

# Associative Eating Behaviors and Eating Disorders among Adult Men and Women with Varying Body Mass Index- A Descriptive Study In Urban Population

Behnaz Shahrokhisahneh<sup>1</sup>, Khyrunnisa Begum<sup>2</sup>

<sup>1</sup>Research Scholar, <sup>2</sup>Professor (former),  
DOS in Food Science and Nutrition, University of Mysore, Manasagangotri, Mysore, 57006, India

Corresponding Author: Behnaz Shahrokhisahneh

## ABSTRACT

**Background:** Maladaptive eating behaviors and eating disorders are major determinants of overweight and obesity. Environment and urbanization exert tremendous effect on eating behaviors in population.

**Objective:** The present study aims to identify prevalence of eating behaviors and eating disorders and their association to body weights among adult men and women in an urban region of south India.

**Method:** This was a quantitative observational study. Men (107) and women (193) aged 27 to 47 years having BMI varying between 18.5 and 40 participated. Selection was based on purposive sampling method. Demographic details were obtained and eating behaviors and eating disorders were assessed using appropriate questionnaires. Height and weight of all the participants was obtained using standard techniques.

**Results:** Our results demonstrated significant positive influence of eating patterns on body weight status, especially non-vegetarian diet practice, munching, number of meals consumed per day, meal skipping, eating outside home, high-fat eating and snacking. Munching(31% females, 35% males) was a common practice. Binge eating, picky eating, night eating, restrained eating and uncontrolled eating was found in less than 10% of the population. Emotional eating and food cravings were prevalent in markedly higher percentage of participants and were significantly associated with overweight and obesity ( $P < 0.05$ ).

**Conclusion:** It is evident from the study that eating practices and eating disorders prevalent were essentially similar to those in developed countries. Occurrences of these eating disorders are indicative of the risk for an increase in overweight and obesity among population from underdeveloped countries.

**Keywords:** eating behavior; eating disorder; munching habit; binge eating; emotional eating; food craving

## INTRODUCTION

Prevalence of obesity is on constant rise globally in the past two-three decades; [1] it is therefore considered as the most pandemic yet neglected public health problem. According to World Health

Organization (WHO) estimates (October 2017), more than 1.9 billion adults (18 years and older) had been overweight in 2016 and obesity has tripled since 1975. [2] WHO also declares that low and middle-income countries experience an ascending trend in

prevalence of overweight and obesity. [2] Having a multifactorial etiology, obesity is associated with a variety of health-threatening conditions. [3] Hence obesity prevention has to be considered as the universal health priority.

Heredity and endocrine factors are crucial etiological factors for obesity, individuals having obesity-associated genes are more prone to develop obesity, although behavioral and socio-environmental factors are equally important in its etiology. [4-6] Eating behavior is one of the primary contributive determinants of body weight status, [5] wherein, eating behaviors including choices about time and place of eating, type and quantity of food consumed, decision making about start and stop time of food consumption influence energy intake and weight gain. [7] Therefore, it is worthwhile to have a clear understanding about interaction between individual differences in body composition and weight gain patterns with individual's behaviors such as food choices, energy intake and expenditure. This eventually points to the associative causes and environmental determinants of obesity. [7,8] Likewise, identifying other problems and correlates of obesity such as binge eating disorder, [9,10] night eating syndrome (NES), [11] snacking, [12] food cravings [13-17] and emotional eating are important. Studies regarding association of eating behaviors/ disorders and obesity are meager in Indian context [18] identification of eating behaviors and eating disorders that could be modified for weight control would provide information to develop management strategies for obesity control. The aim of the present study was to identify eating behaviors and eating disorders prevalent among adult men and women in India, one of the developing countries and their association to body weights.

## METHODOLOGY

**Study Design:** This is a quantitative observational study designed to investigate the associative eating behaviors and eating

disorders prevalent among adult men and women with varying body weights. The study was conducted in Mysore, a major city from south India.

**Study population:** 300 men and women aged 27 to 47 years having BMI varying between 18.5 and 40 participated in the study. Approximately equal proportion of subjects with normal BMI, overweight and obese was included (100 subjects had BMI 18.5- 23.99 and 200 had BMI of 24.0 - 40.0).

**Sampling design and Techniques:** Purposive sampling was implemented; more than 700 men and women were approached; out of whom, 107 men and 193 women (total 300) who met all the inclusion criteria participated in the study. Inclusion criteria charted were: educated married and unmarried men and women (no-pregnant and lactating) in the age group of 27 to 47 years; having BMI between 18.5-40 (classification considered- 18.5- 23.99 as normal, 24-26.99 as Overweight and 27-40 obese); non-diabetic, non-hypertensive and euthyroid subjects without long-term sickness (6 months) or under medical treatment that affect appetite or body weight.

The study was approved by the Institutional Human Ethics Committee for Human Research (IHEC), University of Mysore (reference number (IHEC-UOM No.148/Ph.D./2016-2017).

**Tools used for data collection:** Previously standardized questionnaires were used to obtain information. Details regarding demography (age, gender, religion, marital status, education, occupation, job status, family type, number of children, and socioeconomic status) were obtained. Body weight (kg) and height (cm) of each participant were measured using anthropometric rod (PRESTIGE; Measuring Range 0-2000 mm; graduation 1 mm) and digital electronic balance (Karada Scan Body composition monitor; Model: HBF-375) adopting techniques as described in WHO monograph 53. [19]

**Eating pattern, eating behavior and disorders:** three different questionnaires were used for the purpose; i. Assessment of eating pattern and eating habit – this included information regarding the type of diet, number of meals consumed per day, skipping meals and meals often skipped, munching habit and frequency of eating outside home; ii. Eating behavior of the participants was assessed using the “Eating behavior pattern questionnaire” and modified to suit for our population [20] and; iii. Eating problems and eating disorders: This included information related to food cravings, [21] Binge Eating Disorder (BED), [22] Night Eating Syndrome (NES), [23] Emotional eating and restrained eating,

uncontrolled eating (Three Factor Eating Questionnaire (TEFQ-18)). [24] Picky eating was also assessed by adopting 5 questions from adult picky eating questionnaire. [25] The adopted questionnaires were standardized to test for suitability for our population.

**Statistical Analysis:**

The computed data was analyzed for statistical significance; the primary analysis was carried out using SPSS version 16. The data was analyzed for descriptive statistics and the results are presented as number and percentages. In order to compare the means, Chi-square test was implemented.

**RESULTS**

Table1. Descriptive profile of the participants (number and %)

| Variables                   | Characteristic     | Total     | Gender    |            |
|-----------------------------|--------------------|-----------|-----------|------------|
|                             |                    |           | Males     | Females    |
|                             |                    | 300       | 107(35.7) | 193(64.3)  |
| Age (yrs.)                  | 27-36              | 166(55.3) | 62(57.9)  | 104(53.9)  |
|                             | 37-47              | 134(44.7) | 45(42.1)  | 89(46.1)   |
| Religion                    | Hindu              | 226(75.3) | 90(84.1)  | 136(70.5)  |
|                             | Muslims            | 35(11.7)  | 11(10.3)  | 24(12.4)   |
|                             | Christians         | 39(13.0)  | 6(5.6)    | 33(17.1)   |
| Education                   | SSLC + diploma     | 30(10.0)  | 8(7.5)    | 22 (11.4)  |
|                             | Graduates          | 68(22.7)  | 20 (18.7) | 48(24.9)   |
|                             | Higher education   | 165(55.0) | 68(63.6)  | 97 (50.3)  |
|                             | Professionals      | 37(12.3)  | 11(10.3)  | 26 (13.5)  |
| Job status                  | On Job             | 262(87.3) | 98 (91.6) | 164 (85.0) |
|                             | Unemployed         | 38(12.6)  | 9 (8.4)   | 29 (15.0)  |
| Marital status              | Married            | 245(81.7) | 69(64.5)  | 176(91.2)  |
|                             | Unmarried/Divorces | 55(18.3)  | 38(35.5)  | 17 (8.8)   |
| Type of family              | Nuclear            | 220(73.3) | 70(65.4)  | 150(77.7)  |
|                             | Joint              | 69(23.0)  | 34(31.8)  | 35(18.1)   |
|                             | Extended           | 9(3.0)    | 2(1.9)    | 7(3.6)     |
| Number of children          | No child           | 83(27.7)  | 53(49.5)  | 30(15.0)   |
|                             | 1 to 2             | 203(67.7) | 53(49.5)  | 150(77.7)  |
|                             | 3 and above        | 14(4.7)   | 1(0.9)    | 13(6.7)    |
| Socio-Economic Status (SES) | Low                | 81(27.0)  | 30(28.0)  | 51(26.4)   |
|                             | Middle             | 152(50.7) | 52(48.6)  | 100(51.8)  |
|                             | High               | 67(22.3)  | 25(23.4)  | 42(21.8)   |
| Weight status- BMI          | Normal             | 100(33.3) | 33(30.8)  | 67(34.7)   |
|                             | Overweight         | 88(29.3)  | 33(30.8)  | 55(28.5)   |
|                             | Obese              | 112(37.3) | 41(38.3)  | 71(36.8)   |

The demographic information of the participants is presented in table 1. It reveals that higher proportions of both men and women participants belonged to 27-36 years of age. Seventy-eight percent of the participants were graduates and postgraduates, while 13 percent were professionals being medical doctors, lawyers and engineers. Higher proportion of men and women were employed. 81.7% of

the participants were married wherein markedly higher proportions of women were married.

A general pattern of eating among participants in different weight categories is shown in Table 2. It is evident from the results that markedly higher proportion of subjects practiced non-vegetarian diet, wherein the association between practicing non-vegetarianism and increasing body

mass index was found to be statistically significant among male subjects ( $P < 0.05$ ). Two to three meals a day was the common eating pattern among the participants (80.3%) while 19% mentioned to follow 4-5 meals per day. An insignificant proportion (0.7%) had more than 5 meals per day. Although skipping meals was not found to be a prevalent habit among men and women subjects, breakfast was apparently the most skipped meal. Among the participants who mentioned to skip meals, markedly higher percentage skipped meals once a week. Further, eating outside home as in restaurant

was common. Most of the participants (both men and women) stated that they ate outside home at least once a week. Nevertheless, there was no significant association between place of eating and BMI. In addition, 'moderately low-fat eaters' were more predominant than 'high-fat eaters' and 'low-fat eaters'. Likewise, 'moderate snackers' were more prevalent (90%) than 'snackers' and 'not snackers' in the study population. Both fat eating and snacking behaviors did not exhibit statistically significant association to body weights.

Table 2. Comparison of eating pattern among participants in different weight categories N (%)

| Variables                                    | Participants – weight category |                  |                           |                    |                |                             |                     |                |
|--|--------------------------------|------------------|---------------------------|--------------------|----------------|-----------------------------|---------------------|----------------|
|  | Total                          |                  | Male                      |                    |                | Female                      |                     |                |
|  | Males<br>n-107                 | Females<br>n-193 | Normal<br>N =33           | Overweight<br>N 33 | Obese<br>N =41 | Normal<br>N =67             | overweight<br>N =55 | Obese<br>N =71 |
| <b>Type of diet</b>                          |                                |                  |                           |                    |                |                             |                     |                |
| Vegetarian                                   | 41(38.3)                       | 60(31.1)         | 17(51.5)                  | 16(48.5)           | 8(19.5)        | 20(30.0)                    | 18(32.7)            | 22(31.0)       |
| Non-Vegetarian                               | 66(61.7)                       | 133(68.9)        | 16(48.5)                  | 17(51.5)           | 33(80.5)       | 47(70.0)                    | 37(67.3)            | 49(69.0)       |
| Chi-square                                   |                                |                  | $\chi^2 = 10.01, P=0.007$ |                    |                | $\chi^2 = 0.117, P=0.943$   |                     |                |
| <b>No. of meals/day</b>                      |                                |                  |                           |                    |                |                             |                     |                |
| 2-3  | 81(75.7)                       | 160(32.9)        | 28(84.8)                  | 26(32.1)           | 27(66)         | 57(85.1)                    | 49(89.1)            | 54(76.1)       |
| 4-5  | 25(23.4)                       | 32(16.6)         | 5(15.2)                   | 7(21.2)            | 13(31.6)       | 10(14.9)                    | 6(10.9)             | 16(22.5)       |
| 6-7  | 1(0.9)                         | 1(0.5)           | 0(0.0)                    | 0(0.0)             | 1(2.4)         | 0(0.0)                      | 0(0.0)              | 1(1.4)         |
| Chi-square                                   |                                |                  | $\chi^2 = 4.781, P=0.311$ |                    |                | $\chi^2 = 5.108, P=0.276$   |                     |                |
| <b>Skipping meals*</b>                       |                                |                  |                           |                    |                |                             |                     |                |
| Yes  | 21(16.6)                       | 73(37.8)         | 5(15.2)                   | 8(24.2)            | 8(19.5)        | 22(32.8)                    | 24(43.6)            | 27(38.0)       |
| No   | 86(80.4)                       | 120(62.2)        | 28(84.8)                  | 25(75.8)           | 33(80.5)       | 45(67.2)                    | 31(56.4)            | 44(62.0)       |
| Chi-square                                   |                                |                  | $\chi^2 = 0.865, P=0.649$ |                    |                | $\chi^2 = 1.5, P=0.472$     |                     |                |
| <b>Meal often skipped</b>                    |                                |                  |                           |                    |                |                             |                     |                |
| Breakfast                                    | 12(11.2)                       | 48(24.9)         | 3(9.1)                    | 4(12.1)            | 5(12.2)        | 14(20.9)                    | 18(32.7)            | 16(22.5)       |
| Lunch  | 9(8.4)                         | 15(7.8)          | 2(6.1)                    | 4(12.1)            | 3(7.3)         | 4(6.0)                      | 6(10.9)             | 5(7.0)         |
| Dinner                                       | 0(0.0)                         | 10(5.2)          | 0(0.0)                    | 0(0.0)             | 0(0.0)         | 4(40.0)                     | 0(0.0)              | 6(60.0)        |
| Chi-square                                   |                                |                  | $\chi^2 = 1.177, P=0.882$ |                    |                | $\chi^2 = 7.934, P= 0.243$  |                     |                |
| <b>Frequency of Meal skipped/week</b>        |                                |                  |                           |                    |                |                             |                     |                |
| Once   | 7(6.5)                         | 20(10.4)         | 2(6.1)                    | 1(3.0)             | 4(9.8)         | 4(6.0)                      | 9(16.4)             | 7(9.9)         |
| 2-4 times                                    | 11(10.3)                       | 39(20.2)         | 3(9.1)                    | 6(18.2)            | 2(4.9)         | 13(19.4)                    | 10(18.2)            | 16(22.5)       |
| Daily  | 3(2.8)                         | 14(7.3)          | 0(0.0)                    | 1(3.0)             | 2(4.9)         | 5(7.5)                      | 5(9.1)              | 4(5.6)         |
| Chi-square                                   |                                |                  | $\chi^2 = 0.234, P=0.398$ |                    |                | $\chi^2 = 0.152, P= 0.598$  |                     |                |
| <b>Frequency of eating outside home/week</b> |                                |                  |                           |                    |                |                             |                     |                |
| Once   | 40(37.4)                       | 89(46.1)         | 11(33.3)                  | 14(34.1)           | 40(37.4)       | 39(58.2)                    | 23(41.8)            | 27(38.0)       |
| 2-4 times                                    | 32(29.9)                       | 55(28.5)         | 8(24.2)                   | 12(36.4)           | 12(29.3)       | 12(17.9)                    | 15(27.3)            | 28(39.4)       |
| Daily  | 23(21.5)                       | 7(3.6)           | 4(12.1)                   | 6(18.2)            | 13(31.7)       | 0(0.0)                      | 2(3.6)              | 5(7.0)         |
| Not eat outside                              | 12(11.2)                       | 42(21.8)         | 6(18.2)                   | 4(12.1)            | 2(4.9)         | 16(23.9)                    | 15(27.3)            | 11(15.5)       |
| Chi-square                                   |                                |                  | $\chi^2 = 8.082, P=0.232$ |                    |                | $\chi^2 = 15.899, P= 0.014$ |                     |                |
| <b>Place Preferred to eat</b>                |                                |                  |                           |                    |                |                             |                     |                |
| Eating in restaurant                         | 102(95.3)                      | 167(86.5)        | 33(100.0)                 | 31(93.9)           | 38(92.7)       | 57(85.1)                    | 46(83.6)            | 64(90.1)       |
| Place order for delivery                     | 5(4.7)                         | 26(13.5)         | 0(0.0)                    | 2(6.1)             | 3(7.3)         | 10(14.9)                    | 9(16.4)             | 7(9.9)         |
| Chi-square                                   |                                |                  | $\chi^2 = 2.404, P=0.301$ |                    |                | $\chi^2 = 1.311, P= 0.519$  |                     |                |
| <b>Fat eating</b>                            |                                |                  |                           |                    |                |                             |                     |                |
| High fat eater                               | 2(1.9)                         | 1(0.5)           | 0(0.0)                    | 1(3.0)             | 1(2.4)         | 0(0.0)                      | 0(0.0)              | 1(1.4)         |
| Moderate (neutral)                           | 102(95.3)                      | 179(92.7)        | 32(97.0)                  | 30(90.9)           | 40(97.6)       | 63(94.0)                    | 53(96.4)            | 63(88.7)       |
| Low fat eater                                | 3(2.8)                         | 13(6.7)          | 1(3.0)                    | 2(6.1)             | 0(0.0)         | 4(6.0)                      | 2(3.6)              | 7(9.9)         |
| Chi-square                                   |                                |                  | $\chi^2 = 3.429, P=0.489$ |                    |                | $\chi^2 = 3.802, P=0.433$   |                     |                |
| <b>Snacking</b>                              |                                |                  |                           |                    |                |                             |                     |                |
| Not snacker                                  | 3(2.8)                         | 22(11.4)         | 0(0.0)                    | 2(6.1)             | 1(2.4)         | 9(13.4)                     | 6(10.9)             | 7(9.9)         |
| Moderate snacker                             | 101(94.4)                      | 169(87.6)        | 33(100.0)                 | 30(90.9)           | 38(92.7)       | 58(86.6)                    | 48(87.3)            | 63(88.7)       |
| Snacker                                      | 3(2.8)                         | 2(1.0)           | 0(0.0)                    | 1(3.0)             | 2(4.9)         | 0(0.0)                      | 1(1.8)              | 1(1.4)         |
| Chi-square                                   |                                |                  | $\chi^2 = 3.919, P=0.417$ |                    |                | $\chi^2 = 1.535, P=0.820$   |                     |                |

**Table 3. Munching habit among the participants and their associate variables according to body weight**

| Variables                                | Participants – different body weight category No (%) |                  |                 |                    |                          |                 |                     |                |
|--|--|------------------|-----------------|--------------------|--------------------------|-----------------|---------------------|----------------|
|  | Total  |                  | Male            |                    |                          | Female          |                     |                |
|  | Males<br>n-107                                       | Females<br>n-193 | Normal<br>N =33 | Overweight<br>N 33 | Obese<br>N =41           | Normal<br>N =67 | Overweight<br>N =55 | Obese<br>N =71 |
| <b>Munching habit</b>                    |  |                  |                 |                    |                          |                 |                     |                |
| Yes                                      | 38(35.5)   | 60(31.1)         | 8(24.2)         | 9(27.3)            | 21(51.2)                 | 11(16.4)        | 9(16.4)             | 40(56.3)       |
| No                                       | 69(64.5)   | 133(68.9)        | 25(75.8)        | 24(72.7)           | 20(48.8)                 | 56(83.6)        | 46(83.6)            | 31(43.7)       |
| Chi-square                               | $\chi^2=7.225, P=0.027$                              |                  |                 |                    | $\chi^2=33.426, P=0.001$ |                 |                     |                |
| <b>Time of munching</b>                  |  |                  |                 |                    |                          |                 |                     |                |
| Day time                                 | 6(5.6)   | 8(4.1)           | 1(3.0)          | 2(6.1)             | 3(7.3)                   | 2(3.0)          | 1(1.8)              | 5(7.0)         |
| Evening                                  | 28(26.2)   | 52(26.9)         | 6(18.2)         | 6(18.2)            | 16(39.0)                 | 9(13.4)         | 8(14.5)             | 35(49.3)       |
| Night                                    | 4(3.7)   | 0(0.0)           | 1(3.0)          | 1(3.0)             | 2(4.9)                   | 0(0.0)          | 0(0.0)              | 0(0.0)         |
| Chi-square                               | $\chi^2=10.232, P=0.249$                             |                  |                 |                    | $\chi^2=37.382, P=0.001$ |                 |                     |                |
| <b>Age when munching habit commenced</b> |  |                  |                 |                    |                          |                 |                     |                |
| Childhood                                | 10(9.3)  | 20(10.4)         | 2(6.1)          | 1(3.0)             | 7(17.1)                  | 3(4.5)          | 4(7.3)              | 13(18.3)       |
| Adolescence                              | 16(15.0)   | 21(10.9)         | 3(9.1)          | 3(9.1)             | 10(24.4)                 | 2(3.0)          | 2(3.6)              | 17(23.9)       |
| Adulthood                                | 12(11.2)   | 19(9.8)          | 3(9.1)          | 5(15.2)            | 4(9.8)                   | 6(9.0)          | 3(5.5)              | 10(14.1)       |
| Chi-square                               | $\chi^2=11.6, P=0.072$                               |                  |                 |                    | $\chi^2=37.518, P=0.001$ |                 |                     |                |
| <b>Munch while watching TV</b>           |  |                  |                 |                    |                          |                 |                     |                |
| Yes                                      | 66(61.7)   | 113(58.5)        | 14(42.4)        | 22(66.7)           | 30(73.2)                 | 37(55.2)        | 30(54.5)            | 46(64.8)       |
| No                                       | 41(38.3)   | 80(41.5)         | 19(57.6)        | 11(33.3)           | 11(26.8)                 | 30(44.8)        | 25(45.5)            | 25(35.2)       |
| Chi-square                               | $\chi^2=7.815, P=0.020$                              |                  |                 |                    | $\chi^2=1.808, P=0.405$  |                 |                     |                |
| <b>Munch while chatting with friends</b> |  |                  |                 |                    |                          |                 |                     |                |
| Yes                                      | 56(52.3)   | 97(50.3)         | 12(36.4)        | 17(51.5)           | 27(65.9)                 | 33(49.3)        | 25(45.5)            | 39(54.9)       |
| No                                       | 51(47.7)   | 96(49.7)         | 21(63.6)        | 16(48.5)           | 14(34.1)                 | 34(50.7)        | 30(54.5)            | 32(45.1)       |
| Chi-square                               | $\chi^2=6.387, P=0.041$                              |                  |                 |                    | $\chi^2=1.154, P=0.561$  |                 |                     |                |
| <b>Munch while studying(reading)</b>     |  |                  |                 |                    |                          |                 |                     |                |
| Yes                                      | 25(23.4)   | 41(21.2)         | 6(18.2)         | 5(15.2)            | 14(34.1)                 | 9(13.4)         | 7(12.7)             | 25(35.2)       |
| No                                       | 82(76.6)   | 152(78.8)        | 27(81.8)        | 28(84.8)           | 27(65.9)                 | 58(86.6)        | 48(87.3)            | 46(64.8)       |
| Chi-square                               | $\chi^2=4.40, P=0.111$                               |                  |                 |                    | $\chi^2=13.107, P=0.001$ |                 |                     |                |

**Table 4. Eating disorders prevalent among the participants as influenced by body weight status**

| Eating disorders                                   | %  |                  | Males           |                     |                          | Females         |                     |                |
|--|--|------------------|-----------------|---------------------|--------------------------|-----------------|---------------------|----------------|
|  | Males<br>n-107                                       | Females<br>n-193 | Normal<br>N =33 | Overweight<br>N =33 | Obese<br>N =41           | Normal<br>N =67 | Overweight<br>N =55 | Obese<br>N =71 |
|  | <b>Binge eating disorder - level of binge eating</b> |                  |                 |                     |                          |                 |                     |                |
| little or no                                       | 98(91.6)   | 175(90.7)        | 33(100.0)       | 31(93.9)            | 34(82.9)                 | 63(94.0)        | 48(87.3)            | 64(90.1)       |
| Moderate   | 8(7.5)   | 16(8.3)          | 0(0.0)          | 2(6.1)              | 6(14.6)                  | 4(6.0)          | 7(12.7)             | 5(7.0)         |
| severe binge                                       | 1(0.9)   | 2(1.0)           | 0(0.0)          | 0(0.0)              | 1(2.4)                   | 0(0.0)          | 0(0.0)              | 2(2.8)         |
| Chi-square   | $\chi^2=7.586, P=0.108$                              |                  |                 |                     | $\chi^2=5.467, P=0.243$  |                 |                     |                |
| <b>Picky eating behavior</b>                       |  |                  |                 |                     |                          |                 |                     |                |
| Little or no                                       | 50(46.7)   | 99(51.3)         | 11(33.3)        | 16(48.5)            | 23(56.1)                 | 35(52.2)        | 30(54.5)            | 34(47.9)       |
| Moderate   | 50(46.7)   | 88(45.6)         | 19(57.6)        | 16(48.5)            | 15(36.6)                 | 29(43.3)        | 24(43.6)            | 35(49.3)       |
| Severe   | 7(6.5)   | 6(3.1)           | 3(9.1)          | 1(3.0)              | 3(7.3)                   | 3(4.5)          | 1(1.8)              | 2(2.8)         |
| Chi-square   | $\chi^2=4.802, P=0.308$                              |                  |                 |                     | $\chi^2=1.345, P=0.854$  |                 |                     |                |
| <b>Night Eating Syndrome</b>                       |  |                  |                 |                     |                          |                 |                     |                |
| No night eating                                    | 98(91.6)   | 183(94.8)        | 30(90.9)        | 29(87.9)            | 39(95.1)                 | 66(98.5)        | 51(92.7)            | 66(93.0)       |
| Night eating                                       | 9(8.4)   | 9(4.7)           | 3(9.1)          | 4(12.1)             | 2(4.9)                   | 1(1.5)          | 4(7.3)              | 4(5.6)         |
| Strong night eating                                | 0(0.0)   | 1(0.5)           | 0(0.0)          | 0(0.0)              | 0(0.0)                   | 0(0.0)          | 0(0.0)              | 1(1.4)         |
| Chi-square   | $\chi^2=1.274, P=0.529$                              |                  |                 |                     | $\chi^2=4.257, P=0.372$  |                 |                     |                |
| <b>Restrained eating</b>                           |  |                  |                 |                     |                          |                 |                     |                |
| Not restrained                                     | 5(4.7)   | 8(4.1)           | 0(0.0)          | 3(9.1)              | 2(4.9)                   | 2(3.0)          | 2(3.6)              | 4(5.6)         |
| Neutral  | 97(90.7)   | 172(89.1)        | 31(93.9)        | 27(81.8)            | 39(95.1)                 | 60(89.6)        | 48(87.3)            | 64(90.1)       |
| Restrained   | 5(4.7)   | 13(6.7)          | 2(40.0)         | 3(60.0)             | 0(0.0)                   | 5(7.5)          | 5(9.1)              | 3(4.2)         |
| Chi-square   | $\chi^2=6.768, P=0.149$                              |                  |                 |                     | $\chi^2=1.832, P=0.767$  |                 |                     |                |
| <b>Emotional eating</b>                            |  |                  |                 |                     |                          |                 |                     |                |
| No emotional                                       | 34(31.8)   | 92(47.7)         | 10(30.3)        | 15(45.5)            | 9(22.0)                  | 40(59.7)        | 27(49.1)            | 25(35.2)       |
| Moderate emotional                                 | 49(45.8)   | 84(43.5)         | 20(60.6)        | 11(33.3)            | 18(43.9)                 | 26(38.8)        | 26(47.3)            | 32(45.1)       |
| Emotional  | 24(22.4)   | 17(8.8)          | 3(9.1)          | 7(21.2)             | 14(34.1)                 | 1(1.5)          | 2(3.6)              | 14(19.7)       |
| Chi-square   | $\chi^2=11.092, P=0.026$                             |                  |                 |                     | $\chi^2=20.265, P=0.001$ |                 |                     |                |
| <b>Uncontrolled eating</b>                         |  |                  |                 |                     |                          |                 |                     |                |
| Have control on eating                             | 17(15.9)   | 60(31.1)         | 8(24.2)         | 5(15.2)             | 4(9.8)                   | 30(44.8)        | 18(32.7)            | 12(16.9)       |
| Neutral  | 81(75.7)   | 127(65.8)        | 25(75.8)        | 27(81.8)            | 29(70.7)                 | 37(52.2)        | 37(67.3)            | 53(74.6)       |
| Uncontrolled eating                                | 9(8.4)   | 6(3.1)           | 0(0.0)          | 1(3.0)              | 8(19.5)                  | 0(0.0)          | 0(0.0)              | 6(8.5)         |
| Chi-square   | $\chi^2=12.647, P=0.013$                             |                  |                 |                     | $\chi^2=20.994, P=0.001$ |                 |                     |                |
| <b>Food cravings (scores based on 0- 90 scale)</b> |  |                  |                 |                     |                          |                 |                     |                |
| No craving <30                                     | 32(29.9)   | 51(26.4)         | 15(45.5)        | 11(33.3)            | 6(14.6)                  | 25(37.3)        | 13(23.6)            | 13(18.3)       |
| Neutral 31 – 60                                    | 5(4.7)   | 16(8.3)          | 2(6.1)          | 1(3.0)              | 2(4.9)                   | 8(11.9)         | 6(10.9)             | 2(2.8)         |
| Food craving >60                                   | 70(65.4)   | 126(65.3)        | 16(48.5)        | 21(63.6)            | 33(80.5)                 | 34(50.7)        | 36(65.5)            | 56(78.9)       |
| Chi-square   | $\chi^2=9.211, P=0.056$                              |                  |                 |                     | $\chi^2=13.212, P=0.010$ |                 |                     |                |



Munching habit among the participants as well as its associative factors are presented in Table 3. It is apparent that a greater proportion of both men and women participants (67.3%) did not claim to have munching habit; nevertheless, statistically significant association ( $P < 0.005$ ) was noted between munching and BMI among both men and women. Further, time preferred for munching was also enquired, notably increasing body mass index was found to have a strong association with time of munching among females. Other associative activities alongside munching exhibited gender-based variations; munch while 'watching TV' and 'chatting with friends' was highest among males while females preferred to munch while 'reading', there were significantly ( $P < 0.005$ ) associated to their respective BMIs. Hence a positive association could be inferred between raised mass indexes and munching. Majority of the participants claimed to have developed munching habit at the time of adolescence, a significant ( $p < 0.05$ ) association was observed between age since munching habit started and elevated body mass index.

Eating problems prevalent among participants is illustrated in Table 4, a variety of eating disorders seem to be prevalent among the participants. There is an obvious association between certain eating problems and body weight status. Binge eating was found among 9 to 10% of overweight and obese male and female participants. Among other disorders, moderate to severe picky eating and restrained eating was seen among those with normal body weights in higher proportions. Emotional eating (moderate- 45.8 & 43.5%; severe form- 22.4 & 8.8%) and food cravings (65%) was most prevalent among overweight and obese men and women. Higher percentages of men (16%) and women (31.1%) with normal weights claimed to exercise controlled eating while 8.4 and 3.1% overweight men and women claimed to have uncontrolled eating disorder. Our results revealed that emotional eating and uncontrolled eating disorders

bear statistically significant association to higher body weight status among both men and women while food craving among female participants exhibited significant association.

## DISCUSSION

Eating is a complex phenomenon involving temporal and hedonic characteristics of food and environment and personality traits of individuals that influence eating pattern. [26,27] Personality traits such as impulsivity, novelty seeking, stress reactivity, harm avoidance, perfectionism, and other personality traits are common in population worldwide, these generally influence eating pattern giving rise to eating disorders. These disturbances in eating habits could lead to either excessive or insufficient food intake affecting body weight changes. The most frequently studied eating disorders are anorexia nervosa and bulimia, however certain atypical eating disorders have also been referred to those significant eating disorders associated with unexplained weight loss, rumination, unexplained food intolerances or an extremely picky eating habit that does not meet the criteria of anorexia nervosa, bulimia, or binge disorder.

Studies have demonstrated the importance of peripheral uptake of serotonin in food intake behavior; while among bulimic patient's functional alterations in serotonin uptake occurs. This alteration is considered as an outcome of aberrant eating behavior in humans. [28] Eating behavior may be an important factor determining excess weight gain during adulthood, and are useful inferences especially when focused on preventing obesity. Information about the prevalence of eating disorders, and the improvement in prognosis if eating disorders are detected early highlight the importance of identifying such risk factors. [29]

Our study endorse results of previous studies supporting a positive role of vegetarian diet with respect to weight

control, <sup>[30]</sup> pesco-vegetarian and vegans are also regarded to maintain lower body weights. <sup>[31]</sup> Majority of the study participants with normal BMI range were vegetarians. On the other hand, markedly higher percentage of participants practicing nonvegetarian diets had higher body weights; the differences were statistically significant ( $P=0.007$ ) in case of male subjects.

Among the other temporal characteristics of the study population, consuming 4-7 meals daily and skipping meals daily were found in higher proportion among overweight and obese individuals. A recent study showed an association between consuming 1-2 meals per day and decrease in BMI; whereas having 3 or more meals per day was associated with increased BMI. <sup>[32]</sup> In contrast to this, our study did not show any significant association with body mass index and majority of the subject from both genders consumed 2-3 meals per day. Meal skipping is a growing trend and is the consequence of practicing modern lifestyle and may result in obesity. <sup>[33]</sup> Despite a common notion of the relationship between skipping meals and increasing body weight, there are meager experimental studies available to demonstrate this belief. Conversely, copious cross-sectional studies showed that people who skipped breakfast regularly had higher body mass index. <sup>[34]</sup> A few studies also report that skipping meals was more common among young adults. <sup>[35]</sup> An increase in the frequency of eating outside home has been considered as one of the factors which may contribute to the upsurge of obesity prevalence. Some cross-sectional and longitudinal studies have revealed an association between frequency of eating outside home and higher BMI. <sup>[36]</sup> In a study, the association between eating outside home with overweight and obesity was observed only among men, <sup>[36]</sup> while our results exhibited a trend in higher BMI among those who ate outside home frequently but was not statistically significant. This could be due to the propensity of Indians to eat the same

cuisines outside (cafes and restaurants) which they often consume at home. Cross-sectional studies show a positive association between the quantity of fat intake and relative body weights. In our study, high fat consuming behavior was seen in a very small percentage of population (2%).

The association between snacking and overweight and obesity has been the center of attention of many studies. The probability of obesity in relation to snacking differs up to 70% according to the definition of snacking. <sup>[37]</sup> Though in our study the definition of snacking is to some extent clear; Statements such as “I eat snacks/chat at food streets”, “I am a snacker”, “I snack two to three times a day”, “If I am bored, I will snack more”, “I usually keep cookies/fried snacks at home” clearly show that snack is an extra eating occasion in addition to the normal meals. Our results did not show considerable association between snacking and the BMI. One reason could be that many of the snacks have low to moderate energy content. Literature also provides small and inconsistent evidence about the association of snacking with increasing BMI. <sup>[38]</sup> Research on munching habit in association with obesity is lacking. According to Cambridge online dictionary “munching” defines as “to eat something, especially noisily”; this definition encompasses eating different foods from crackers and biscuits to fruits but in a continuous way both during working hours and leisure time. Our findings revealed statistical significance between munching and elevated BMI in both men and women ( $P=0.027$  men;  $P=0.001$  women). Most frequent activity associated with munching among the study population was watching TV, chatting with friends and studying, gender biased effect was obvious between munching and high body mass indexes.

Binge eating without purging is reported to be common in general populations and is often associated as one of the important etiology for obesity. Other than these, certain atypical eating disorders have also been referred to those significant

eating disorders associated with unexplained weight loss, rumination, unexplained food intolerances or an extremely picky eating habit that does not meet the criteria of anorexia nervosa, bulimia, or binge disorder. [28] Statistics about their prevalence in Indian population is scarce. Practices such as Food cravings, Uncontrolled eating, Emotional eating, Restrained eating, Picky eating and binge eating are risk factors for increased body weights their prevalence in subjects among different body weight categories were assessed. [39-41] In our study population binge eating, night eating and restrained eating was prevalent in less than 10%. The prevalence rate is essentially similar to the statistics reported from developed countries. [11-42]

Picky eating represents certain eating behaviors such as strong food preferences, restricted food intake and lack of vegetable consumption and reluctance to eat new or unfamiliar foods in individuals. [43-44] In our study 50% of the population reported to have this eating problem and only less than 5% were severe picky eaters, nevertheless, the differences among subjects with differing body weight status was statistically not significant, it suggests the need for more detailed investigations about picky eating behaviors in Indian adult population.

Uncontrolled eating refers to a tendency to overeat, with the feeling of being out of control. Emotional eating means the tendency to eat in response to negative emotions. Both these disorders were prevalent among men and women participants, and had a strong association with higher BMI (uncontrolled eating-  $P=0.013$  men;  $P=0.001$  women; emotional eating-  $P=0.026$  men,  $P=0.001$ ). Food craving has been the center of attention of numerous studies for decades. Food craving has been associated with body mass index and ingestion of various types of foods (sweet, high-fat, carbohydrate/starches, and fast-food). [45] Research suggests that incidence, type of food craved most and strength of cravings, differs among men and

women. [46] Our results showed a significant association between weight status and food craving among women.

## CONCLUSION

Unhealthy eating behaviors and eating disorders have become common among populations worldwide. Data related to the prevalence of eating disorders is sporadic in developing countries. Eating behaviours and eating disorders are known to contribute to obesity, it is reasonable to understand the importance of developing data base about eating patterns of population and occurrence of eating disorders. This study attempts to explore the eating practices and eating disorders prevalent among adult men and women from a major city in south India.

Our results have demonstrated a significant and positive influence of eating patterns such as non-vegetarian diet practice, munching, number of meals consumed per day, meal skipping, eating outside home, high fat eating and snacking on body weights. However, majority of participants were moderate fat eaters and moderate snackers, munching (31 % females and 35% males) was a common practice. Occurrence of Binge eating, picky eating, night eating, restrained eating and uncontrolled eating was prevalent in less than 10% of the population. Except for picky eating and restrained eating other disorders had a positive association to overweight and obesity. Surprisingly emotional eating (emotional eating- 22.4 and 8.8%; moderate emotional eating- 45.8 and 43.5% in male and females respectively) and food cravings (65% males and females) was prevalent in markedly higher percentage. Both these disorders were significantly associated with overweight and obesity (emotional eating-  $P=0.026$  men,  $P=0.001$  women; food craving-  $P=0.010$  women). Our study has brought about important observation that the urban adult population have eating practices and disorders essentially similar to other developed countries. Also, the prevailing



eating practices indicate risk for the rising obesity prevalence in developing countries. Therefore, implementing programs to create awareness among population about the eating disorders and importance of right eating practices should be prioritised. People should be educated about the symptoms and harmful effects of eating disorders so that they volunteer for corrective measures.

## REFERENCES

1. Satija A, Hu FB, Bowen L, Bharathi AV, Vaz M, Prabhakaran D, et al. Dietary patterns in India and their association with obesity and central obesity. *Public health nutrition*. 2015;18(16):3031-41.
2. Organization WH. Obesity and Overweight factsheet from the WHO. Health. 2017.
3. Dhurandhar NV. Obesity in India: Opportunities for clinical research. *Journal of Obesity and Metabolic Research*. 2014;1(1):25.
4. Mackenbach JD, Rutter H, Compernelle S, Glonti K, Oppert JM, Charreire H, et al. Obesogenic environments: a systematic review of the association between the physical environment and adult weight status, the SPOTLIGHT project. *BMC Public Health*. 2014;14:233.
5. Dietrich A, Federbusch M, Grellmann C, Villringer A, Horstmann A. Body weight status, eating behavior, sensitivity to reward/punishment, and gender: relationships and interdependencies. *Front Psychol*. 2014;5:1073.
6. Jensen MK, Chiuve SE, Rimm EB, Dethlefsen C, Tjonneland A, Joensen AM, et al. Obesity, behavioral lifestyle factors, and risk of acute coronary events. *Circulation*. 2008;117(24):3062-9.
7. French SA, Epstein LH, Jeffery RW, Blundell JE, Wardle J. Eating behavior dimensions. Associations with energy intake and body weight. A review. *Appetite*. 2012;59(2):541-9.
8. French MT, Roebuck MC, McLellan AT, Sindelar JL. Can the Treatment Services Review be used to estimate the costs of addiction and ancillary services? *Journal of Substance Abuse*. 2000;12(4):341-61.
9. Klatzkin RR, Gaffney S, Cyrus K, Bigus E, Brownley KA. Binge eating disorder and obesity: Preliminary evidence for distinct cardiovascular and psychological phenotypes. *Physiology & behavior*. 2015;142:207.
10. Higgins DM, Dorflinger L, MacGregor KL, Heapy AA, Goulet JL, Ruser C. Binge eating behavior among a national sample of overweight and obese veterans. *Obesity*. 2013;21(5):900-3.
11. Milano W, De Rosa M, Milano L, Capasso A. Night eating syndrome: an overview. *Journal of Pharmacy and Pharmacology*. 2012;64(1):2-10.
12. Berg C, Lappas G, Wolk A, Strandhagen E, Torén K, Rosengren A, et al. Eating patterns and portion size associated with obesity in a Swedish population. *Appetite*. 2009;52(1):21-6.
13. Franken IHA, Muris P. Individual differences in reward sensitivity are related to food craving and relative body weight in healthy women. *Appetite*. 2005;45(2):198-201.
14. Howarth N, Huang TT, Roberts S, Lin B, McCrory M. Eating patterns and dietary composition in relation to BMI in younger and older adults. *International journal of obesity*. 2007;31(4):675-84.
15. White MA, Whisenhunt BL, Williamson DA, Greenway FL, Netemeyer RG. Development and validation of the food-craving inventory. *Obesity*. 2002;10(2):107-14.
16. Potenza MN, Grilo CM. How relevant is food craving to obesity and its treatment? *Frontiers in psychiatry*. 2014;5.
17. Dietrich A, Hollmann M, Mathar D, Villringer A, Horstmann A. Brain regulation of food craving: relationships with weight status and eating behavior. *Int J Obes*. 2016;40(6):982-9.
18. Singh Mannat M, Parsekar SS, Bhumika T. Body Image, Eating Disorders and Role of Media among Indian Adolescents. *Journal of Indian Association for Child & Adolescent Mental Health*. 2016;12(1):9-35.
19. Jelliffe DB. The assessment of the nutritional status of the community. Geneva Switzerland World Health Organization 1966 (World Health Organization Monograph Series No 53) 271 p. 1966.
20. Schlundt DG, Hargreaves MK, Buchowski MS. The eating behavior patterns questionnaire predicts dietary fat intake in African American women. *Journal of the*

- American Dietetic Association. 2003; 103(3):338-45.
21. Meule A, Hermann T, Kübler A. A short version of the Food Cravings Questionnaire-Trait: the FCQ-T-reduced. *Frontiers in psychology*. 2014;5:190.
  22. Gormally J, Black S, Daston S, Rardin D. The assessment of binge eating severity among obese persons. *Addictive behaviors*. 1982;7(1):47-55.
  23. Allison KC, Stunkard AJ, Thier SL. *Overcoming night eating syndrome: a step-by-step guide to breaking the cycle*: New Harbinger Publications; 2004.
  24. De Lauzon B, Romon M, Deschamps V, Lafay L, Borys J-M, Karlsson J, et al. The Three-Factor Eating Questionnaire-R18 is able to distinguish among different eating patterns in a general population. *The Journal of nutrition*. 2004;134(9):2372-80.
  25. Kauer J, Pelchat ML, Rozin P, Zickgraf HF. Adult picky eating. Phenomenology, taste sensitivity, and psychological correlates. *Appetite*. 2015;90:219-28.
  26. Leech RM, Timperio A, Livingstone KM, Worsley A, McNaughton SA. Temporal eating patterns: associations with nutrient intakes, diet quality, and measures of adiposity. *The American journal of clinical nutrition*. 2017;106(4):1121-30.
  27. Leech RM, Worsley A, Timperio A, McNaughton SA. Temporal eating patterns: a latent class analysis approach. *International Journal of Behavioral Nutrition and Physical Activity*. 2017;14(1):3.
  28. Rikani AA, Choudhry Z, Choudhry AM, Ikram H, Asghar MW, Kajal D, et al. A critique of the literature on etiology of eating disorders. *Annals of neurosciences*. 2013;20(4):157.
  29. Hays NP, Bathalon GP, McCrory MA, Roubenoff R, Lipman R, Roberts SB. Eating behavior correlates of adult weight gain and obesity in healthy women aged 55–65 y. *The American journal of clinical nutrition*. 2002;75(3):476-83.
  30. Tonstad S, Butler T, Yan R, Fraser GE. Type of vegetarian diet, body weight, and prevalence of type 2 diabetes. *Diabetes care*. 2009;32(5):791-6.
  31. Agrawal S, Millett CJ, Dhillon PK, Subramanian S, Ebrahim S. Type of vegetarian diet, obesity and diabetes in adult Indian population. *Nutrition journal*. 2014;13(1):89.
  32. Kahleova H, Lloren JI, Mashchak A, Hill M, Fraser G. [Frequency and timing of meals and changes in body mass index: Analysis of the data from the Adventist Health Study-2]. *Vnitřní lékařství*. 2016; 62(11 Suppl 4):S15-20.
  33. Nas A, Mirza N, Hagele F, Kahlhofer J, Keller J, Rising R, et al. Impact of breakfast skipping compared with dinner skipping on regulation of energy balance and metabolic risk. *Am J Clin Nutr*. 2017;105(6):1351-61.
  34. McCrory MA. Meal skipping and variables related to energy balance in adults: a brief review, with emphasis on the breakfast meal. *Physiology & behavior*. 2014;134:51-4.
  35. Pendergast FJ, Livingstone KM, Worsley A, McNaughton SA. Correlates of meal skipping in young adults: a systematic review. *The international journal of behavioral nutrition and physical activity*. 2016;13(1):125.
  36. Bezerra IN, Sichieri R. Eating out of home and obesity: a Brazilian nationwide survey. *Public health nutrition*. 2009;12(11):2037-43.
  37. Gregori D, Foltran F, Ghidina M, Berchiolla P. Understanding the influence of the snack definition on the association between snacking and obesity: a review. *International journal of food sciences and nutrition*. 2011;62(3):270-5.
  38. Mestas A, Muñoz-Pareja M, López-García E, Rodríguez-Artalejo F. Selected eating behaviours and excess body weight: a systematic review. *Obesity Reviews*. 2012;13(2):106-35.
  39. De Zwaan M. Binge eating disorder and obesity. *International Journal of Obesity & Related Metabolic Disorders*. 2001;25.
  40. Escandón-Nagel N, Peró M, Grau A, Soriano J, Feixas G. Emotional eating and cognitive conflicts as predictors of binge eating disorder in patients with obesity. *International Journal of Clinical and Health Psychology*. 2018;18(1):52-9.
  41. Yanovski SZ, Nelson JE, Dubbert BK, Spitzer RL. Association of binge eating disorder and psychiatric comorbidity in obese subjects. *American Journal of Psychiatry*. 1993;150:1472-9.
  42. Micali N, Field AE, Treasure JL, Evans DM. Are obesity risk genes associated with

- binge eating in adolescence? Obesity (Silver Spring, Md). 2015;23(8):1729-36.
43. Wildes JE, Zucker NL, Marcus MD. Picky eating in adults: Results of a web-based survey. *International Journal of Eating Disorders*. 2012;45(4):575-82.
44. Antoniou E, Roefs A, Kremers S, Jansen A, Gubbels J, Sleddens E, et al. Picky eating and child weight status development: a longitudinal study. *Journal of Human Nutrition and Dietetics*. 2016;29(3):298-307.
45. Potenza MN, Grilo CM. How Relevant is Food Craving to Obesity and Its Treatment? *Frontiers in psychiatry*. 2014;5:164.
46. Gilhooly C, Das S, Golden J, McCrory M, Dallal G, Saltzman E, et al. Food cravings and energy regulation: the characteristics of craved foods and their relationship with eating behaviors and weight change during 6 months of dietary energy restriction. *International Journal of Obesity*. 2007; 31(12):1849.

How to cite this article: Shahrokhisahneh B, Begum K. Associative eating behaviors and eating disorders among adult men and women with varying body mass index- a descriptive study in urban population. *Int J Health Sci Res*. 2018; 8(7):281-291.

\*\*\*\*\*