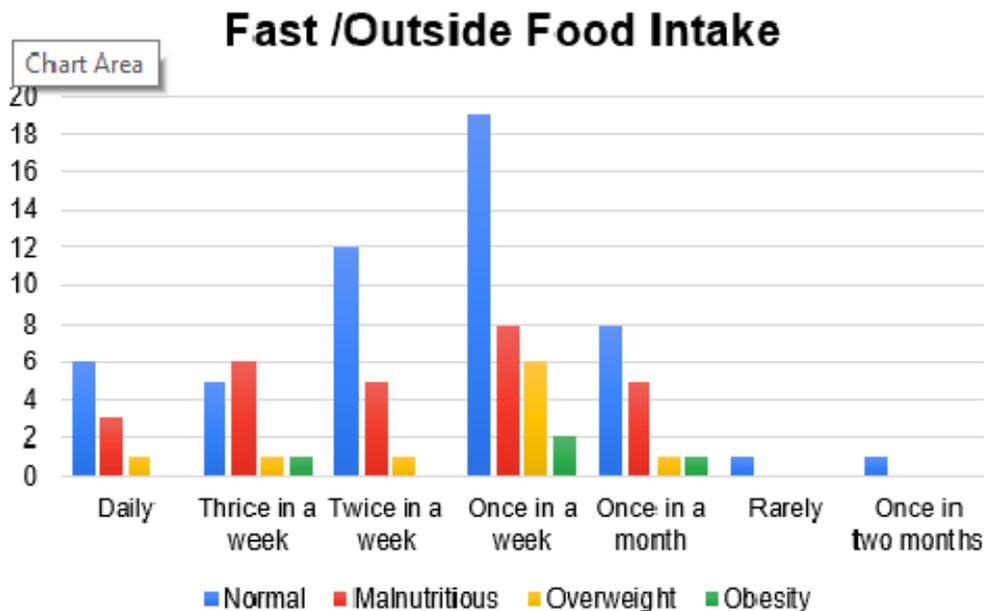


Fig. 9. Frequency of fast/outside food intake of the students

It is observed that the students who eat fast food rarely, or once every two months, are healthy and normal. The underweight student’s percentage is high in the students who eat fast food daily or a couple of times a week. Obese students are eating fast food, though not daily.

**10. Health history of the students:** It was observed that 19% students were facing headache problems, 16% students were feeling weak, 13% students were facing acidity problems, 9% students had stomach aches, 2% anaemia, 7% depression, 2% diarrhoea, 10% viral fever, 6% dehydration, 1% dengue, 3% dizziness, 1% jaundice, and 1% asthma; 1% of girl students were going through PCOD; and 9% students were healthy and had never faced any health issue in the past.

### Count of Students facing health issues

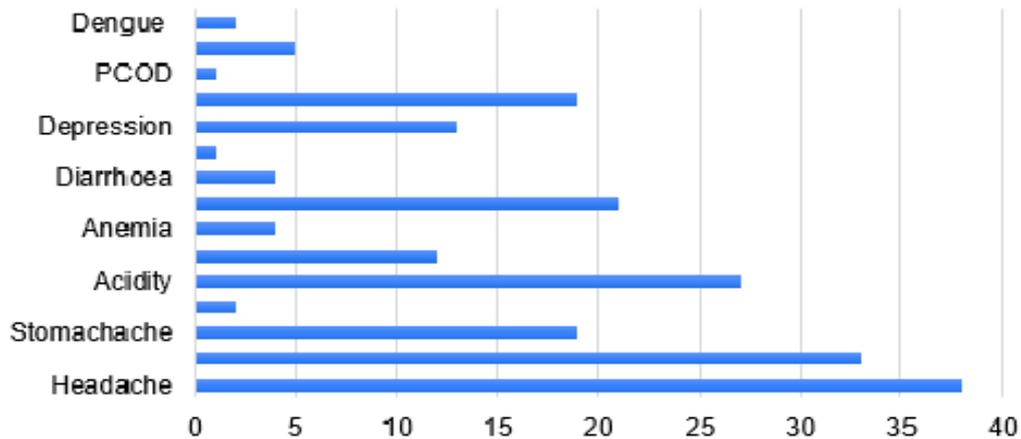


Fig. 10. Count of students health issues

### 11. Observations on Diet:

In the interview conducted regarding their eating habits, it was observed that the vegetarian students normally eat chapati, seasonal vegetables, dal, and rice in their diet. Dairy products contain proteins, which are essential for bodybuilding. It was observed that 69.9% students drink milk, 6.8% students eat Cheese, 13.6% eat butter, 35% students eats ghee, 42.7% students eats Curd, 11.7% students eat seeds. The non-vegetarian students prefer to eat chicken; 63.1% of them eat chicken, 25.2% eat meat, and 30.1% eat fish; the shawarma is an outside food. 10.7% students eat, 11.7% students eat fast food or ready to cook food like Pizza, Burger, Noodles, Maggi. 10.7% of students eat chocolate.

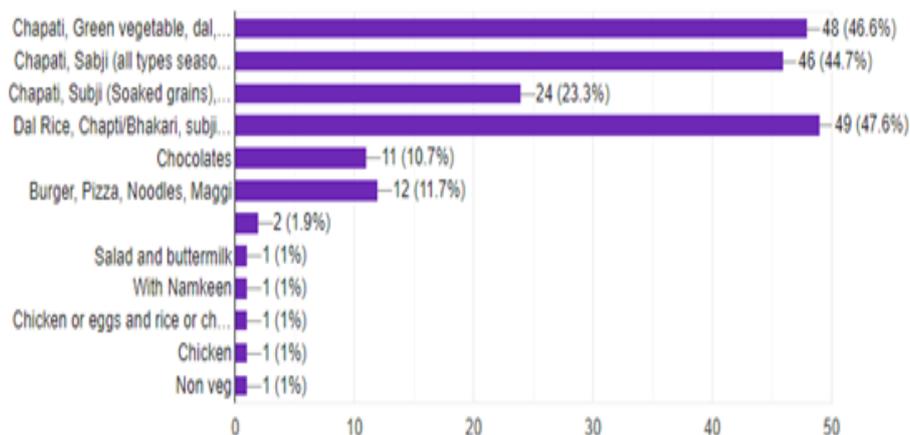


Fig. 11. Percentage count of students food habits

The students below 7Lac annual income eat homemade food and that too chapatti, subji, dal and rice and those who eats non-vegetarian food, they eats eggs and chicken which is affordable to them once in a week. The amount and frequency of eating nuts, seeds, curd, cheese, and butter are very low due to financial conditions.

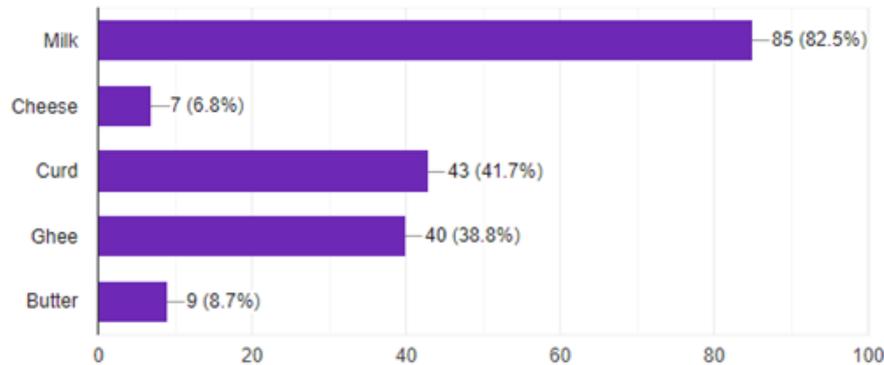


Fig. 12. Percentage count of students Milk product intakes

## V. TESTING OF HYPOTHESIS

Testing of hypothesis for the collected data was done using R Software. The total number of responses were 102 so **Chi Square test** was applied to check the association between two variables. Researcher have also used two sample **t- test** to check whether there is difference between mean BMI values according to the gender of the students. Chi square test was used to check the association between health status & gender and health status & Annual Income of the students.

### **Test 1:**

To check whether there is difference between mean BMI values between male and female students?

**Ho: Null hypothesis:** There is no significant difference in the mean BMI values between male and female students.

**H1: Alternative hypothesis:** There is significant difference in the mean BMI values between male and female students.

### **Welch Two Sample t-test**

data: male\_data\$BMI and female\_data\$BMI

t = 1.6433, df = 99.885, p-value = 0.1035

**Alternative hypothesis:** true difference in means is not equal to 095 percent confidence interval: -0.2870957 3.0562324

### **Sample estimates:**

TABLE I: SAMPLE ESTIMATES

Mean of x	Mean of y
22.41997	21.03540

**Conclusion:** From the mean values we get to know that there is no much difference in it. Here p-value is 0.1035 which is greater than 0.05, so we fail to reject the null hypothesis and conclude that there is enough evidence to suggest that there is no a significant difference in the mean BMI values between male and female students.

**Test 2:**

To check whether there is association between health status and gender?  
 data: health\_gender\_table

TABLE 2: HEALTH STATUS ACCORDING TO GENDER

Health Status	Female	Male
Malnutrition	12	15
Normal	26	27
Obesity	1	3
Overweight	5	13

**Ho: Null hypothesis:** There is no association between health status and gender.

**H1: Alternative hypothesis:** There is association between health Status and gender.

**Pearson's Chi-squared test**

X-squared = 3.0435, df = 3, p-value = 0.385

**Conclusion:** Here the p value is 0.385 which is greater than 5% level of Significance. Hence reject alternate hypothesis that is H1 and accept Ho.

**Interpretation:** By Accepting the null hypothesis researcher conclude that, there is enough evidence to suggest that there is no association between health status and gender

**Test 3:**

To check whether the income status and health status of individual are related or not?

**Null hypothesis (H0):** There is no correlation between income status and health status.

**Alternative hypothesis (H1):** There is a correlation between income status and health status.

TABLE 3: CORRELATION BETWEEN INCOME STATUS AND HEALTH STATUS

Income Status	Underweig ht		Normal	Obesity	Overweigh t
Above 25 Lacs	0		1	0	0
Below 1 Lacs	7		10	1	0
Below 15 Lacs	2		4	0	2
Below 2 Lacs	1		4	0	1
Below 25 Lacs	0		0	1	1
Below 7 Lacs	17		34	2	13
Cannot disclose	0		0	0	1

**Pearson's Chi-squared test**

data: table

X-squared = 25.15, df = 18, p-value = 0.1208

**Conclusion:** If the p-value is greater than the significance level (typically 0.05), we accept the null hypothesis and conclude that there is no statistically significant association between the two variables.

Here the p value is 0.1208 which is greater than 5% level of Significance. Hence reject alternate hypothesis that is H1 and accept Ho.

**Interpretation:** By accepting the null hypothesis, researcher conclude that, there is no enough evidence to suggest that there is no correlation between income status and health status.

**Test 4:**

To check whether there is association between income status and health status of malnutrition students?

**Null hypothesis (H0):** There is no correlation between income status and health status for malnutrition students.

**Alternative hypothesis (H1):** There is a correlation between income status and health status for malnutrition students.

TABLE 4: CORRELATION BETWEEN INCOME STATUS AND MALNUTRITION STATUS

Income Status	Malnutrition
Below 1 Lacs	7
Below 15 Lacs	2
Below 2 Lacs	1
Below 7 Lacs	17

**Chi-squared test for given probabilities**

data: table1

X-squared = 23.815, df = 3, **p-value = 2.731e-05(0.00002731)**

**Conclusion:** If the p-value is less than the significance level (typically 0.05), researcher reject the null hypothesis and conclude that there is statistically significant association between the two variables.

Here the p value is 2.731e-05 which is less than 5% level of Significance. Hence reject null hypothesis that is Ho and accept H1.

**Interpretation:** By rejecting the null hypothesis, we conclude that there is enough evidence to suggest that there is association between income status and health status of malnutrition students. Hence researcher conclude that, according to their annual income the problem of malnutrition/underweight may arise for them

**Test 5:**

To check whether there is association between income status and health status of overweight students?

**Null hypothesis (H0):** There is no correlation between income status and health status for overweight students.

**Alternative hypothesis (H1):** There is a correlation between income status and health status for overweight students.

TABLE 5: CORRELATION BETWEEN INCOME STATUS AND OVERWEIGHT STATUS

Income Status	Overweight
Below 15 Lacs	2
Below 2 Lacs	1
Below 25 Lacs	1
Below 7 Lacs	13
Cannot disclose	1

### **Chi-squared test for given probabilities**

data: table1

X-squared = 30.889, df = 4, p-value = 3.225e-06(**0.000003225**)

**Conclusion:** If the p-value is less than the significance level (typically 0.05), researcher reject the null hypothesis and conclude that there is statistically significant association between the two variables.

Here the p value is 3.225e-06 which is less than 5% level of Significance. Hence reject the null hypothesis that is  $H_0$  and accept  $H_1$ .

**Interpretation:** By rejecting the null hypothesis, researcher conclude that, there is enough evidence to suggest that there is association between income status and health status of overweight students. Hence conclude that, according to their annual income the problem of overweight may arise for them

## **VII SUGGESTIONS TO IMPROVE THE DIET OF UNDERWEIGHT STUDENTS**

Students who are underweight are advised to add seasonal fruit, milk, and green vegetables to their diet. Also, they are asked to add eggs to their diet if they eat eggs and are not vegetarians. These students eat food only three times a day, like breakfast, lunch, and dinner. Therefore, some of them are advised to increase their food intake. The students who are overweight and obese are advised to reduce their frequency of eating non-vegetarian food and add fruits to their diet. Instead of meat and chicken, they are advised to eat fish. Therefore, a balanced diet to fulfil the requirements of carbohydrates, fats for energy, proteins for body building, and vitamins, proteins, and minerals for regulating and protecting the body is necessary for college students.

As per ICMR 2020, for health and wellbeing, first-year students should get the recommended dietary allowance (RDA) as per their age (18–19 years). For Boys: 2800–3320 calories per day, and for girls, 2400–2500 calories per day. For young adults above 19yrs for Men: 2100-2700 calories per day and for Women: 2100-1650 calories per day.

25 out of 27 underweight students are staying at home, and only two are staying at the hostel, which shows that the diet and food they are getting at home are not sufficient and balanced. Therefore, it is necessary to spread awareness among parents about a balanced diet for students. Most of the parents are from a low-income group, and it seems they are not educated. Therefore awareness among the parents and also students about nutrition and balanced diet is must.

## **CONCLUSION**

For the income status and health status the overall analysis using chi square showed that there is no association between these two variables. Whereas for malnutrition and overweight students study was conducted individually using chi square test and researcher got to know that, there is association between annual income and health status. 48% of college-going teenagers, adolescent students, and young adults are found either underweight, overweight, or obese. Obesity is observed in the students who eat fast food once or twice a week. 92% of students faced some other health issues. In their diet, many students eat fast food at least once a week. In their daily diet, mostly carbohydrates, fats, and proteins are consumed. For vitamins and minerals, they are not very aware. Underweight students are from low socio-economic

families. For them and their parents too, awareness about a balanced diet and nutrition for young adults has to be organised, or a credit-based course on nutrition and health education has to be added for the students. This research will help students improve their dietary habits and health, increase the number of attendees, and achieve academic excellence.

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