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**ASSESSMENT OF NUTRITIONAL STATUS OF SUNNI MUSLIM HIGH SCHOOL AND JUNIOR COLLEGE STUDENTS – A GENDER COMPARISON IN MUMBAI.**

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**Abstract**

*Obesity is a reflection of an imbalance of caloric intake and outflow; it requires plentiful evaluation of samples, familial, environmental, genetic, and cultural distinctiveness for clinicians to design successful interventions. Childhood obesity has become an emerging public health issue showing an increasing trend in developing countries. Studies documented have shown that the prevalence of overweight among adolescents varies between 10 and 30%.* *This study has two-fold objectives which are to conduct dietary recall in both the groups and to compare nutritional status between both the groups. The study was conducted in Sunni Muslim high school and junior college students as there have not been a study conducted in this community regarding their eating patterns, physical activity and anthropometric measurements. Total 250 subjects were taken for the study out of which 125 were adolescent male and 125 young adult male subjects. Subjects with any disease condition were in the exclusion criteria of our action project. Anthropometric data was collected and calculated (height, weight, body mass index, waist circumference, hip circumference and waist to hip ratio), using standard methods and standard weighing scale and measuring tape. The other aspect was to assess their daily dietary intake through food frequency questionnaire and 24 hour dietary recall. It can be observed that mean energy (kcal) intake of adolescent males (1410+ 519) and young adults with a mean of (1529 + 524) is lesser than the intake of empty calories in male subjects. With the mean of empty calorie intake among both the groups in male subjects (522 + 338) and (699 + 364) respectively with the P value of (<0.05), significant. Among females the young adults have higher energy consumption (1419+ 519) than adolescents (954 + 392).The mean empty calorie consumption of adolescent (434+ 276) is lesser than the mean consumption of young adults (615+ 317) with the (P<0.00), significant. In our study we observed that there was a significant difference between male and female subjects with regards to their daily dietary intake; the consumption of total energy intake was (2940 + 524 and 2374 + 515) ; carbohydrate intake was (1618 + 78.18 and 1442 + 73.52) which was higher than the protein consumption (375 + 35.68 and 275 + 14.5) and fat (875+ 17.42 and 764 + 15.08) intake respectively. There was a significant difference in energy and carbohydrate consumption with P<0.05 and a significance of total intake of empty calories (P=0.00).* *Current study showed that the total energy consumption of adolescent males and young adults was lesser than the intake of empty calories in male subjects. Among females the young adults have higher energy consumption than adolescents; similarly, the empty calorie consumption of young adults was comparatively higher than that observed in adolescent female subjects.*

**Keywords:** *Obesity, evaluation, health issue, overweight adolescents*, *nutritional status*

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**Introduction:**

Nutritional assessment is the process of nourishing or being nourished, especially the process by which one assimilates food and uses it for growth and for replacement of tissues. In India, weight for age has been the most widely used indicator for assessment of nutritional status, detection of under nutrition and monitoring the improvement following interventions in children.

Obesity is a complex condition with serious social and psychological dimensions, virtually affecting all age groups threatening to overwhelm both developed and developing countries as stated by the World Health Organization. In 1995, WHO estimated 200 million obese adults and 18 million children under the age group of five were classifies as overweight. The number increasing to 300 million obese adults in the year 2000. As per WHO obesity epidemic is not only restricted to industrialized society but also showing an estimation of over 115 million people suffering from obesity related problems in developing countries.As we viewed that overweight and obesity kills more people than underweight almost affecting 65% of the world’s population. In 2010 nearly 43 million children under the age group of 5 years were overweight1.

The table 1 below showed comparative statistics of obesity between Asian Indians in USA and India.

**Table 1:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables** | **AI\* (USA)** | **AI\*(Urban)** | **AI\* (Rural)** |
| **Overweight /Obesity** | 73 | 65 | 32 |
| **Abdominal Obesity** | 23 | 39 | 8 |

\*AI- Asian Indians. Source: Mishra R, Mishra A, *et al.,* AAPI – CDC PROJECT,(2004-2006).

22% obesity prevalence rate in children & adolescents is between 5 to19 years. Indian adolescents and young adults (13to25 years) consume four times of daily recommendation of fats and nearly at par with the intake in adolescents in North America3. Several social and environmental factors influence people’s total caloric intake and physical activity levels which have a major impact on overweight and obesity4-5. Once overweight or obese sets in an individual, retreating the energy balance towards healthy weight is a significantly challenging issue especially for children and young population as they do not have direct control over healthy food choice and appropriate activity levels. Chief elements which are the leading causes of childhood obesity are unhealthy dietary habits and reduced physical activity6. There is an increase in the lack of physical activity due to over indulgence in indoor activities and entertainment like television viewing, internet surfing and computer games etc. Studies have shown that television viewing is one of the factors which has influenced children leading increasing the trend towards childhood obesity7. Children are exposed to various platforms like school cafeteria, neighborhood where there is no control on the portion size or the caloric intake and low knowledge about the dietary composition often leading to an increase caloric intake per body weight per day8.Convinient life style is another factor leading to childhood obesity; like commuting via car instead of walking or bicycling which further reduces physical activity, aggressive advertisements by companies on ready to eat foods, carbonated beverages are a part of lifestyle factors9. Ramachandran A, et . al.,(2002), conducted an evidence based urban study on children from six schools two each from high, middle and lower income groups in Chennai, showing a difference between the rich and the poor. Thus showing the prevalence of overweight and obesity in adolescents ranging from 22% in better off schools to 4.5% in lower income group schools10.

Considering all the above factors which have led to increase in obesity we decided to conduct a survey on “An Assessment of Nutritional Status on Sunni Muslims High School and Junior College Students – A Gender Comparative study in Mumbai City”.

**Material and Methods:**

This investigative study seeks to find the effect of Junk food habits and nutrient intake in adolescents and young adults, which is a cause of obesity among these groups.

Adolescence begins with the onset of physiologically normal puberty, and ends when an adult identity and behaviour is accepted. The period of development corresponds between the age group of 10-19 years which is consistent with the definition given by World Health Organization. Empty calories are calories from food that supplies energy but is not nutritionally balanced.

**1.] Sampling**

I- The total sample size is 500 {250 girls – 125 adolescents (13-17 years) and 125 young adults (18-22 years) and 250 boys– 125 adolescents (13-17 years) and 125 young adults (18-22 years)} using Purposive Convenience Sampling for Anthropometric.

II- Target group of school and junior college girls and boys will be selected for the study.

III- Exclusion criteria – Subjects with any disease condition (diabetes mellitus, kidney disorder, cardiac history) or illness will be excluded.

IV- Inclusion criteria – Clinically healthy students of school (13-16 yrs) and junior college (18-22yrs) only, will be taken in the inclusion criteria.

**2.] Assessment of Nutritional Status by Anthropometry.**

Anthropometric measurements for all the subjects were taken before and after the study.

**3.] Methodology for 24 hours Dietary Recall**

24-Hour dietary recall and food record was taken based on foods and amounts actually consumed by the student on one specific day. Diet histories were taken based on students perceptions of usual intake over a less precisely defined period of time. A dietary recall is a retrospective method of dietary assessment where an individual is interviewed about their food and beverage consumption during a defined period of time, typically the previous day or the preceding 24 hours.  Recall of intake over a longer time period is problematic due to the limitations of memory. Several national surveys use the 24-hour recall method because of its high response rate and its ability to obtain detailed information.  The interview was carried out in person, through a questionnaire.  In the Norwegian arm of the EPIC study no significant differences in the dietary data obtained were found when face-to-face 24-hour recalls were compared to telephone 24-hour recalls11. A single 24-hour recall is not considered to be representative of habitual diet at an individual level but is adequate for surveying intake in a large group and estimating group mean intakes.  In a preliminary study to decide the method for the UK Low Income Diet and Nutrition Survey (LIDNS), four repeat 24-hour recalls were recommended as the most appropriate method of dietary assessment in this group12.Repeat 24-hour recalls can be employed to assess a typical diet at an individual level; these are also known as multiple recalls.  In a recent Australian study in adults, eight repeat 24-hour recalls were recommended to capture the variation in macronutrient intake13; the nutritionist gather detailed information about everything the subject ate and drank from morning to night of the previous day or over the 24-hour period, either backward or forward depending on short term memory and cooperation from the interviewer

**Strengths and limitations of the 24-hour dietary recall.**

The strengths are based on actual intake to estimate absolute amount rather than relative amount of nutrients Open ended—high level of specificity Interviews could be sensitive to the cultural difference

The Limitations include day to day variation in dietary intake. Therefore to reduce the error from dietary recall interviewers were given considerable training and practice. The interviews were conducted us. During the interviews there was a relaxed and unhurried atmosphere.

**Results & Discussion:**

Youfawang, Keyouge and Berry M, in their study in the year 2000 showed that the enormous changes in diet and activity in the society Body mass index (BMI) tracking is still very important between childhood and adolescents in China14.

**Table 2.a.Total energy and Empty calorie consumption in male subjects (adolescence- 13-16 years and young adults – 17-22 years)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Age Group | N | Mean | Std. Deviation |
| Energy Kcal | Adolescents | 125 | 1410 | 519 |
|  | Young Adults | 125 | 1529 | 524 |
| Empty Calories | Adolescents | 125 | 521 | 338 |
|  | Young Adults | 125 | 699 | 364 |

Note: The test is t-test but the values are looked for Z-test. (T becomes Z when N is large).

**Table 2.b.Total energy and Empty calorie consumption in female subjects (adolescence- 13-16 years and young adults – 17-22 years)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Age Group | N | Mean | Std. Deviation |
| Energy Kcal | Adolescents | 125 | 954 | 392 |
|  | Young Adults | 125 | 1419 | 519 |
| Empty Calories | Adolescents | 125 | 434 | 276 |
|  | Young Adults | 125 | 615 | 317 |

**Figure – 1.a. Comparison of Total Energy and Empty Calories in Male Subjects**

**Figure – 1.b. – Comparison of Total Energy and Empty Calories in Female Subjects**

From Table 2 (a & b) it can be observed that mean energy (kcal) intake of adolescent males (1410+ 519) and young adults with a mean of (1529 + 524) is lesser than the intake of empty calories in male subjects. With the mean of empty calorie intake among both the groups in male subjects (522 + 338) and (699 + 364) respectively with the P value of (<0.05), significant.

Among females the young adults have higher energy consumption (1419+ 519) than adolescents (954 + 392).The mean empty calorie consumption of adolescent (434+ 276) is lesser than the mean consumption of young adults (615+ 317) with the (P<0.00), significant.

Frank M and Michelle Wien in 2010 stated that although concerns had risen regarding environmental exposure along with childhood obesity and adult co-morbidities, there have been no formal expert recommendations. Currently one of the most important factors underlying obesity as an epidemic are coupled with increase energy intake with limited energy expenditure15. Nidhi *et al.,* (2010), reviewed in their study that high total fat and saturated fatty acid (SFA) intake and with a low intake of monounsaturated fatty acid (MUFAs) and omega 3 (polyunsaturated fatty acid) showed imbalanced nutrition which could be responsible for increasing the prevalence of obesity and insulin resistance in urban Asian Indian adolescents and young adults16.

**Table 3. The Mean Nutrient Intake of the Total Samples**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Gender | N | Mean | Std. Deviation |
| Energy KCal | Male | 250 | 2940 | 524 |
|  | Female | 250 | 2374 | 515 |
| Empty Calories | Male | 250 | 1222 | 362 |
|  | Female | 250 | 1050 | 310 |
| Proteins gms | Male | 250 | 375 | 35.68 |
|  | Female | 250 | 275 | 14.54 |
| CHO gms | Male | 250 | 1618 | 78.18 |
|  | Female | 250 | 1442 | 73.52 |
| Fat gms | Male | 250 | 875 | 17.42 |
|  | Female | 250 | 764 | 15.08 |

**Figure 2 - Comparison of Dietary Intake among Male and Female Subjects**

In our study we observed that there was a significant difference between male and female subjects with regards to their daily dietary intake; the consumption of total energy intake was (2940 + 524 and 2374 + 515) ; carbohydrate intake was (1618 + 78.18 and 1442 + 73.52) which was higher than the protein consumption (375 + 35.68 and 275 + 14.5) and fat (875+ 17.42 and 764 + 15.08) intake respectively. There was a significant difference in energy and carbohydrate consumption with P<0.05 and a significance of total intake of empty calories (P=0.00).

Chrisa Arcan *et al.,* (2012), in their research findings indicated that selected aspects of home environment were associated with weight status of American Indian children. Obesity intervention in this population showed, considered helping parents to engage into healthful behaviours and to increase availability of healthy food at home. Helen N (2008), in her reviewed article on “Gendered dimensions of obesity in childhood and adolescents”, documented that difference between males and females in exposure and vulnerability to obesogenic environments, the consequences of child and adolescent obesity and their responses to interventions for this condition.

**Table 4.1a Energy Intake**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | |  | Gender | | Total |
|  | |  | Male | Female |  |
| Energy Intake | Less than Adequate | % within Gender | 96.0%(240) | 92.8%(232) | 94.4%(472) |
|  | Adequate | % within Gender | 4.0%(10) | 7.2%(18) | 5.6%(28) |
| Total | | % within Gender | 100.0%(250) | 100.0%(250) | 100.0%(500) |

**Table 4.1b Protein Intake**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | |  | Gender | | Total |
|  | |  | Male | Female |  |
| Protein Intake | Less than Adequate | % within Gender | 87.6%(205) | 91.2%(228) | 89.5%(433) |
|  | Adequate | % within Gender | 12.4%(29) | 8.8%(22) | 10.5%(51) |
| Total | | % within Gender | 100.0%(234) | 100.0%(250) | 100.0%(484) |

**Table 4.1c Fat Intake**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | |  | Gender | | Total |
|  | |  | Male | Female |  |
| Fat Intake | Less than Adequate | Count | 68 | 74 | 142 |
|  |  | % within Gender | 27.2% | 29.6% | 28.4% |
|  | Adequate | Count | 182 | 176 | 358 |
|  |  | % within Gender | 72.8% | 70.4% | 71.6% |
| Total | | Count | 250 | 250 | 500 |
|  | | % within Gender | 100.0% | 100.0% | 100.0% |

**Figure 3.1a - Comparison of Energy Intake with ICMR cut-off**

**Figure 3.1b - Comparison of Protein Intake with ICMR cut-off**

**Figure 3.1c - Comparison of Fat Intake with ICMR cut-off**

On comparison with the standard cut-off ranges according to ICMR 2009 the results were as follows. Table 4.1a showed that energy intake was less than adequate in 96% of male subjects and similar results were observed in 92.8% of female subjects; whereas only 4% and 7.2% of male and female subjects respectively were found consuming adequate energy intake. Table 4.1b demonstrated that 87.6% of males and 91.2% of females consumed less than adequate amounts of proteins per day; 12.4% and 8.8% of males and females fell into the adequate range of daily protein intake as given by ICMR. Table 4.1c showed 27.2% and 29.6% of subjects (males and females) respectively had less than adequate consumption of recommended daily fat intake and on comparison it was observed that 72.8% and 70.4% subjects (males and females) respectively had adequate recommended daily allowance of fat.

**Conclusion:**

Obesity has reached globally epidemic proportionally, more than 1 billion adults are found to be overweight and approximately 300 million are clinically obese. In the last two decades there has been an increase in health care costs due to obesity related issues among children and adolescents. Childhood obesity is a global phenomenon affecting all socio economic groups irrespective of their age, gender or race. The treatment of overweight and obesity in both children and adolescents requires a multidisciplinary, multi- phase approach which include all aspects like improvement in dietary management, increase physical activity thereby reduction in sedentary lifestyle, in severe cases pharmacotherapy and bariatric surgery is also done. Thus a holistic approach towards management of childhood obesity should be implemented by the society, policy makers, and government by providing recreational facilities, imparting community education by registered dieticians and nutritionists, providing funds for assessment and diagnosis of the disease.The study was conducted in Sunni Muslim high school and junior college students as there have not been a study conducted in this community regarding their eating patterns and nutritional requirements.

Total 500 subjects were taken for the study out of which 250 were adolescent and young adult males and the other group had 250 adolescent and young adult female subjects. The inclusion criteria for the subjects were clinically healthy students from schools and colleges and the subjects were given the approval of clinically healthy by the Doctor who was a part of the study during our data collection. Subjects with any disease condition were in the exclusion criteria of our action project. The other aspect was to assess their daily dietary intake through food frequency questionnaire and 24 hour dietary recall. Once the data was collected statistical analysis was done, and results and discussion was drawn. The total energy consumption of adolescent males and young adults was lesser than the intake of empty calories in male subjects. Among females the young adults have higher energy consumption than adolescents; similarly, the empty calorie consumption of young adults was comparatively higher than that observed in adolescent female subjects.In the study it was observed that among males there was a significant difference between adolescents and young adults, for the consumption of energy, empty calories and carbohydrate intake which was higher than proteins and fat intake respectively. Similar results were observed among the female subjects (adolescents and young adults), data demonstrated that the energy intake of the adolescent was lesser than that of young adults. There was marginal difference observed in adolescent and young adult in respect with their protein and fat consumption. Although another observation was that empty calorie and carbohydrate consumption of adolescent subjects was lesser in comparison of young adult.When both the genders were compared it was observed that males had higher energy intake than females subjects. Carbohydrate and empty calorie intake of males was marginally higher than that of females. Further, the protein and fat intake were higher in male subjects in comparison to female subjects. Thus there was a statistically significant difference in total energy, empty calories and carbohydrate intake in both the groups.

**Recommendations and Limitations:**

**Recommendations:**

* The study can be conducted on adolescents and young adults in different communities.
* The study can also be done in paediatric population.
* Various other parameters can be used to carry out the study.
* Estimation of hemoglobin, blood sugar levels, calcium, iron status and thyroid can be done through blood tests.
* Physical activity levels can be estimated in the population.
* Various other dietary aspects like food frequency questionnaire, food item list, weighment methods can be used.
* Nutrition Education Programs can be conducted and pre and post test results can be obtained from the data.

**Limitations**

* The study was restricted to one community.
* Cooperation for approval of data collection from various schools and colleges were difficult due to the religious perspective.

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