Original Article

Awareness on causes, consequences and preventive measures of obesity among urban married women in India

Praween Agrawal, Kamla Gupta[1], Vinod Mishra[2], Sutapa Agrawal[3]

Population Council, New Delhi, [1]Tata Institute of Social Sciences, Mumbai, India, [2]United Nations, New York, USA, [3]South Asia Network for Chronic Disease, Public Health Foundation of India, New Delhi, India

Address for the Correspondence:
Dr. Sutapa Agrawal, South Asia Network for Chronic Disease (SANCD), Public Health Foundation of India (PHFI), First Floor, C-1/52 Safdarjung Development Area, New Delhi - 110 016, India.
E-mail: sutapa.agrawal@phfi.org

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Abstract

Background: In spite of the numerous chronic diseases that have been linked to obesity, studies focusing on the awareness regarding causes, consequences and strategies to prevent and control of obesity among women are lacking in the literature, especially in developing countries such as India, where obesity is culturally accepted and nurtured and women bearded the highest weight gain in the recent decade. **Objective:** We explored the awareness regarding causes, consequences and preventive measures of obesity among 325 ever-married aged 20-54 years women with different levels of body mass index (BMI) in the national capital territory of Delhi representing urban India. **Materials and Methods:** A population based follow-up survey of women systematically selected from the second round of National Family Health Survey (NFHS-2, 1998-99) samples who were re-interviewed after four years in 2003. As a part of qualitative data collection, the respondents were asked to free list open-ended questions on causes, consequences and preventive measures of obesity. Responses were analyzed through *Anthropac* software package. **Results:** Over eating was reported as the most important cause of obesity by normal and overweight women whereas obese women reported fried food consumption as the most important cause of weight gain. A few women from each group reported changing lifestyle as a cause of obesity. Also, there were lots of misconceptions about the cause of obesity among women (such as no tension in life, more tension, happiness, constipation, problem in Delhi's water etc.). In terms of the consequences of obesity, the participants were well aware of the common physical consequences. Normal and obese women reported breathlessness as the most important consequence whereas overweight women reported problem in standing and sitting. Regarding preventive measures, overweight and obese women reported 'walking' as most important preventive measure of obesity whereas normal women reported 'doing exercise'. In addition, 'dieting' was reported as the next important preventive measures of obesity by all groups of women. **Conclusion:** Our study of a fairly large, community-based sample of women has shown that women were aware of the complex nature of obesity in terms of causes, consequences and a range of potential solutions. The findings are important for public health interventions in obesity care in India. Implementation of health promotion and health education in the community should use effective school education and mass media programme to raise more awareness of the causes, consequences and preventive measures and hammer misconceptions, to combat the growing level of obesity among Indian women.

Key words: Consequences, causes, Delhi, India, obesity, overweight, preventive measures, women

INTRODUCTION

Obesity (body mass index (BMI) ≥ 30kg/m^2) is identified as a major public health challenge of the 21st century across the globe.[1] Currently, an estimated 205 million men and 297 million women over the age of 20 were obese — a total of more than half a billion adults worldwide.[2] Even in countries like India, which are typically known for high prevalence of under nutrition, a significant proportion of overweight and obese people now coexists with those who are undernourished.[3] Most available recent data by National family health survey (NFHS-3 in 2005-2006) from India showed overweight and obesity together among women is 12.6% (an increase of almost 25% from NFHS-2, 1998-99) and

almost similar percentage of underweight and overweight women coexists in urban India (25% underweight and 23.5% overweight or obese).[4] The prevalence is more profound in the women of age between 40-49 years (23.7%), residing in cities (23.5%), having high qualification (23.8%), belonging to Sikh community (31.6%) and households in the highest wealth quintile (30.5%).[5] Current figures in New Delhi indicate that every second person fulfils the criteria of obesity or has excess abdominal fat.[6] In the near future, obesity is likely to emerge as a challenging problem for Indian women. Therefore, in the light of the increasing population weights, it is worthwhile to know how far the population is aware of the causes, consequences of obesity and the remedies taken by the people to avoid obesity or to reduce weight, more specifically among adult women in India who are the sufferer of largest weight gain as compared to men.[4]

In spite of the numerous chronic diseases that have been linked to obesity, studies focusing on the level of community awareness, health hazards and strategies to prevent and control of obesity are lacking in the literature, especially in developing countries such as India, where obesity is culturally acknowledged and nurtured. Awareness of any public health disease helps in prevention and in proper action to be initiated. Obesity is known to increase the risk of various diseases and awareness of them is the first step towards taking steps to prevent this. The level of awareness about causes, consequences and preventive measures of obesity is still, to a greater extent, low particularly among women in India and confined to very few individuals affiliated with the health field. The determination of level of awareness among women is therefore an important step to the development of useful interventions intended to lessen this health problem. In this study, we aim to investigate the awareness of women regarding causes and consequences of obesity and the preventive measures to tackle the problem of weight gain among normal weight, overweight and obese women in a community based follow-up study in the national capital territory of Delhi, representing urban India.

MATERIALS AND METHODS

Study location and population

The present paper utilises data collected for the Doctoral dissertation by the first author, the title of the thesis being, *'Dynamics of obesity among women in India: A special reference to Delhi'*. Delhi which has a heterogeneous, multicultural population representative of the Indian urban scenario was chosen as the preferred location for this study. Full details of the study have been presented elsewhere.[7] Briefly, during May-June 2003, a follow up survey was carried out in the national capital territory of Delhi using the same sample derived from the National Family Health Survey-2 (NFHS-2) conducted during 1998-99. NFHS-2 collected demographic, socio-economic and health information from a nationally representative sample of 90, 303 ever-married women aged 15-49 years in all 29 states of India covering more than 99% of the country's population with a response rate of 98%. Details of sample design, including sampling frame are provided in the national survey report.[8]

From the 1998-99 NFHS-2 Delhi samples, 325 women aged 15-49 years, systematically chosen from the 1998-99 NFHS-2 Delhi samples were re-interviewed in a follow up survey after four years in 2003 using an interview schedule. Their weights and heights were again recorded (using the same equipment used in NFHS-2) to compute their current body mass index. In addition to these measurements, detailed information was collected on their dietary habits, levels of sedentary lifestyle, along with other socio-demographic characteristics. Information on woman's awareness regarding causes and consequences of obesity and the preventive measures to tackle the problem of weight gain was also sought as a part of the qualitative information. Qualitative data collection technique such as 'free listing' was carried out from the sample population by asking open-ended questions.

Sample Selection, response rate and sample size

Earlier studies on obesity in India and other developing countries have shown that overweight and obesity are predominant in urban areas and among women.[9,10] Therefore, only urban Primary Sampling Units (PSUs) were chosen for the follow-up survey in Delhi. The sample frame for the follow up survey was fixed to include women in all BMI categories and literacy levels. The aim was to have a sample size of at least 300 women, 100 from each of the three BMI categories (normal, overweight, and obese). At the time of revisit, several issues such as migration, change of address, non-response and non-availability of respondents tend to reduce the desired sample size. Potential loss during follow-up[11] was dealt with increasing the initial sample size (double than required) to get the desired sample size for the study.

In NFHS-2 Delhi sample, 1117, 500 and 203 women were normal, overweight and obese respectively. In NFHS-2 survey questionnaire respondents were asked, '*Would you mind if we come again for a similar study at some future date after a year or so?*' Those women who objected for a revisit were excluded from the follow up survey thus there remained 1050 normal, 476 overweight and 177 obese women in the sampling frame. Samples were drawn from each of these three categories through systematic stratified random selection using a random number. From the normal BMI category, every fourth woman and from the overweight category every second woman was drawn. In the obese category all women were included in the sample to get the desired sample size. This resulted into selection of a total of 677 women-262 normal, 238 overweight and 177 obese. For the follow up survey, the addresses of the selected women were obtained from the NFHS-2 Household Questionnaires. Sample size was further reduced due to non-availability of some questionnaires and non-identified addresses. Finally, a total of 595 women-217 normal, 227 overweight and 151 obese were selected for the follow up interview.Details of the samples selection and response rate is illustrated in the schematic diagram [Figure 1].

In the follow-up survey, 57% of the eligible samples (337 women) were successfully interviewed-113 normal, 124 overweight and 100 obese women. 43% of the sample (258 women) could not be interviewed as they were out of station (16%), had migrated (22%), their residence was un-located (1%), died (1%) or refused for an

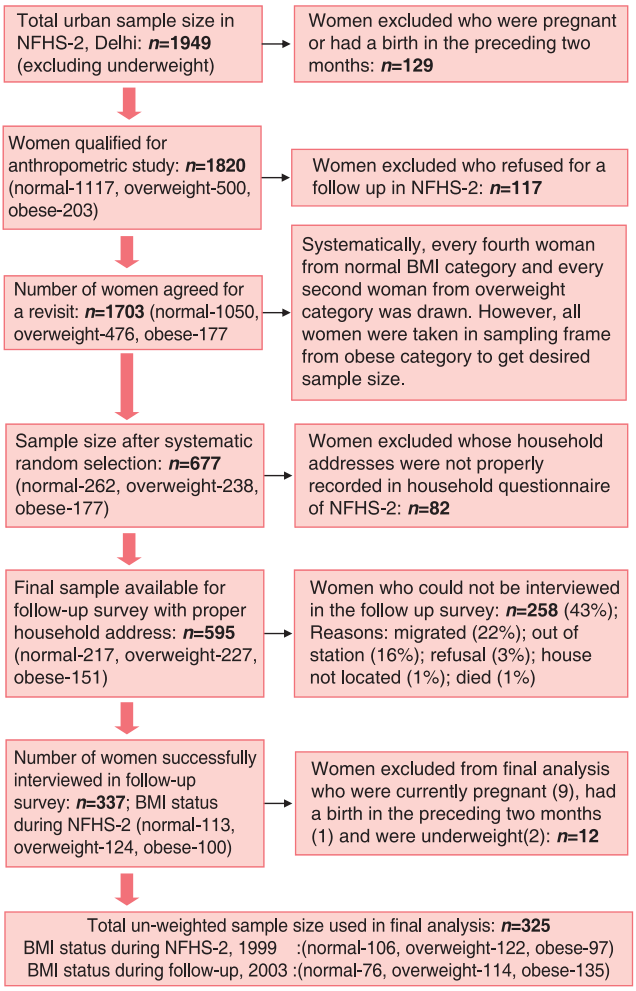

Figure 1: Selection of sample in the follow-up survey and response rate

interview (3%). Women who were pregnant ($n = 9$) at the time of the follow-up survey, women who had given birth during the two months preceding the survey ($n = 2$) and underweight women ($n = 1$) have been excluded from the final analysis. Therefore, the findings are based on the remaining 325 respondents of the follow up survey. A separate analysis using NFHS-2 data shows that the socio-demographic characteristics of those interviewed and those could not be interviewed in the follow up survey were similar (data not shown) indicating that the follow-up sample appears representative of the NFHS-2 sample population.

Anthropometric measurements

In NFHS-2 (executed by the field investigators) as well as in the follow-up survey (executed by the researcher), each ever-married woman was weighed in light clothes with shoes off using a solar-powered digital scale with an accuracy of ±100gms. Their height was also measured using an adjustable wooden measuring board, specifically designed to provide accurate measurements (to the nearest 0.1cm) in a developing country field situation. These data were used to calculate their individual BMIs. Practical and clinical definitions of overweight and obesity are based on the BMI, which is computed by dividing weight (in kilogram) by the square of height (in meter) [kg/m^2].[12] A woman with a BMI between 25 and 30 is considered to be overweight, a BMI of greater than 30 is considered to be obese. A woman with a BMI between 18.5 and 24.9 is considered normal, and if the BMI is below 18.5 the woman is considered to be underweight.[12]

Statistical methods

Data were analyzed using descriptive statistics. Responses from the free listing have been analyzed through computer software ANTHROPAC[1] version 4.98 which was developed specifically for this kind of qualitative research.[13] ANTHROPAC[1] provides the frequency, rank and salience (a combination of frequency and rank) for each of the items. ANTHROPAC then employs Johnson's hierarchical clustering and non-metric, multidimensional scaling to identify a consensus model. The results provide a cultural perspective on the clustering of items. For analysis purpose, women have been divided into three groups: normal, overweight and obese. All other analysis was done using SPSS Version 19 (IBM SPSS Statistics, Chicago, IL, USA).

Ethical approval

The study received ethical approval from the International Institute for Population Science's Ethical Review Board. Informed consent was obtained from all respondents in both NFHS-2 and the follow-up survey before asking questions and before obtaining measurements of their height and weight. The analysis presented in this study is based on secondary analysis of the survey data with all identifying information removed.

RESULTS

Characteristics of the study population

Table 1 presents the characteristics of the study population. In the study sample, there were almost equal percentage of overweight (43.6%) and obese (39.4%) women and 17% were medically obese. Almost one third of the respondents were below 35 years and two thirds were over 35 years of age. The mean age of the respondents was 41.2 years. Over half the study population (58%) had completed high school education while one-seventh was illiterate. Almost 80% of the respondents were Hindu, the rest being Muslim, Sikh and Others. Regarding caste/tribe distribution, 'Others' were predominant (84%) and there was equal percentage of Scheduled Castes/Tribes (8%) and other backward Class (8%). Majority of the respondents (87%) belonged to households with a higher standard of living (SLI) whereas less than 14% women belonged to households with a medium or lower SLI. Majority of women (92%) were not working except for 8% [Table 1].

[1]ANTHROPAC is a menu-driven DOS program for collecting and analyzing data on cultural domains. The program helps collect and analyze structured qualitative and quantitative data including freelists, pilesorts, triads, paired comparisons, and ratings. ANTHROPAC's analytical tools include techniques that are unique to Anthropology, such as consensus analysis, as well as standard multivariate tools such as multiple regression, factor analysis, cluster analysis, multidimensional scaling and correspondence analysis. In addition, the program provides a wide variety of data manipulation and transformation tools, plus a full-featured matrix algebra language.

Table 1: Characteristics of the study population (*n* = 236) aged 20-54, Delhi, 2003

Characteristics	Percent	Number of women
Current Body Mass Index[1]		
Overweight (BMI 25.0-29.99kg/m^2)	43.6	103
Obese (BMI ≥30.0-34.99kg/m^2)	39.4	93
Medically Obese (BMI ≥35.0kg/m^2)	16.9	40
Current age		
20-34	33.1	78
35-54	66.9	158
Mean age	41.2	236
Education[2]		
Illiterate	13.6	32
Literate, <middle school complete	15.3	36
Middle school complete	13.6	32
High school complete and above	57.6	136
Religion		
Hindu	79.7	188
Muslim	8.5	20
Sikh or Others[3]	11.9	28
Caste/tribe status[4]		
Scheduled caste/tribes	8.1	19
Other backward class	8.1	19
Others	83.9	198
Standard of living index[5]		
Low/ Medium	13.5	31
High	86.5	199
Employment status		
Not working	92.3	217
Working	7.7	18
Media Exposure		
Never reads newspapers	53.4	126
Reads newspapers occasionally	11.0	26
Reads newspapers daily	35.6	84
Total	100.0	236

Note: [1] Women who were pregnant at the time of the survey, or who had given birth during the two months preceding the survey, were excluded from these anthropometric measurements. [2]Illiterate-0 years of education, literate but less than middle school complete-1-5 years of education, middle school complete-6-8 years of education, high school complete or more-9+ years of education [3]Buddhist, Christian, Jain, Jewish, Zoroastrian [4]Scheduled castes and Scheduled tribes are identified by the Government of India as socially and economically backward and needing protection from social injustice and exploitation; Other Backward class category is a diverse collection of intermediate castes that were considered low in the traditional caste hierarchy but are clearly above SC; Others' is a default residual group that enjoys higher status in the caste hierarchy. [5]Standard of living (SLI) was defined in terms of household assets and material possessions and these have been shown to be reliable and valid measures of household material well-being. It is an index which is based on ownership of a number of different consumer durables and other household items. It is calculated by adding the following scores: House type: 4 for *pucca*, 2 for semi *pucca*, 0 for *kachha*; toilet facility: 4 for own flush toilet, 2 for public or shared flush toilet or own pit toilet, 1 for shared or public pit toilet, 0 for no facility; source of lighting: 2 for electricity, 1 for kerosene, gas or oil, 0 for other source of lighting; main fuel for cooking: 2 for electricity, liquefied natural gas, or biogas, 1 for coal, charcoal, or kerosene, 0 for other fuel; source of drinking water: 2 for pipe, hand pump, or well in residence/yard/plot, 1 for public tap, hand pump, or well, 0 for other water source; separate room for cooking: 1 for yes, 0 for no; ownership of house: 2 for yes, 0 for no; ownership of agricultural land: 4 for 5 acres or more, 3 for 2.0-4.9 acres, 2 for less than 2 acres or acreage not known, 0 for no agricultural land; ownership of irrigated land: 2 if household owns at least some irrigated land, 0 for no irrigated land; ownership of livestock: 2 if own livestock, 0 if not own livestock; durable goods ownership: 4 for a car or tractor, 3 each for a moped/scooter/motorcycle, telephone, refrigerator, or colour television, 2 each for a bicycle, electric fan, radio/transistor, sewing machine, black and white television, water pump, bullock cart, or thresher, 1 each for a mattress, pressure cooker, chair, cot/bed, table, or clock/watch. Index scores range from 0-14 for low SLI to 15-24 for medium SLI to 25-67 for high SLI.

Table 2: Free listing results regarding awareness about causes of obesity among women with a normal BMI (*n* = 55) Delhi, 2003

Causes of obesity	Frequency	Resp. pct	Avg. rank	Smith's S
Over eating	26	47	1.577	0.368
More fried foods consumption	14	25	1.429	0.214
No work	12	22	1.583	0.164
Sitting idly	6	11	1.333	0.094
No exercise	5	9	2.400	0.057
Happiness	5	9	1.400	0.073
No walking	5	9	2.600	0.044
No tension	4	7	2.500	0.038
Sleeping	4	7	2.000	0.048
Intake of oily foods	4	7	1.750	0.059
Eating disorder	3	5	1.667	0.036
More rest	3	5	2.000	0.036
Less work	3	5	1.000	0.055
Intake of more non-veg foods	2	4	1.500	0.027
Milk consumption	2	4	2.000	0.027
Sweet consumption	2	4	2.000	0.024
Ghee consumption	2	4	1.500	0.027
Swelling of body	1	2	1.000	0.018
Diseases	1	2	2.000	0.012
Genetics	1	2	2.000	0.014
Thyroid problem	1	2	1.000	0.018
Butter consumption	1	2	3.000	0.009
Junk food consumption	1	2	3.000	0.011
Hormonal imbalance	1	2	4.000	0.007
Diabetes	1	2	2.000	0.015
More tension	1	2	2.000	0.009
Lifestyle	1	2	3.000	0.009
No balanced diet	1	2	2.000	0.009
Fruit consumption	1	2	3.000	0.009
Juice consumption	1	2	4.000	0.005
Infertility	1	2	1.000	0.018
Total/Average	116	2.109		

Awareness regarding causes of obesity

Tables 2, 3 and 4 present the results of free listing about awareness regarding causes of obesity among normal, overweight and obese women respectively. Over eating was reported as the most important cause of obesity by normal and overweight women whereas; obese women reported consumption of fried foods as the most important cause of weight gain. On the other hand, more fried food consumption was reported as the second most important cause of weight gain by normal and overweight women whereas over eating was reported by obese women. The next important cause for obesity reported by the normal and overweight women was 'not doing any work'. However, obese women blamed idle sitting as a major cause of becoming obese. Among other causes, lack of physical exercise was reported by a higher proportion of obese and overweight women, whereas 'no walking' was reported by normal women. A higher proportion of obese and overweight

Table 3: Free listing results regarding awareness about causes of obesity among overweight women (*n* = 96) Delhi, 2003

Causes of obesity	Frequency	Resp. pct	Avg. rank	Smith's S
Over eating	43	45	1.372	0.391
Eating of fried foods	26	27	1.808	0.190
More rest	20	21	1.800	0.146
No work	19	20	2.000	0.136
No exercise	15	16	2.000	0.096
Tension	8	8	2.000	0.058
Sweet consumption	8	8	2.878	0.036
No walking	8	8	2.000	0.053
Ghee consumption	8	8	1.750	0.059
Medicines	5	5	1.400	0.046
Hereditary	5	5	2.800	0.030
Eating disorder	5	5	1.400	0.043
Disease	5	5	1.800	0.035
Happiness	4	4	1.750	0.030
Intake of oily food	4	4	2.500	0.024
Sleeping	3	3	2.333	0.018
Age	3	3	1.667	0.024
Menstrual problem	3	3	2.000	0.018
Oil consumption	2	2	2.000	0.024
Food habits	2	2	1.500	0.019
Anaemia	2	2	1.500	0.016
Frequent eating out	2	2	2.500	0.016
No tension	2	2	2.000	0.017
Junk food consumption	2	2	2.000	0.009
Sugar consumption	2	2	1.500	0.012
Hormonal imbalance	2	2	2.500	0.013
Family planning (sterilization)	2	2	1.000	0.017
Blood becomes water	1	1	3.000	0.013
Internal body problem	1	1	5.000	0.021
More glucose consumption	1	1	1.000	0.003
Problem in Delhi's water	1	1	1.000	0.003
Operation	1	1	1.000	0.010
Gastric	1	1	2.000	0.010
Eating pulses	1	1	4.000	0.010
Irregular time of eating	1	1	1.000	0.005
Eating rice	1	1	2.000	0.010
Eating more *Urad dal* (a type of Indian pulse)	1	1	3.000	0.007
Attending party	1	1	4.000	0.003
Not eating green vegetables	1	1	2.000	0.003
Spicy food consumption	1	1	4.000	0.009
After delivery	1	1	1.000	0.003
Wealth and prosperity	1	1	4.000	0.010
Changing lifestyle	1	1	5.000	0.004
Carelessness	1	1	3.000	0.002
More calorie consumption	1	1	3.000	0.003
Fat consumption	1	1	1.000	0.005
Egg consumption	1	1	3.000	0.010
Total/Average	230	2.396		

women reported 'having tension' as a cause of obesity whereas 'happiness' or 'having no tension' was reported by normal women. Another common cause for obesity reported by overweight and obese women was eating sweets. It is interesting to find out that sterilization operation as well as operation for other medical ailments was reported as a cause of obesity by a substantial proportion of obese women than overweight women However, none of the normal women reported any type of operation as a cause. A few women from each group also reported changing lifestyle as a cause of obesity.

Table 4: Free listing results regarding awareness about causes of obesity among obese women (*n* = 104) Delhi, 2003

Causes of obesity	Frequency	Resp. pct	Avg. rank	Smith's S
Eating of fried foods	37	36	1.541	0.275
Over eating	37	36	1.568	0.278
Sitting	20	19	1.900	0.135
No exercise	11	11	2.000	0.062
More sweet consumption	10	10	2.300	0.058
No work	8	8	1.500	0.063
Eating more rice	8	8	2.125	0.055
Tension	8	8	1.750	0.060
No walking	7	7	1.857	0.043
Medical surgery	6	6	1.000	0.058
Less work	6	6	1.833	0.037
More ghee consumption	5	5	2.000	0.034
Family Planning (sterilization)	5	5	1.600	0.037
Food habits	5	5	1.600	0.038
Spicy food consumption	4	4	3.000	0.018
Hereditary	4	4	1.000	0.035
Eating fatty foods	4	4	1.250	0.014
Potato consumption	3	3	3.333	0.018
Sleeping	3	3	2.000	0.010
Thyroid problem	3	3	2.000	0.019
Eating Non-vegetarian foods	3	3	1.000	0.010
Eating disorder	2	2	1.500	0.019
Happiness	2	2	1.000	0.014
Eating outside food daily	2	2	1.000	0.019
After delivery	2	2	3.000	0.019
Medicines	2	2	1.000	0.006
More tea consumption	2	2	3.000	0.019
Hormonal imbalance	2	2	2.000	0.010
Abortion	2	2	2.000	0.007
More salt consumption	1	1	1.000	0.006
No tension	1	1	2.000	0.010
Diseases	1	1	2.000	0.005
Standing	1	1	1.000	0.006
Milk consumption	1	1	1.000	0.010
Change in lifestyle	1	1	3.000	0.010
Glucose consumption	1	1	1.000	0.003
Wrong habits	1	1	1.000	0.010
More rest	1	1	2.600	0.008
Sugar consumption	1	1	1.000	0.002
Constipation	1	1	6.000	0.002
Total/Average	224	2.154		

Awareness regarding consequences of obesity

Tables 5, 6 and 7 present the results of free listing about awareness regarding consequences of obesity among normal, overweight and obese women, respectively. Normal and obese women reported 'breathlessness' as the most important consequence of obesity whereas overweight women reported problem in standing and sitting. On the other hand, problem in standing and sitting was reported as the second important consequence of obesity by normal and obese women whereas breathlessness was reported by overweight women. Normal women reported 'problem while working' as the next important consequence of obesity whereas 'problem while walking' was reported by overweight and obese women.

Table 5: Free listing results regarding awareness about consequences of obesity among women with a normal BMI (*n* = 69), Delhi, 2003

Consequences of obesity	Frequency	Resp. pct	Avg. rank	Smith's S
Breathlessness	36	52	1.611	0.398
Problem in standing and sitting	32	46	1.344	0.386
Problem in working	22	32	1.682	0.235
Problem in walking	18	26	1.667	1.191
Leads to diseases	9	13	1.889	0.083
Cause excessive fatigue	5	7	2.600	0.035
Cause pain in legs	4	6	2.000	0.034
Leads to swelling of body	4	6	2.250	0.029
Cause high blood pressure	4	6	2.250	0.035
Cause joint pain	3	4	2.000	0.024
Cause diabetes	3	4	2.000	0.027
Problem in doing household works	3	4	2.333	0.019
Cannot run	2	3	1.500	0.024
Indigestion	2	3	3.000	0.017
Leads to body pain	2	3	1.000	0.029
Causes pain in hands and legs	1	1	1.000	0.014
Looks ugly	1	1	3.000	0.007
Causes back pain	1	1	2.000	0.010
Causes low blood pressure	1	1	4.000	0.006
Problem in clothing	1	1	3.000	0.005
Problem in climbing staircase	1	1	3.000	0.005
Feelings of uneasiness	1	1	2.000	0.010
Becomes less active	1	1	1.000	0.014
Total/Average	157	2.275		

Among the other consequences, occurrence of diseases was highly reported by almost all groups of women. It was interesting to find out that 'bad figure' and 'clothes not fitting' were reported as consequences of obesity by a higher proportion of obese women than overweight women. However, none of the normal women reported this type of consequence. Also, common problems like climbing staircase, excessive fatigue, joint pain and leg pain were reported by a few women from each group. A few overweight and obese women have also reported that people make fun of them. Some overweight women even reported 'loss of everything' and 'root cause of all diseases' as the consequence of obesity.

Table 6: Free listing results regarding awareness about consequences of obesity among overweight women (*n*=112) Delhi, 2003

Consequences of obesity	Frequency	Resp. pct	Avg. rank	Smith's S
Problem in standing and sitting	49	44	1.408	0.365
Breathlessness	45	40	1.689	0.292
Problem in walking	33	29	1.758	0.199
Leads to diseases	19	17	1.632	0.126
Problem in working	19	17	1.526	0.128
Leads to laziness	10	9	2.100	0.052
Looks ugly	7	6	1.857	0.042
Problem in sitting	6	5	1.333	0.049
Problem in climbing staircase	6	5	1.833	0.036
Feeling of tiredness	5	4	2.400	0.022
Leads to high blood pressure	4	4	1.750	0.028
Heart problem	3	3	2.333	0.016
Problem in sweeping	3	3	2.000	0.016
Leads to bodily weakness	3	3	1.000	0.027
Problem in fitting of cloths	2	2	2.000	0.012
Bad figure	2	2	1.500	0.015
Loss of self confidence	2	2	2.500	0.007
Slow speed of work	2	2	2.000	0.013
Joint pain	2	2	2.000	0.004
Diabetes	2	2	2.500	0.009
Leg pain	2	2	2.500	0.006
Running problem	2	2	1.500	0.004
People make fun	1	1	1.000	0.004
Sleeping problem	1	1	2.000	0.009
Mental tension	1	1	2.000	0.004
Loss of everything	1	1	1.000	0.009
Problem in washing	1	1	2.000	0.004
Problem in standing	1	1	2.000	0.006
Physical problem	1	1	2.000	0.004
Body pain	1	1	2.000	0.006
Gastric problem	1	1	2.000	0.006
Cannot eat fried foods	1	1	1.000	0.009
Dizziness	1	1	1.000	0.009
Cannot sit in *jhula*	1	1	2.000	0.004
Root cause of all diseases	1	1	3.000	0.004
Feels uncomfortable	1	1	3.000	0.003
Knee pain	1	1	2.000	0.004
Blood sugar problem	1	1	1.000	0.009
Pain in hands and legs	1	1	2.000	0.009
Problem in washing cloths	1	1	2.000	0.004
Looks fat	1	1	2.000	0.004
Total/Average	116	2.109		

Table 7: Free listing results regarding awareness about consequences of obesity among obese women (*n*=133) Delhi, 2003

Consequences of obesity	Frequency	Resp. pct	Avg. rank	Smith's S
Breathlessness	62	47	1.677	0.358
Problem in standing and sitting	51	38	1.510	0.303
Problem in walking	39	29	1.667	0.219
Problem in working	31	23	1.903	0.153
Leads to diseases	19	14	1.895	0.102
Leads to bad figure	10	8	2.100	0.043
Causes arthritis	9	7	2.222	0.042
Problem in sitting	8	6	1.375	0.051
Problem in fittings of cloth	8	6	2.125	0.038
Leads to high blood pressure	6	5	1.500	0.039
Cause leg pain	6	5	1.667	0.035
Cause laziness	6	5	2.333	0.024
Problem in climbing staircase	5	4	2.800	0.014
Problem in standing	5	4	1.400	0.031
Cause diabetes	4	3	3.250	0.013
Sweeping	4	3	2.000	0.019
Leads to pain in hands and legs	3	2	1.333	0.019
Looks ugly	3	2	2.667	0.013
Feelings of uneasiness	2	2	1.500	0.011
Feeling of excessive fatigue	2	2	2.000	0.005
Feeling of tiredness	2	2	1.500	0.013
Leads to swelling of body	2	2	1.000	0.010
Problem in wearing cloths	2	2	1.000	0.011
Leads to gastric problem	1	2	5.000	0.008
Causes bodily weakness	1	1	3.000	0.008
Causes body pain	1	1	3.000	0.002
Cannot run	1	1	1.000	0.003
Loss of sleep	1	1	2.000	0.003
Cannot wear high heel sleeper	1	1	2.000	0.008
People make fun	1	1	4.000	0.004
Spot in clothes	1	1	1.000	0.004
Causes tension	1	1	2.000	0.002
Root cause of every problem	1	1	2.000	0.008
Causes knee pain	1	1	1.000	0.004
Problem in stomach	1	1	2.000	0.004
Heart problem	1	1	2.000	0.008
Asthma problem	1	1	1.000	0.006
Looks over aged	1	1	2.000	0.004
Feel shy in moving around	1	1	3.000	0.008
Cannot eat outside	1	1	3.000	0.004
Problem in slipping through door	1	1	2.000	0.003
Total/Average	307	2.308		

Awareness regarding preventive measures of obesity

Tables 8, 9 and 10 present the results of free listing about awareness regarding preventive measures of obesity among normal, overweight and obese women, respectively. Overweight and obese women reported 'walking' as most important preventive measure of obesity whereas normal women reported

Table 8: Free listing results regarding awareness about preventive measures of obesity among women with a normal BMI (*n* = 38) Delhi, 2003

Preventive measures of obesity	Frequency	Resp. pct	Avg. rank	Smith's S
Exercise	24	63	1.417	0.511
Walking	14	37	1.643	0.285
Dieting	12	32	1.667	0.219
More work	5	13	1.600	0.092
No fried food	4	11	1.500	0.086
Running	2	5	2.500	0.022
Yoga	1	3	2.000	0.018
Intake of boiled food	1	3	2.000	0.013
Swimming	1	3	4.000	0.007
Intake of balanced diet	1	3	1.000	0.026
Less consumption of rice	1	3	1.000	0.026
Sweeping	1	3	1.000	0.026
Working	1	3	1.000	0.026
Intake of lemon water	1	3	1.000	0.026
Fasting	1	3	1.000	0.026
Care of body	1	3	2.000	0.013
Jogging	1	3	2.000	0.018
Cycling	1	3	4.000	0.007
Continuous movement	1	3	1.000	0.026
Doing household work	1	3	2.000	0.013
Total/Average	75	1.974		

Table 9: Free listing results regarding awareness about preventive measures of obesity among overweight women (*n* = 71) Delhi, 2003

Preventive measures of obesity	Frequency	Resp. pct	Avg. rank	Smith's S
Walking	37	52	1.568	0.412
Exercise	34	48	1.559	0.391
Dieting	26	37	1.808	0.264
No fried foods	7	10	2.571	0.050
Working	6	8	2.167	0.060
Intake of less fried food	6	8	1.667	0.059
Intake of lemon water at morning	4	6	1.500	0.042
Household work	4	6	2.000	0.035
Less sweets	3	4	2.000	0.026
Yoga	3	4	1.333	0.035
More salad	2	3	1.500	0.023
Skipping	2	3	2.000	0.021
Running	2	3	2.000	0.014
No cold drinks	2	3	4.000	0.008
Less sugar	2	3	2.000	0.019
No ghee	1	3	1.000	0.014
Honey	1	1	2.000	0.011
Self control	1	1	3.000	0.005
No junk foods	1	1	4.000	0.006
Jogging	1	1	3.000	0.007
Herbal medicines	1	1	2.000	0.007
No sweets	1	1	2.000	0.009
Swimming	1	1	4.000	0.004
Walking after every meal	1	1	2.000	0.007
Intake of boiled foods	1	1	1.000	0.014
Skip food at night	1	1	2.000	0.011
Less tea	1	1	3.000	0.007
No tension	1	1	3.000	0.005
No potato	1	1	2.000	0.009
No rice	1	1	3.000	0.014
Less ghee	1	1	1.000	0.014
Changing food habits	1	1	1.000	0.007
No sugar	1	1	2.000	0.007
Total/Average	158	2.225		

'exercise'. On the other hand, overweight and obese women reported exercise as the second important preventive measure of obesity whereas walking was reported by normal women. In addition, dieting was reported as the next important preventive measure of obesity by all groups of women. Among the other preventive measures, 'precautions in diets' (like eating less fried foods and less sweets consumption) and 'more physical work' were reported by all the groups of women. A few obese women reported visiting gymnasium and use of machines while doing exercise as preventive measures.

DISCUSSION

This is the first empirical evidence of awareness level among urban women in a developing country such as India, which is facing increasing level of obesity in its adult women population. Our study shows that awareness about the causes, consequences and preventive measures of obesity is though almost quite similar among Indian women; the perception varies according to the differential in the BMI of individual. Women reported, overeating, fried food eating and inactivity as a major cause of obesity which is similar to a finding by Tiwari *et al.*,[14] who found that a majority of the females considered over eating, childbirth and reduced activity as the possible causes of their obesity and also obesity in other persons. Women with higher BMI have reported more varieties of consequences than women with a normal BMI since overweight and obese women themselves have experienced the consequences of being obese in their day-to-day life. In terms of the consequences of obesity, respondents were well aware of the common physical consequences. Walking, exercise and dieting as preventive measures were known to a substantial number of women. These findings suggest that future intervention strategies should pay particular attention to physical activity, inactivity, and body image attitudes.

Obesity is now well recognized as a disease in its own right, one which is largely preventable through changes in life style. This fact, together with its association with the leading causes of illness and death, has made obesity a high priority problem in the World.[15] However, without societal changes, a steadily rising proportion of adult will develop many medical complications of obesity . The rising epidemic

Table 10: Free listing results regarding awareness about preventive measures of obesity among obese women (*n* = 75) Delhi, 2003

Preventive measures of obesity	Frequency	Resp. pct	Avg. rank	Smith's S
Walking	45	60	1.711	0.426
Exercise	42	56	1.405	0.464
Dieting	27	36	1.667	0.262
Jogging	4	5	2.750	0.029
Less rice consumption	4	5	2.000	0.033
Doing Yoga	4	5	1.500	0.044
Intake of less fried foods	3	4	2.000	0.020
Intake of less sweets	2	3	2.000	0.022
Doing more work	2	3	2.000	0.018
Intake of less non-vegetarian foods	2	3	2.000	0.017
Skipping (jumping with a rope)	2	3	1.500	0.018
Running	2	3	1.000	0.018
Intake of light food	2	3	1.000	0.020
Consume only *chapati*	1	1	1.000	0.013
Less use of machines	1	1	1.000	0.013
Visit to gymnasium	1	1	3.000	0.013
Less cereal intake	1	1	2.000	0.013
Drinking more water	1	1	1.000	0.004
Less sugar consumption	1	1	3.000	0.007
Taking food timely	1	1	4.000	0.013
Oil massage	1	1	2.000	0.004
Intake of less red chilly	1	1	3.000	0.003
No potato consumption	1	1	2.000	0.009
No sugar consumption	1	1	3.000	0.004
Lemon water at morning	1	1	4.000	0.011
Taking honey with water	1	1	2.000	0.008
Should remain happy always	1	1	2.000	0.003
Sweeping	1	1	1.000	0.007
No fried food consumption	1	1	1.000	0.007
Fasting	1	1	2.000	0.013
Cooking in soya oil	1	1	1.000	0.013
Eating *besan ka roti*	1	1	2.000	0.007
Dieting	1	1	1.000	0.013
Total/Average	161	2.147		

reflects the profound changes in the society and on the behavioural patterns of communities.[1] In developed nations, extraordinary emphasis is placed on thinness, the contrary is the case in developing countries where obesity is culturally accepted and admired.[16] Though the pattern of obesity is still in the early stages in India compared to western countries, it nevertheless needs to be tackled aggressively before it assumes serious epidemic proportions. There is a need to sensitize the public and policy makers about the problem of obesity looking at large in India in future, as prevention is better than cure. While the problem of under-nutrition still exists in many parts of India, the additional burden of obesity due to increasing sedentary lifestyle, junk food habits in some urban and economically sound areas is really alarming.[5] Prevention and control of this serious problem through mass awareness programmes to adopt diversified nutritional food and healthy lifestyle are therefore strongly recommended to contain the epidemic rise of obesity among Indian women.

STRENGTH AND WEAKNESSES OF THE STUDY

Some strengths as well as limitations of our study deserve attention. Firstly, our study is based in the national capital territory of Delhi which typifies a multicultural and multiethnic population representing India's growing urban scenario. Second, there is dearth of studies in India which examines the awareness of the causes and consequences of excess weight gain and preventive measures among overweight and obese women in India taking a representative data on anthropometric measures at the population level. Our study used actual measured weights and heights without relying on self-reported values of weights and heights, which could otherwise be over or under-estimated. For these reasons, this study is an important contribution to address this existing gap in knowledge in India. Although rigorous methods, for example cross checks and back-checks, were employed to achieve high quality data, some measurement errors cannot be ruled out.

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