PREVALENCE AND FACTORS RELATED TO OVERWEIGHT AMONG URBAN WOMEN (19-49 YEARS) IN SALEM, TAMIL NADU.

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Dissertation submitted in partial fulfilment of the requirements

for the award of the degree of Master of the Public Health

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DECLARATION

I hereby declare that the work embodied in this dissertation entitled "Prevalence and factors related to overweight among urban women (19-49 years) in Salem, Tamil Nadu" is the result of original research and has not been submitted for any degree in any other university or institution.

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CERTIFICATE

Certified that the dissertation titled '***Prevalence and factors related to overweight among urban women (19-49 years) in Salem, Tamil Nadu.***' is a bonafide record of original research work undertaken by Dr.Aarthy.R, in partial fulfilment of the requirements for the award of the degree of Master of Public Health, under our guidance and supervision

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ABBREVIATIONS

BMI	Body Mass Index
FRS	Figure Rating Scale
GPAQ	Global Physical Activity Questionnaire.
MET	Metabolic Equivalent
NFHS	National Family Health Survey
SPSS	Statistical package for social sciences
WHO	World Health Organisation
WC	Waist Circumference

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ABSTRACT

Background Obesity is increasing at an alarming rate throughout the world, it is declared as a global problem. Though the overweight rates in India are low when compared to western countries, the rate of overweight is steadily increasing. Hence it is necessary to know about the levels of overweight in cities like Salem and to know about the factors associated with it. Apart from socio-demographic factors, perception towards overweight is also an important factor which determines overweight.

Objective To estimate the prevalence of overweight among women (19-49 years) and to study the factors associated with overweight in Salem, Tamil Nadu.

Methodology A cross sectional survey on a sample of 540 subjects out of which 500 participated (response rate: 92.5 percent) using a pretested questionnaire with information related to socio-economic details, physical activity, dietary patterns, perception and knowledge related to overweight were recorded by interview schedule. Body mass Index (BMI) and waist circumference (WC) were taken as the outcome variables. Univariate, bivariate and logistic regression were done using SPSS version 15.0.

Results: The prevalence of overweight is 54 percent, while the obesity level is 21.6 percent and the prevalence of abdominal obesity is 67.4 percent. It was found that women who think themselves to thinner than what they are (OR= 9.59, 95 percent confidence interval 6.05-15.80), age more than 35 years of age (OR= 2.60, 1.61-4.19) and husband being self employed (OR= 1.73,1.06-2.82) were factors significantly associated with overweight status (Body Mass Index more than 25).Similarly women from higher socioeconomic status (OR= 4.46,1.57-12.66),middle socioeconomic class (OR= 2.93,1.70-5.05) and age more than 35 years (OR= 2.05,1.20-3.50) were factors significantly associated with abdominal obesity(waist circumference more than 80 cms).

Conclusion The levels of overweight, obesity and abdominal obesity are high in the urban setting of Salem. Though factors like age, occupation and socioeconomic status cannot be altered, the perception towards overweight can be changed by early intervention so that weight reduction may be easier.

CHAPTER-1

INTRODUCTION AND LITERATURE REVIEW

1.1. **INTRODUCTION**:

Obesity is increasing at an alarming rate throughout the world and has become a global problem. The World Health Organisation (WHO) has declared overweight as one of the top 10 health risks in the world and one of the top five in developed nations(WHO,2002).[1] According to estimates, there are more than one billion overweight people worldwide, and some 250 million of these are estimated to be clinically obese(WHO,1998).[2]

Once related to affluence, obesity is now growing fast in many middle and low income countries. [3,4] In countries like India, where prevalence of under nutrition is very high , a significant proportion of overweight and obese people now co-exist with those who are under nourished.[5]

The problem of overweight and obesity are caused by a chronic imbalance between energy intake and actual energy needs of the body. In the middle and low income countries, with increasing urbanization, mechanization of jobs and transportation, availability of processed and fast foods, and dependence on television for leisure, people are fast adopting less physically active lifestyles and consuming more "energy-dense, nutrient-poor" diets.[3,6-10] Urbanization and modernization have made our lives more sedentary and less physically active than before. Urbanization involves changes in occupation patterns, life- styles, family structures and value systems. Such changes have an impact on dietary practices and the levels of physical activity.

The causes for obesity are multi factorial. Poor diet and physical inactivity cause overweight and obesity. The socioeconomic context in a larger part determines the imbalance between food intake and energy expenditure. Although obesity is affected by interaction between multiple genes and the environment, the genetic pool is not changing rapidly but the environmental and social context that has changed and causes this epidemic.[11]

Obesity is not an lethal disease in and of itself, but is a significant risk factor associated with a range of serious non-communicable diseases and conditions. Overweight/obesity is considered as an intermediate risk factor for major chronic disease conditions including Heart disease, Cancer, Stroke, Chronic respiratory diseases and diabetes.[12]

Eighty percent of deaths which occurs in the low and middle income countries is due to chronic diseases and 70-80 percent of deaths in India and China are due to chronic diseases.[13] Deaths from infectious diseases, maternal and perinatal conditions and nutritional deficiencies are likely to decline by 3 percent but the death due to chronic disease are projected to increase by 17 percent in the coming next ten years (WHO,2005).[12] For all the governments, HIV/AIDS, Malaria and Tuberculosis remain the main focus, whereas common conditions remain marginalized. Chronic diseases thus remain as one of such neglected conditions.[14]

The problem of overweight remains unnoticed in our society. Only recently the chronic disease epidemiology has gained pace in India. The government is planning for an integrated national programme for the prevention and control and for multi-sectoral policy intervention and enhance the engagement of the health systems in activities related to chronic disease prevention and control.[15]

This research report consists of four chapters. This introductory chapter presents a brief literature review on overweight, rationale for the study undertaken and objectives of the study. Chapter two provides details of study methodology that was followed while conducting the study. The third chapter reports on the findings of the study. The fourth and final chapter discusses the results of the study and its implications and concludes with policy recommendations.

1.2. LITERATURE REVIEW:

1.2.1. Emergence of obesity in the developing countries:

The emergence of obesity in the developing countries is caused by many factors including nutrition transition, demographic transition, and epidemiologic transition. Each type of transition has an important role in the occurrence of obesity, but urbanisation and nutrition transition remains as main determinants.[16]

a. Rapid urbanisation:

The rural to urban migration in many developing countries has exposed the migrants to urbanized diets and lifestyle thus urbanisation remains as a primary driving factor for nutrition transition and emergence of obesity.[6,16] Studies done in India have shown that many migrants, now living in urban slums and city shantytowns, have become obese and manifest a number of other cardiovascular risk factors. Changes of occupations, advent of newer technologies, and rapid pace of urban life have increasingly resulted in more sedentary work and less energy expenditure.[16]

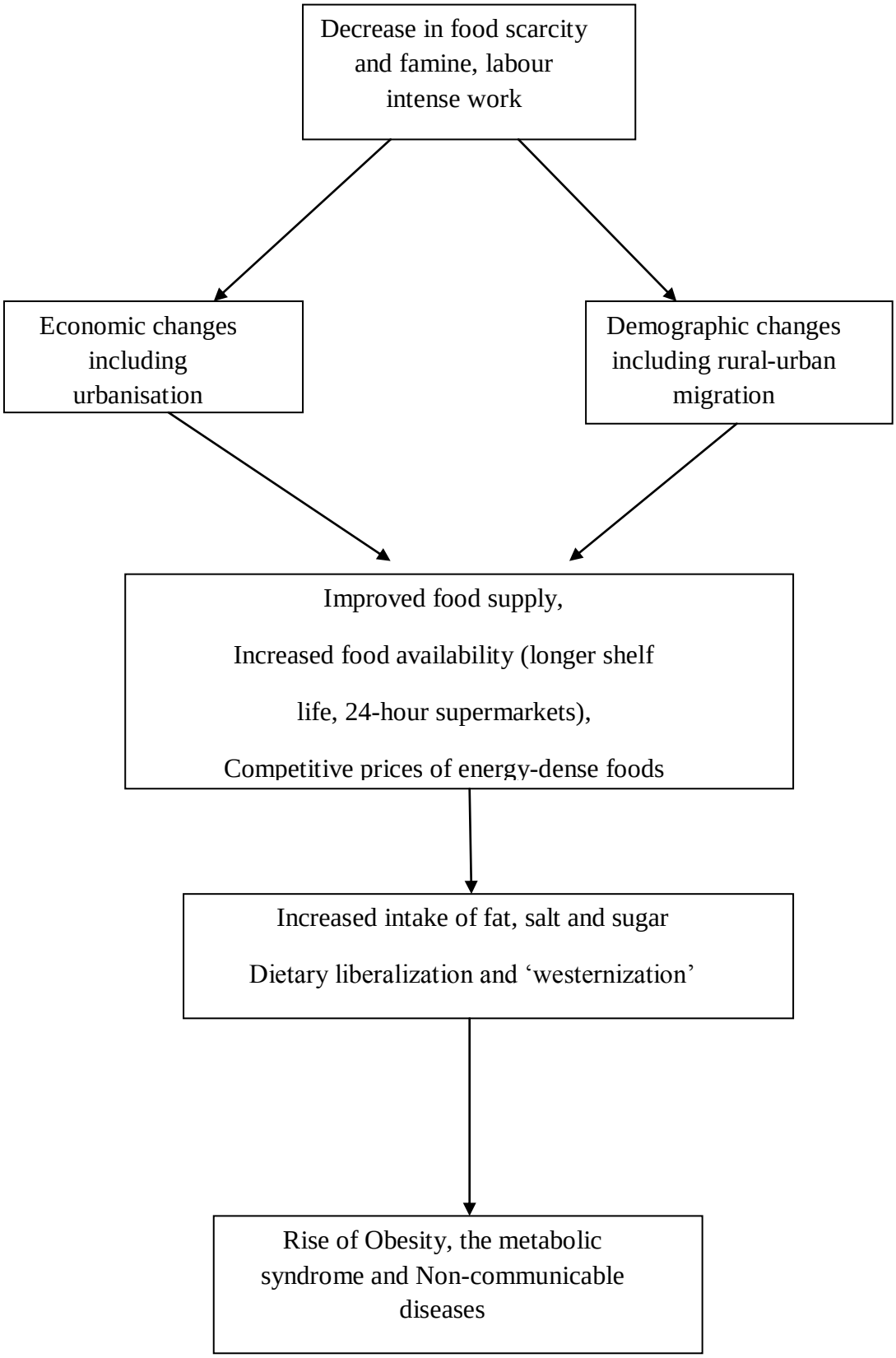
b. Nutrition transition:

The pattern of nutrition transition has evolved from one stage to another in many ethnic groups and disparate geographic locations in the developing countries. The diet pattern is continuously changing along with human evolution. The hunter-gatherer population's diets were rich in carbohydrates and fibre and low in fat, especially saturated fat, with a high-activity profile and lean body phenotype. Later, when individuals existed in famine-like situations later, the diet was comprised of a low calorie, low protein and fat diets and had growth retardation and low body fat and fat-free mass. During the later stages when famines decreased and when nutrition improved, the consumption of fruits, vegetables and animal proteins, the physical inactivity increased. This pattern is now seen in developed countries which is conducive for the development of obesity. As economies improve people become more affluent and consume diets high in saturated fats, cholesterol and refined carbohydrates and low polyunsaturated fatty acids and fibre associated with sedentary life style. In India the intake of dairy products, sugar, and hydrogenated vegetable oils is increasing.[16]

c. Epidemiologic transition

Epidemiologic transition includes transition from widely prevalent infectious diseases to a pattern of high prevalence of chronic lifestyle related non-communicable diseases.[11]The various factors responsible for increasing NCDs include rapid nutrition transition, rural-to-urban migration, increasingly sedentary occupations and lifestyle. Though both genetic and environmental factors seem to contribute to it; however, the role of environment seems to be predominant.[16] This is explained in Figure.1

Figure.1.Emergence of obesity in the developing countries.



(Source: Adapted from Misra A, Khurana L. Obesity and the Metabolic Syndrome in Developing Countries. J Clin Endocrinol Metab, November 2008, 93(11):S9–S30.)

1.2.2. Prevalence of overweight globally and in the Asia-Pacific region:

Obesity epidemic was first noted in the United States of America and then crossed Europe and then spread to the developing countries.[17, 18] The prevalence rates for overweight and obesity varies across different region with the Middle East, Central and Eastern Europe and North America having higher prevalence rates.[19] Highest obesity prevalence is found in Polynesia (76.8 percent) and Micronesia (70.3 percent). Moderately high prevalence of obesity is found in Arab countries and other high income nations of the world with a variable range of 24–50 percent.[20]In 1998, it is found that there was an increase in prevalence of obesity from 2.3 percent to 19.6 percent in several developing countries.[16] Higher prevalence of obesity and abdominal obesity has been seen in women compared with men in many developing countries, consistent with the sedentary lifestyle as discussed earlier. Women have higher rates of obesity whereas men have higher rates of overweight (WHO, 2000)[21]

a. Asian and Pacific region:

In Asia-Pacific, there has been an increase in the prevalence of overweight across the region (WHO, 1998).[2] In China the incidence the overweight among men is 10.8 percent and 16.1 percent among women. There is an increase of abdominal obesity by 20 percent among the Indian men and women (IOTF, 2000).[22]Even in low-prevalence countries, the prevalence is significantly high (more than 20%) in urban areas.[16]

b. The scenario in India and Tamil Nadu:

The prevalence of overweight among women in India is 14.8% and among men is 12.1 percent according to the National Family Health Survey -3 (NFHS,

2005).[24] This is an increase from the previous round of NFHS, which showed the rate of overweight among ever married women to be 11 percent where 8.4 percent were overweight and 2.3 percent were obese.[25] The prevalence of overweight is high in the states of Punjab, Kerala, Goa, Tamil Nadu and Andhra Pradesh for both men and women, but the prevalence rate is higher among women when compared to men. Similarly the rate of overweight is three times more in urban area (25.5 percent, NFHS, 2005) when compared to rural area (7.98 percent, NFHS, 2005).

In 2002, a study done in Western India showed the presence of both overweight and underweight in an urban area. [25] In 2009, a study in Gwalior showed, that 34.4 percent of males and 31.3 percent females (aged 30 years and above) to be overweight. This study showed the increase in the prevalence of overweight more among men which is different from other studies elsewhere mentioned.[27]

According to NFHS-3, (2005) the prevalence of overweight in Tamil Nadu is 19.8 percent among men and 24.4 percent among women similar to all India scenario where the rates are high among women when compared to men. The trend is similar to Indian scenario where the prevalence is more among women and also the urban more than the rural. A 2009 study done in Mecheri, a rural place in Salem District, among 77 women aged 20 and above found 47 percent of overweight, the highest prevalence so far in any Indian study.[28]

1.2.3. The prevalence of Waist Circumference globally and India:

Waist circumference data from 63 countries has shown highest prevalence of abdominal obesity among South Asians when compared with North Europeans and other Asian ethnic populations. Data from countries in sub-Saharan Africa,

South America, and the Middle East also showed similar high prevalence of abdominal obesity: 67 percent of women and 18 percent of men in urban Cameroon, 43 percent in Venezuela, and 24.6 percent in Oman. In an industrial population in India, 30.9 percent of men and 32.8 percent of women were reported to have abdominal obesity.[16]

1.2.4. Classifying overweight and obesity

The classification of overweight and obesity helps us for a meaningful comparison of weight status within and between populations and identifying the individuals and groups at increased risk of morbidities and mortalities, which later helps in setting priorities for intervention at the individual and community levels and helps for further evaluation.[21]

1.2.4.1. Body Mass Index (BMI):

Body mass index (BMI) is a simple index of weight-for-height that is commonly used in classifying overweight and obesity in adult populations and individuals. It is defined as the weight in kilograms divided by the square of the height in meters (kg/m2).[2]

BMI = weight (kg)/ (height metres) ^{2}

Table 1.1.The WHO classification of weight based on BMI

Classification	Body Mass Index	Risk of co-morbidities
Underweight	< 18.50	Low(risk of other clinical problems increased)
Normal range	18.50-24.99	Average
Overweight	>=25.0	
Pre obese	25.00-29.00	Increased
Obese class 1	30.00-34.99	Moderate
Obese class 2	35.00-39.99	Severe
Obese class 3	More than 40.00	Very severe

(Source: WHO 2000)

These measurements are age independent and same for both the sex. The Body Mass Index provides useful, crude, population-level measure of overweight and obesity and used to estimate the prevalence within a population and the risk associated with them. It can be used to estimate the prevalence of overweight and obesity within a population and the risks associated with them. The calculated BMI does not correspond to

same degrees of fatness or associated health risk in individuals and populations and does not account for wide variation in fat distribution.[23]

a. An alternative classification of Body Mass Index (BMI) for Asian population

In Asian subjects, the risk associated with diabetes and cardiovascular diseases occurs at lower levels of BMI when compared with the white population. This is attributed to body fat distribution; Asian Indians tend to have more visceral adipose tissue, causing higher insulin resistance despite having a lean BMI. The WHO also advocated a lower limit of normal BMI in Asian Indians (WHO, 2000). A WHO expert consultation (2004) concluded that the proportion of Asian people with a high risk of type-2 diabetes and cardiovascular disease is substantial at BMIs lower than the existing WHO cut-off point for overweight (more than 25 kg/m2).

For many Asian populations, additional trigger points for public health action were identified as 23 kg/m2 or higher, representing increased risk, and 27.5 kg/m2 or higher as representing high risk. The suggested categories are as follows: less than18.5 kg/m2underweight; 18.5–23 kg/m2 increasing but acceptable risk; 23–27.5 kg/m2 increased risk; and 27.5 kg/m2 or higher high risk. The consultation identified further potential public health action points (23.0, 27.5, 32.5 and 37.5 kg/m2) along the continuum of BMI, and proposed methods by which countries could make decisions about the definitions of increased risk for their population (WHO Expert Consultation, 2004).[9,22,23]

Table 1.2.The WHO alternative BMI classification for Asian population

Classification	BMI (kg/m2)
Underweight	Less than 18.5
Normal range	18.5 to 22.9
Classification	BMI (kg/m2)
Overweight	More than or equal to 23
At risk	23 to 24.9
Obese I	25 to 29.9
Obese II	More than or equal to 30

(Source: WHO Expert Consultation, 2004).

b. Waist circumference

The measurements of Waist Circumference (WC) and Waist Hip Ratio (WHR) can be thought as alternatives both in research as well as clinical practices.[29] Though Waist Hip Circumference can indicate abdominal fat distribution and ill health, waist circumference is a convenient and simple measurement which is unrelated to height and can reflect changes in the risk factors for cardiovascular diseases and other chronic diseases in different populations, hence this alone can be used as an initial screening tool.[21]

Table 1.3. The classification for Waist Circumference:

Risk of metabolic complications	Waist circumference (Cm)	
	Men	Women
Increased	More than or equal to 90 cms	More than or equal to 80cms
Substantially increased	More than or equal to 102 cms	More than or equal to 88cms

(Source: WHO, 2000)

1.2.5. Factors related to obesity:

a. Age:

In developed countries, it is found that there is an increase in body weight with age up to 50-60 years in both men and women. Similar conditions are seen in developing countries but the maximum rates of overweight are reached around 40 years. In India older women are overweight and obese than younger women. In 2002, a study done in North India has found age to have positive relationship with overweight and obesity but having negative relation with normal and underweight.[20,36]

b. Sex:

The studies done all over the world has shown that more women are obese when compared to men. But the overweight levels are high among men.[20] In 2002, a study done in Malaysia has shown that the prevalence of overweight to be higher among women. Similarly in 2001, a study in Latin American countries have shown similar

picture.[31,32] Studies done in India, have clearly shown the gender differences related to overweight.[30]

c. Parity:

It is found that parity increases the risk of overweight in low and middle socio-economic status groups (WHO, 2000).[20]Parity is found to have highly significant association with overweight especially with women who have five children or more.[36]

d. Socio economic status

In 2002, a study in North India has shown that ten percent of the women belonging to high standard of living were obese.[36] A study done on women in India, 2005 has found that prevalence of overweight to be higher among economically better off women. Higher socio-economic status has been consistently associated with greater risk of obesity and diabetes.[30]

e. Place of residence:

Studies done across the world have shown that urban residence with increased number of overweight people.[16] In 2005, a study done among Indian women shows those urban residences have increased risk of obesity.[30]A study done in 2002 shows that overweight levels to be higher among people residing in the urban area.[36]

f. Religion:

In 2004 study done among women is North India has found that one out of every two Sikh women in Delhi to be overweight or obese.[36] Similarly in 2005 the study done in Indian women has found Sikh women are 1.57 times more likely to be overweight when compared to Hindu women.[29]

g. Education:

A study done in 2002 among women in North India has shown that education of women is directly related to overweight. As education increases, the levels of obesity are likely to increase. Similarly husband's education is directly related to overweight among women.[36]

h. Occupation

A study done in 2002 among North Indian women shows that self-employed women are obese followed by women employed by someone else. Women working in family farm/business are least obese. But a good proportion of not working women are also obese and overweight. Women whose occupation is related to professional/technical/managerial work are mostly overweight.[36]

i. Diet changes:

A 2002 study among North Indian women showed that there was no significance found among vegetarian and non vegetarian among both sexes, but significance was found for people who like fast food and fried food. Milk and egg may be more responsible for overweight and obesity of women. According to another study uncontrolled diet consumption and more sedentary life, women are becoming overweight and obese.[36] In 2005, a study among Indian women found an increase in BMI status to be more among women who frequently consumed the food items containing relatively more sugar and fats. Also ingredients of balanced diet like green leafy vegetables are found to be less consumed by women who experienced relatively more increase in BMI status.[30]

j. Physical activity

A 2002 study among North Indian women found that household durable goods like washing machines, cooking gas and electric ovens reduce the physical

activity leading to overweight. Decreased physical activity has been observed in urban compared with rural groups. Less physical activity leads to an increase in the BMI status over a period of time.[36] In 2005, a study among Indian women found that female participants were more dormant in comparison to male participants.[30]

k. Perception related to overweight:

Studies have shown that perception of ideal body weight varies with culture, ethnicity, educational level and socioeconomic group and can influence the development of obesity.[37] In some developed countries, social stigma against obesity and obsession to remain lean has helped to limit obesity to some extent. Such an attitude towards obesity is not seen in many developing countries.[16] One of the obstacles to slowing down the increase of obesity could be its cultural desirability in some developing societies. Studies done in Africa showed that most women do not perceive themselves as being too fat. Most of them were not concerned with their weight and perceived themselves being too fat and were not interested to lose weight.[37]

A study done in Netherlands found that, there were no differences in preference for a larger body size among two non-western migrant populations. Most women wished to be thinner.[38]In a study done in rural Africa, many rural women were not concerned about their weight and most overweight and obese women did not want to lose weight.[39]

1.3. Rationale for the study*:*

According to World Health Organisation (WHO, 1998), 'the growth in the number of severely overweight adults is expected to double than under-weight during 1995-2025'.The mortality rates also increase with increase in Body Mass Index

(BMI). Globalisation has been inevitable and is triggered by modernisation and urbanisation. Hence obesity is going to emerge as a challenging problem for India. Though the levels of urbanisation in India are low when compared to Western countries it needs to be tackled before it reaches alarming proportions.

Though the National Family Health Survey (NFHS) provides the prevalence of overweight for the country and for all the states in India, it is also important to know about the levels of overweight in cities like Salem and to know about the factors associated with it. There has been only one study done in Salem related to overweight.

In India, there is no literature related to perceptions among women related to overweight. It would be interesting to know about their perceptions and knowledge which would help us to frame policies accordingly.

Therefore this study is undertaken with the following objectives

1.4. Objectives of the study:

a. ***Major objectives of the study***

- To estimate the prevalence of overweight among women aged 19-49 years in Salem, Tamil Nadu.
- To study the factors related to overweight among them.

b. ***Minor objectives of the study***:

- To estimate the prevalence of abdominal obesity among women aged 19-49 years in Salem, Tamil Nadu
- To study the factors associated with abdominal obesity among them.

CHAPTER 2

METHODOLOGY

2.1 Study design:

The study is a Cross-sectional study

2.2. Study setting:

The study was conducted within the limits of Salem Municipal Corporation. Salem is the fifth largest city in Tamil Nadu and has a population of 6, 97,061(2001 Census). The literacy rate is 57.50 percent and the sex ratio is 929.Though agriculture is the main base; it is an important textile centre and has rich mineral reserves with rich industrial base. The Salem Corporation consists of 60 wards.

2.3. Study Frame:

Women in age group 19-49 years residing within the limits of Salem Municipal Corporation.

2.4. Sampling Method:

The method used is Cluster sampling

2.5. Sample size:

The sample size is calculated using Epi Info (version 3.3.2). According to NFHS-3 (National Family Health Survey, 2005-06) the prevalence of overweight among Tamil Nadu women is 34.8 and having the worst acceptable, as 29 the estimated sample size is 243.Sample size was multiplied by two to account for the design effect. Considering 10 percent as non-response rate, the sample size is 534. The sample

size is rounded to 540.the number of clusters selected was 30 and the number of person selected per cluster was 18.Here clusters refers to the number of ward in Salem Municipal corporation

2.6. Sample Selection:

The Salem Municipal Corporation is divided into 60 wards. Each ward is considered as a cluster.30 clusters were selected and 18 people from each cluster were selected from 60 wards by using PPS .After identification of the cluster, a street will be identified randomly and then the geographical centre of the street will be identified and then a bottle will be rotated and the direction as pointed by the bottle will be chosen and then a house will be randomly selected from that direction. That was considered as the first household. After visiting, the first household, the nearest households were visited until eighteen eligible participants were recruited.

2.7. Study Participation:

a. ***Inclusion criteria:***

All women aged between 19 – 49 years on January 1st, 2010 and residing within the limits of Salem Corporation were included.

b. ***Exclusion criteria:***

The following categories of women were not included in the study.

1. Pregnant women.

2. Women with physical deformity.

3. Women who are acutely sick

2.8. **Data Collection Techniques:**

The data collection was for a period of three months from June15th 2010 to September 15th 2010. The data was collected by the principal investigator after obtaining informed consent from each respondent interviewed.The Data was collected using a pre-tested questionnaire (Appendix-II). Information related to socio-demographic details, physical activity (measured using GPAQ questionnaire), dietary patterns (few questions are taken from STEPS questionnaire), perception and knowledge statements related to overweight were recorded. Anthropometric details related to Height, Weight and Waist Circumference (WC) will were taken. The measurements were taken as per the guidelines given with the WHO STEPS Instrument for Chronic Disease Risk Factor Surveillance.

2.9. Data Storage:

Along with the data collection, the data was entered in the Windows Excel and then imported to SPPS for window version 15.0 for analysis purpose. The hard copies of the interview schedule were stored in a locked chamber under the vigilance of the principal investigator. The privacy and the confidentiality were strictly maintained.

2.10. Data Analysis and Statistical Methods

The data was entered in Windows Excel and then scrutinized in the same software. It was then imported to SPSS for window version 15.0 for analysis. The baseline characteristics were analyzed by descriptive statistical principles, for mean age, religion, caste, education and occupation etc. Bivariate analyses of the independent variables with respect to the dependent variable were done by cross tabulation and testing by Chi square test, Chi square test for linear trend as appropriate. For the adjustment of

possible interaction and confounding factors a multivariate analysis was considered for a final model. The effective measure used in the analysis was Odds Ratio. The association was considered statistically significant when the null value for the effect measure came within the confidence limit or with p value less than 0.05. Results with high strength of association and significant or near significant p value in bivariate analysis were considered for the final modelling purpose.

2.11. Introducing the variables in the study:

a. Dependent variable:

1. Overweight (Body Mass Index (BMI) >25 kg/m^2)

2. Abdominal Obesity (Waist Circumference > 80 cm)

Definition of the dependent variable:

Body Mass Index (BMI): According to WHO, BMI (Body Mass Index) value of more than 25 is considered as overweight.[20]

Waist Circumference (WC): According to International Diabetic Federation, a waist Circumference of more than or equal to 80 cms is considered to be having metabolic complications. Hence two categories were made as waist circumference less than 80 cms and waist circumference more than or equal to 80 cms.

b. Independent variables:

Demographic variables:

Age, Religion, Place of residence, Marital status, Number of children.

Socioeconomic variables:

Education status of respondent, Education status of respondent's husband, Occupation of the respondent, Occupation of the respondent's husband,Socio economic status.

Physical activity variables:

The physical activity was captured in three domains namely activity at work, travel to and from places and recreational activities. The activities were classified into vigorous and moderate activities.

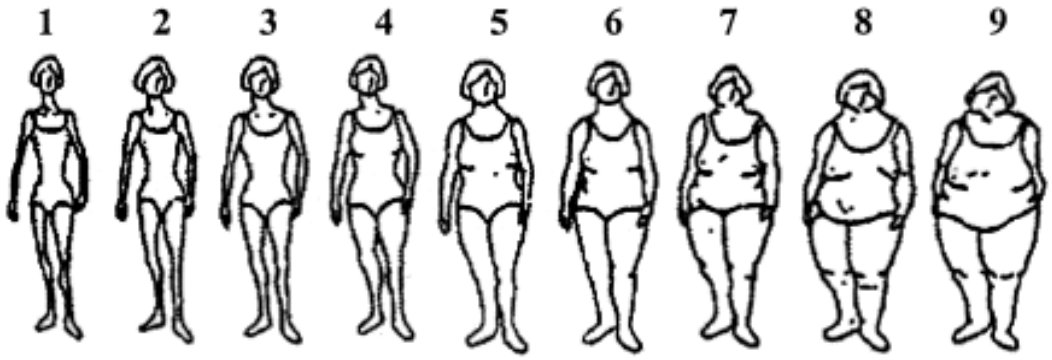
Diet variables:

The number of consumption of items like egg, milk, sweets, chocolates, ice-cream pastries, puffs, biscuits, cold drinks, fried chips were asked.

2.12. **Introducing special tools in the study:**

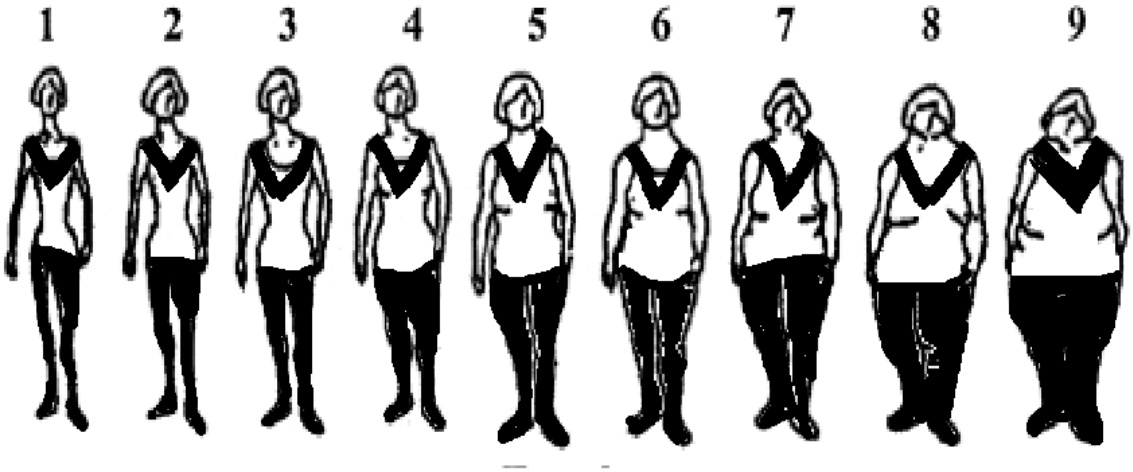
a. Figure Rating Scale:

Perceived body shape was determined from the Figure Rating Scale adapted from a paper by Bhuiyan et al.[40] Participants were asked to rate how they perceive their current body shape by choosing an image that corresponds to heir figure on a scale ranging from 1 to 9, with 1 being the thinnest body type and 9 being the largest, most obese type. The numbers on the scale were later categorized into 1 and 2 as underweight, 3 and 4 as correct weight, image 5 as slightly overweight, images 6 and 7 as moderately overweight and image 8 and 9 as very overweight. The figure is given below:



Female

Since the above picture was found to be culturally not appropriate, these images were then edited to Indian context. The images are given below.



Few questions were added related to the picture on where they would like to be in the next one year and following healthy diet and exercise. Later a Body Image Discrepancy score was calculated.

BID score = standardized body image perception - standardized Body Mass Index.

A negative score indicated that women perceive themselves being thinner than she actually was whereas positive score indicates that the participant perceived themselves being fatter than what it was actually.

2.13. Operationalising variables

a. **Age**: Since age is considered to have an important association with overweight, Data was collected from the participants as self reported age in completed years to find out any significant association. The age group of 19-49 was considered as it the age group where interventions can be effectively used. The age was then classified into 3 groups for description and then coded as less than 35 years and more than 35 years for further analysis.

b. **Religion**: From the previous studies religion is found to be associated with overweight. The participants had to select among the four religions namely Hindu, Muslim, Christian and others which were self reported. Later it was regrouped into Hindu and non- Hindu for further analysis.

c. **Caste**: From the studies done earlier caste is found to have high significance with overweight and hence to find out the relation of caste with overweight, participants were asked to identify themselves with one of them namely, Forward, Backward, Scheduled Caste, Scheduled tribe and others. Later, scheduled caste and scheduled tribe were made into one group and Forward, Backward and others were made into another group.

d. **Marital Status**: The marital status was asked to find out the association with overweight since it is found as factor associated in the studies done previously.It was categorized into currently single (unmarried, widowed, divorced) and married for further analysis.

e. **Husband's education**: Though no previous studies have shown to prove that husband's education has an association with overweight, the husband's education was asked to find out if any association exists. It was an open ended question and it was later categorized into no formal education, educated till primary level, secondary and higher secondary and graduation and above. It was also categorized into years of schooling where less than 10 years (included Upto standard 9) and then more than 10 years (included education more than standard 9).

f. **Husband's occupation**: No previous literature have shown any association of Husband's occupation with overweight, however the question was asked to find out if there existed any relationship. The husband occupation was categorized into government employed, manual labourer, self employed and others. Government and private employed were later categorized together.

g. **Pregnancy Status:** A high significance is found between parity and overweight. Hence this question was included. The age at which the respondents were pregnant was recorded and later the number of pregnancies were calculated and then categorized into nil pregnancy, 1-2 pregnancies, more than 2 for further analysis.

h. **Education of the women**: Women's education is highly correlated with overweight in the previous studied done and hence to find out association women's education was added as a variable. An open ended question was asked and it was later categorized into no formal education, educated till primary level, secondary and higher secondary and graduation and above. It was also categorized into years of schooling where less than 10 years (included Upto standard 9) and then more than 10 years (included education more than standard 9).

i. **Occupation of the women**: The current occupation of the women was asked because it is found that women who are having sedentary job are more likely to be overweight. Hence to find out the association the question was included. It was further classified as home maker and others (including government employed, private employed, student and self employed) for further analysis.

j. **Wage earning among home makers**: No study has been done to find out if any association between homemakers who earn in an informal sector with overweight. To find out an association, a question was added if homemakers are involved in such wage earning. Then the type of wage earning was asked as an open ended questionnaire.

k. **Physical Activity**: The physical activity related to work, transport and recreation was taken into account and then the corresponding time was converted into Metabolic Equivalents (MET) values. Based on the MET values they were classified into three categories namely low, medium and high according to GPAQ (Global Physical Activity Questionnaire) (Annexure-II). The mean sedentary activity per day was also calculated. The sedentary activity which includes sitting or reclining at work, getting to and from places, with friends, playing cards or watching television but does not include time spent on sleeping. The total activity on average per day includes the activity at work; travel to and from places and recreational activities.

Table 2.1. Metabolic Equivalents (METS) values:

Domain	MET value
Work	Moderate MET value = 4.0 Vigorous MET value = 8.0
Transport	Cycling and walking MET value = 4.0
Recreation	Moderate MET value = 4.0 Vigorous MET value = 8.0

(Source: GPAQ questionnaire)

l. **Diet:**

The studies done in India have found that diet to be significantly associated with overweight. Hence the variable was included. The diet pattern, type of oil used for cooking, fruits and vegetable consumption pattern and consumption of food items were asked. The exact number of consumption of those items

The participants answer was taken later all the consumptions were converted into month for analysis. Further categorization was made to add chocolates and sweets together, and bakery items together (which included bakery biscuits, fried chips, puffs, pastries)

m. Statements related to perception related to overweight: Though no previous studies have been done in India, to find out any association between perception and overweight, the question was added to find out if there exists any such association. A series of ten questions of perceptions relating to thinness, overweight, weight gain and for weight control were asked. The participants were asked to agree, disagree to the statements. There

were open ended questions related to the participant's barriers to decreasing/increasing weight, three common reasons for increase of weight.

n. Knowledge related to adverse effects of overweight: Similarly, no literature is found in India where questions were asked on the adverse health effects of overweight. This question was added to find out any association. An open ended question was first asked to find out the adverse effects of overweight form the participants and five closed ended questions were asked if overweight caused diabetes, hypertension, cancer, osteoarthritis and heart diseases. A score was later given. If they agree then a score of 1 was given, if they disagree or they answer no then a score of zero was given. Maximum score of five was taken and later three was taken as cut-off. They were categorized into people who scored less than five and person who scored more than five.

o. Others: questions on height, weight and waist circumference were taken as per the guidelines given with the WHO STEPS Instrument for Chronic Disease Risk Factor Surveillance.

2.14. Ethical considerations:

Ethical clearance was obtained from the Institute Ethical Committee (IEC), Sree Chitra Tirunal Institute for Science and Technology, Trivandrum, Kerala prior to data collection. Participants who were willing to take part in the study were given a consent form (Appendix-I). If the participant was unwilling to sign and/or unable to sign but was willing to participate, then her thumb impression was considered. If she declined to the above formality, but was willing to participate, a witness signature was taken in the consent form on her behalf.

CHAPTER 3

RESULTS

This chapter mainly describes the outcomes of the data analysis in accordance with the objectives. After cleaning the data entered, they were analyzed using SPSS for windows version 15.0. First, the baseline characters of the sample population were identified, followed by the prevalence of overweight and abdominal obesity; next the association between several independent variables taken one at a time and the outcome variable (overweight and abdominal obesity) were examined and finally a regression equation was fitted to identify the predictors of overweight and abdominal obesity .The results are organised into sample characteristics, results of bivariate analysis and results of multivariate analysis.

Of 540 samples selected, 500 women consented to participate in the study with the response rate of ***92.5 percent.***

3.1. **Sample Characteristics**:

A detailed description of the study sample is given in this section. The following characteristics of the sample population are presented; details of the sample socio-economic and demographic features, physical activity, details of the dietary habits, and perceptions among women related to overweight and anthropometric measurements of respondents.

3.1.1***. Baseline Characters of the Sample Population:***

The mean age of the sample population is 33.3 ± 8.42 years. 41.2 percent of the population belonged to 19-30 years of age group and the remaining

Table 3.1.Socio-economic, demographic characteristics of the sample population

Variable	Number (Percentage)
Age (in completed years)	Total number = 500
19-30	206 (41.2)
31-40	179 (35.8)
41-49	115 (23.0)
Religion	Total number = 500
Hindu	384 (76.8)
Christian	61 (12.2)
Muslim	55 (11.0)
Caste	Total number = 500
Forward	68 (13.6)
Backward	352 (70.4)
Scheduled caste	77 (15.4)
Scheduled tribe	3 (0.6)
Marital Status	Total number = 500
Married	400 (80.0)
Unmarried	70 (14.0)
Widowed	14 (2.8)
Divorcee	16 (3.2)
Husband's education	Total number = 420
No formal education	27 (6.4)
Primary (up to 5std)	36 (8.6)
Secondary & Higher Secondary	170 (40.5)
College education	187 (44.5)

3.1.Socio-economic, demographic characteristics *Contd...*	
Husband's Occupation	Total number = 414
Government employed	69 (13.8)
Unemployed	9 (1.8)
Daily labourer	122 (24.4)
Self employed	153 (30.6)
Private employed	61 (12.2)
Education of respondents	Total number = 500
No formal education	34 (6.8)
Primary (up to 5std)	39 (7.8)
Secondary & Higher Secondary	259 (51.8)
College education	168 (33.6)
Occupation of respondents	Total number = 500
Government employed	39 (7.8)
Home maker	324 (64.8)
Daily labourer	77 (15.4)
Student	40 (8.0)
Others*	20 (4.0)
Ever Pregnant	Total number = 500
Yes	397 (79.4)
No	103 (20.6)
Socio Economic Status	Total number = 500
Low	184 (36.8)
Middle	249 (49.8)
High	67 (13.4)

(Source: Primary survey, Salem, 2010) * Self employed, private employed

58.8 percent were aged between 31 and 49 years. Almost 52 percent of the women had up to secondary and higher secondary education.64.8 percent of the sample population are homemakers and among them 25.6 percent earn wages and belonged to the informal sector. The common wage-earning activities performed at home included tailoring at home, taking tuitions, anklet making and few were involved in beedi rolling (since Salem is known for silver jewellery, anklet making is common). 22 percent of the women have never had any pregnancies.60.4 percent of the women had one or two children, while 17.6 percent had above 3 children. Around fifty percent belonged to the middle socio-economic status.

a. Details of the physical activity:

Among the study population, around 50 percent of the women reported to have high physical activity. There can be a possibility of over reporting since women consider themselves doing moderate physical activity based on time spent doing the household chores. The severe physical activity related to house work includes carrying water from the street pipes to their homes. Some of the pipes are located near the houses and some are quite far. This activity was observed among women from low and middle socio economic status. A few women from higher socio economic status were involved in moderate sports activity including doing yoga exercises and playing badminton. It is not surprising to get a nil response for questions related to severe sports activity as most of the respondents are married women and they were amused when such a question was asked.

The calculation of physical activity was into categorized into three categories namely low, medium and high. This was calculated by using the Metabolic Equivalents (MET). The calculation involves formulas where they take into account both the number of days involved in physical activity as well as the time spent for each activity. An average

woman from low and middle socio economic status spends almost 7 days (average of 5 hours each day as reported by the respondents) doing household chores and also doing severe physical activity like carrying water from the streets. Since my study population has many women from the above mentioned socio-economic class, the physical activity calculation rose to 86 percent, but later calculation involving only the Metabolic Equivalents were considered (for more details see APPENDIX- III).After recalculation, the level of high physical activity and moderate physical activity came around 50 percent and 34 percent respectively.

Table 3.2. Physical activity of the study population

Level of physical activity:	Number = 500
High	249 (49.8)
Medium	170 (34.0)
Low	81 (16.2)

(Source: Primary survey, Salem, 2010)

The mean sedentary time among the study population ranges from 30 minutes to 10 hours per day. The minimum time spent was reported by a woman who is a handloom weaver who spends most of her time weaving (Salem city is known for handloom weaving) and the maximum time spent was reported by a young girl, who is a class tenth student who could not continue her studies. She spends most of her time watching television. The relaxing time is usually spent by watching television. It is interesting to note here that the free television scheme introduced by the Tamil Nadu government has made very home possess a television. It was a common to find one such television in every home in the lower socio-economic strata.

Table 3.3. Mean sedentary time and total physical activity per day.

TYPE OF ACTIVITY	MEAN ± S.D	MINIMUM	MAXIMUM
1.Sedentary activity	3.79 ± 2.01 hours per day	30 minutes	10 hours per day
2.Mean total physical activity	142 ± 102.28 minutes per day	100 minutes per day	640.71 minutes per day

(Source: Primary survey, Salem, 2010)

b. Details of the dietary activities*:*

Nearly 75 percent of the sample population are non-vegetarians. More than 50 percent of the study population use sunflower oil for cooking with relatively low saturated fat content. Around 20 percent of the population use groundnut oil for cooking. Sixty two percent of the participants do not eat food outside the home even once a week, while 26.6 percent of the respondents eat food prepared outside for one day in a week and 9 percent consume food two days in a week outside. Surprisingly, the consumption of fruits and vegetables consumption is very much below the WHO recommended levels of more than 5 servings per day.

Table 3.4.Diet pattern among the study population:

TYPE OF DIET:	Number = 500
Vegetarian	71(14.2)
Non-vegetarian	371(74.2)
Egg + vegetarian	58 (11.6)
TYPE OF COOKING OIL:	Number = 500
Sunflower oil	337(67.4)
Gingelly oil	22 (4.4)
Coconut oil	12 (2.4)
Groundnut oil	99(19.8)
Others (others include palmolein oil)	30 (6.0)
FRUITS AND VEGETABLES:	Number = 500
Less than 5 servings	498 (99.6)
More than 5 servings	2 (0.4)
FASTING –FREQUENCY	Number = 500
Yes	102 (20.4)
No	398 (79.6)
AMONG PEOPLE WHO FAST	Number = 102
Less than 2 days	54 (52.9)
More than 2 days	48 (47.1)

(Source: Primary survey, Salem, 2010)

Details of the consumption pattern of selected *food items*:

Though the questionnaire had consumption pattern of items like milk, biscuit and egg they were not taken for analysis because the consumption pattern of those items were not properly recorded because of difficulty in understanding of the question by the respondents. In case of biscuits the consumption of exact number of biscuits were recorded rather than the exact number of consumptions. There was no proper recording related to milk and eggs and hence excluded from analysis.

Table 3.5. Dietary consumption of selected food items

Chocolates and sweet (per month)	Number = 500
0- 1	162 (32.4)
2-4	115 (23.0)
5-9	112 (22.4)
More than 9	111 (22.3
Bakery items (consumptions per month)	Number = 500
0 – 4	146 (29.2)
5 – 9	108 (21.6)
10- 15	114 (22.8)
More than 15	132 (26.4)

(Source: Primary survey, Salem, 2010)

Among the other food items, chocolates and sweets were considered a separate entity and other bakery items were clubbed together for analysis purpose. It is found there seems to be an equal distribution of numbers across the respondents related to chocolates and sweets consumption. But bakery items have around 30 percent of the population having zero to four consumptions per month.

c. Perception related to overweight:

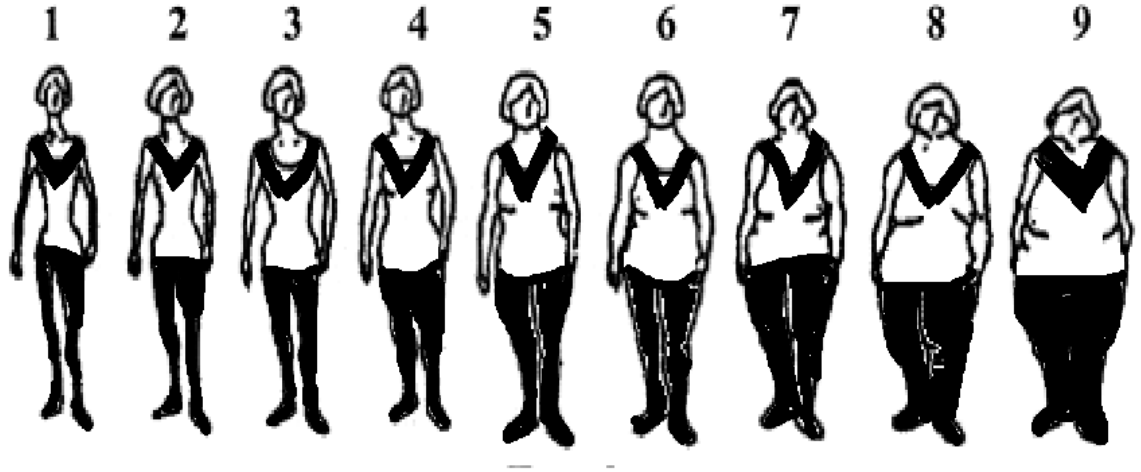
As many as 42 percent of the respondents perceived that that their weight was normal and around 36 percent felt that they were overweight.

Table 3.6. Self perception of one's own weight:

Self perception of one's own weight:	Number = 500
Normal	208 (41.6)
Underweight	80 (16.0)
Overweight	179 (35.8)
Obese	33 (6.6)

(Source: Primary survey, Salem, 2010)

Figure Rating Scale(FRS):



The respondents were asked questions related to the above picture. For details related to the question please refer ANNEXURE – II. The respondents were asked to place themselves among the images from 1-9. As mentioned in the methodology section, the images 1-3 correspond to underweight, 4 to normal weight, 5 to slightly

overweight and 6 and 7 correspond to moderately overweight and 8 and 9 refer to overweight.

From the graphs given below, it is interesting to note that the 27 percent of the respondents would like to place themselves in picture 5, followed by picture 6 which represents slight overweight and 6 represents moderately overweight silhouettes respectively.[46] From figure 2, it can be seen that 42 percent of the respondents wanted to in picture 5 which represents slight overweight. What is interesting is that the respondents want themselves to be in the slightly overweight category than in the normal category.

Figure 3 states that the respondents consider picture 5 (which represents slightly overweight) as an ideal silhouette. Figure 4 states that the respondents think that with diet and exercise they will look like the silhouette, picture 4 (corresponds to correct weight) which states that implies that they understand the effect of diet and food on a person's weight and looks.

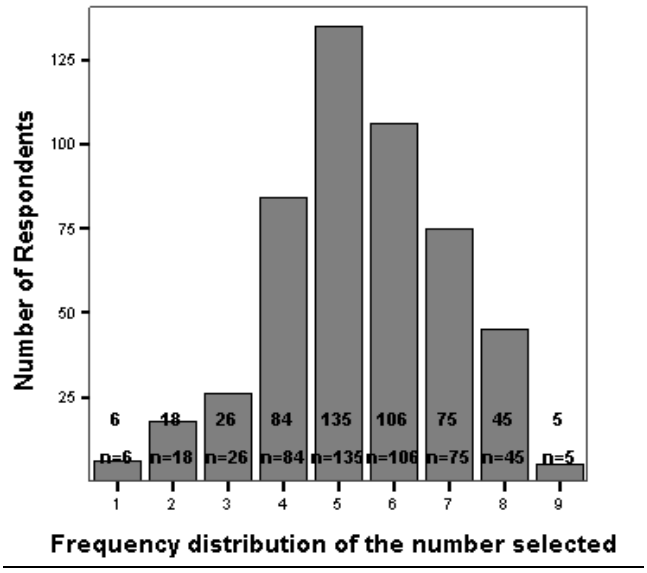


Figure 1: where would the respondents match themselves in the picture?

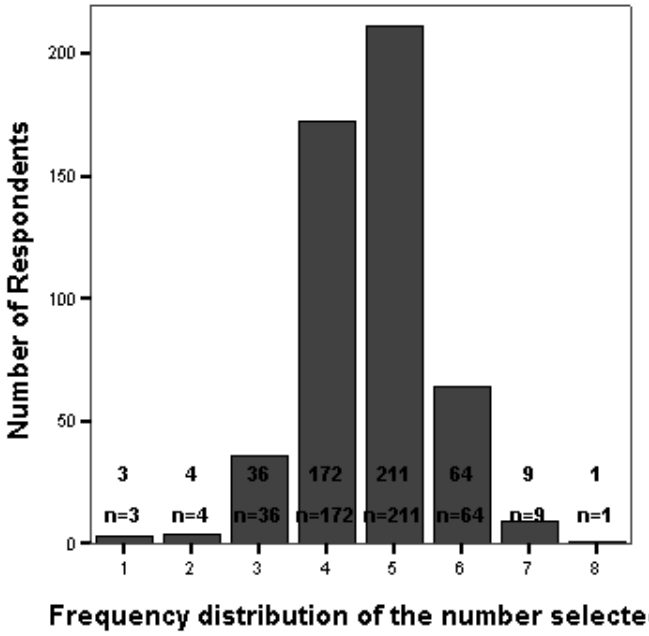


Figure 2: where would the respondents would like to be ideally?

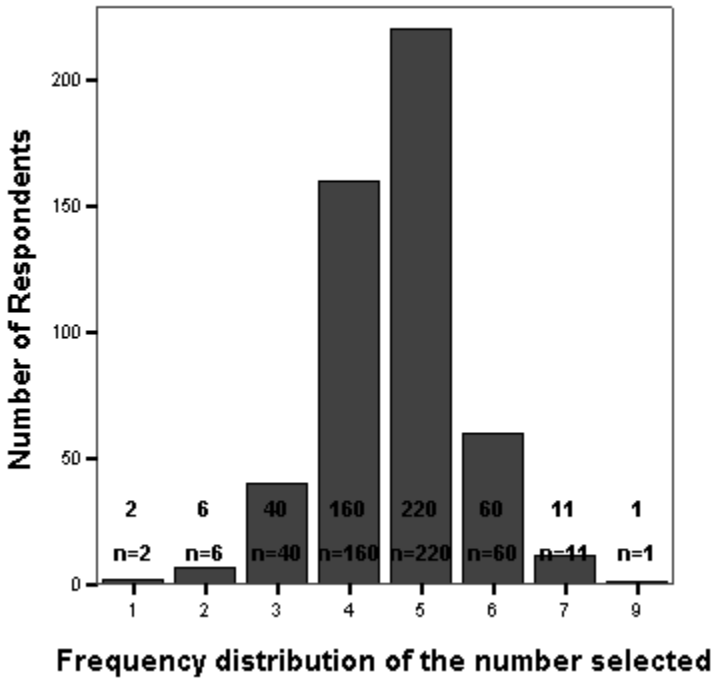


Figure 3: where would the respondents like to be in the forthcoming year?

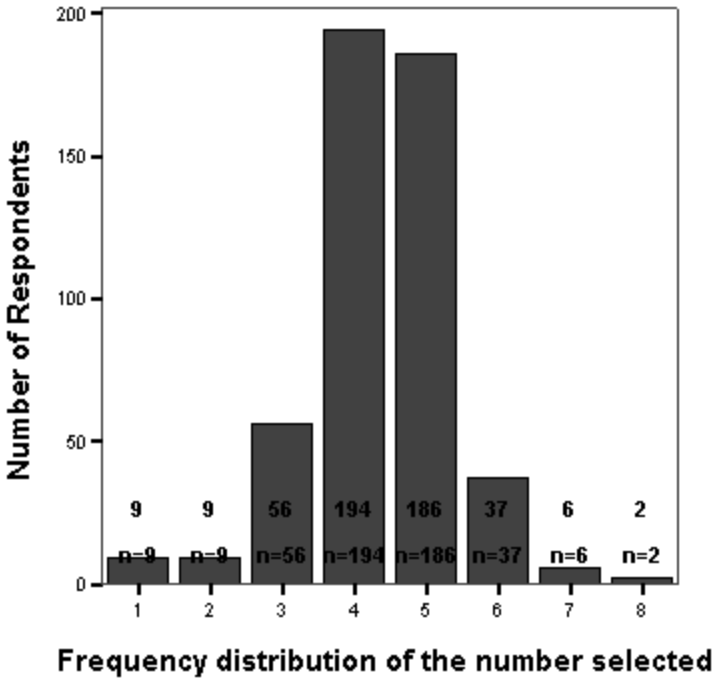


Figure 4: where would the respondents would be if they regularly exercise and have proper diet?

The negative score implies that the respondents consider themselves thinner than their actual weight and positive score implies that, the respondents consider themselves as heavier than their actual weight. In the current study, there seems to be an equal distribution in both positive and negative score, which implies half the study population consider themselves to be thinner than they are actual weight, similarly the other half of the study population considers themselves as heavier than their actual weight

Table 3.7. Body Image discrepancy Score (BID Score)

BID SCORE	NUMBER
Negative score	247 (49.4)
Positive score	253 (50.6)

(Source: Primary survey, Salem, 2010)

Statements on perception related to overweight

Nearly half the respondents stated that thinness is not beautiful, similarly the respondents also agree that overweight is not a sign of prosperity, which means that overweight is just not related to richness. Nearly 80 percent have agreed that less active people are overweight and they are not healthy people. The interesting point here is 65 percent of the respondents feel that it is not practical for women to exercise daily. **Table 3.8. Statements on perception related to overweight**

Statement	Agree(%)	Disagree(%)	Don't know(%)
1.Modern clothes are worn by thin people	332(66.4)	141(28.2)	27(5.4)
2.Thin people are not beautiful	227(45.4)	241(48.2)	32(6.4)
3.Overweight reflects prosperity	213 (42.6)	220 (44.0)	67 (13.4)
4.People who are overweight are less active than normal people	401 (80.2)	75 (15.0)	24 (4.8)
5.People who are overweight are found to be less healthier than normal people	366 (73.2)	89 (17.8)	45 (9.0)
6.Weight gain is hereditary	261 (52.2)	190 (38.0)	49(9.8)
7.Weight gain is related to too much eating	384 (76.8)	65 (13.0)	51 (10.2)
8.One has to eat expensive food to lose weight	79 (15.9)	292 (58.6)	127 (25.5)
9.If one exercises one feels healthy	464 (93)	20 (4.0)	15 (3.0)
10.It is not practical for a woman to exercise daily	327 (65.5)	137 (27.5)	35 (7.0)

(Source: Primary survey, Salem, 2010)

In an open ended question, where the respondents were asked about the barriers which prevented them from reducing weight, the most common responses included eating more food, not eating at right time and unable to do exercise among overweight women. Similarly when another open ended question was asked about oily common reasons for

increase in weight among women the responses included eating food, being happy and after child birth.

Knowledge related to adverse health effects of overweight:

Most of the participants knew about obesity related health effects including hypertension, diabetes, heart problem and osteoarthritis. Nearly 50 percent of the respondents did not know about the obesity causing cancers. Hypertension, breathing problems and diabetes were some of the disease conditions which the participants felt as adverse health effects related to overweight. Other reasons given by them include menstrual problems, thyroid problems and backache.

Table 3.9.Knowledge about adverse health effects of overweight

Statement	Agree (%)	Disagree (%)	Don't know (%)
1.Obesity causes hypertension	411 (82.2)	42 (8.4)	47 (9.4)
2.Obesity causes heart problem	322 (64.4)	92 (18.4)	86 (17.2)
3.Obesity causes diabetes mellitus	322 (64.4)	93 (18.6)	85 (17.0)
4.Obesity causes cancer	151 (30.2)	99 (19.8)	250 (50.0)
5.Obesity causes osteoarthritis	361 (72.2)	28 (5.6)	111 (22.2)

(Source: Primary survey, Salem, 2010)

d. Anthropometric measurements

The mean waist circumference and the Body Mass Index is high in the study population, where the waist circumference mean is more than 80 cms and the Body Mass Index falls in overweight category.

Table 3.10. Anthropometric measurements

Variable	Mean ± S.D
1. Weight	60.74 ± 13.17
2. Height	152.21 ±6.53
3. Waist circumference	85.41 ± 10.99
4. Body Mass Index (BMI)	26.15 ± 5.08

(Source: Primary survey, Salem, 2010)

Classification of weight using BMI

Table 3.11. Classification of weight using BMI:

BMI	Number (%)	classification
<18.5 kg/m^2	24 (4.8)	Underweight
18.5 – 24.9 kg/m^2	206 (41.2)	Normal
25 – 29.9 kg/m^2	162 (32.4)	Overweight
>= 30 kg/m^2	108 (21.6)	Obese

(Source: Primary survey, Salem, 2010)

Fifty four percent of the respondents are overweight, including 21.6 percent of obese women, while only 4.8 percent are underweight.

3.2. Prevalence of overweight/ abdominal obesity among study population:

The prevalence of overweight (BMI >=25) is 54 percent whereas the abdominal obesity prevalence is 67.4 percent.The abdominal obesity prevalence is higher than obesity classified using BMI.

Table 3.12. Prevalence of overweight

Body Mass Index =< 24.99	230 (46.0%)
Body Mass Index >= 25	270 (54.0%)

(Source: Primary survey, Salem, 2010)

Table 3.13. Prevalence of abdominal obesity

Waist circumference	
< 80 cms	163 (32.6%)
>80 cms	337 (67.4%)

(Source: Primary survey, Salem, 2010)

a. *Stratification of WC (Waist circumference) by age group*:

The stratification of waist circumference by age group shows that the prevalence of abdominal obesity is high among women aged more than 35 years.

Table 3.14. Stratification of Waist circumference by age group

Category	19-34	35-49
Waist circumference (WC < 80 cms)	109 (37.5)	54 (25.8)
Waist circumference (WC > 80 cms)	182 (62.5)	155 (74.2)

(Source: Primary survey, Salem, 2010)

3.3. Analysis for factors associated with overweight:

As a first step in identifying the factors related to overweight and abdominal obesity, a simple bivariate analysis for each variable estimating the unadjusted odds ratio with 95 percent confidence interval and p value were noted. Those independent variables found to be significant (p value less than 0.05) or nearly significant (p value less than 0.1) were considered for the multiple logistic regression analysis in a stepwise

manner. In multiple logistic regressions a forward likelihood ratio (Forward LR) method was used.

3.3.1. Bivariate analysis- for overweight as an independent variable

a. Socio demographic factors

Table 3.15. Socio-economic and demographic factors

Variable	Overweight (%)	Unadjusted OR (95 % C.I)	p value
1.Age			
< 35 yrs	45.4	1	
> 35 yrs	66	2.341 (1.62-3.38)	< .001
2.Religion			
Others	53.4	1	
Hindu	54.2	1.03 (0.68-1.56)	0.98
3.Caste			
SC/ST	42.5	1	
Others	56.2	1.73 (1.07-2.81)	0.024
4.Marital Status			
Currently single	46.0	1	
Married	56	1.50(0.96-2.32)	0.09
5.Husband’s education			
<10 years of schooling	50.8	1	
>10 years of schooling	58.0	1.34 (0.88-2.03)	0.19
6.Husband’s Occupation			
Daily labourer	47.5	1	
Govt/private employed	54.6	0.32 (0.81-2.18)	0.26
Self employed	63.4	1.91 (1.18-3.10)	<0.001

Socio-economic and demographic factors (contd..)			
Variable	Overweight(%)	Unadjusted OR (95% C.I)	p value
7.Respondent's Education			
<10 years of schooling	48	1	0 .05
>10 years of schooling	57.4	1.46 (1.00-2.11)	
8.Ever Pregnant			
No	43.7	1	
Yes	56.7	1.68 (1.08 - 2.61)	0.02
9.Number Of Pregnancies:			
0	44.5	1	
1-2	56.6	1.62 (1.04 - 2.52)	0.03
3+	56.8	1.63 (0.93 - 2.88)	0.87
9.Occupation of respondent			
Others *	50.6	1	
Home makers	55.9	1.237 (0.86 – 1.79)	0.29
10.Wage earning among women			
Yes	48.2	1	
No	58.1	1.5 (0.90 – 2.46)	0.15
11. Socio-economic status			
Low	46.2	1	
Middle	58.6	1.65 (1.12 – 2.42)	0.01
High	58.2	1.62 (0.92 – 2.86)	0.094

(Source: Primary survey, Salem, 2010)

*Government /private employed, student and day labourer

Among the socioeconomic and demographic variables considered, husband's occupation, ever having been pregnant, parity as one or two and socio economic status were found to be significantly associated with overweight status. Women of age above 35 years have increased odds of overweight more than any other factor by as much as two times as compared to those below 35 years. Those who had been ever pregnant, whose husband are self employed also had slightly increased risk of being overweight.

b.Physical activity

Physical activity was not found to be significantly associated with overweight status.

Table 3.16. Association of physical activity with overweight

Variable	Overweight (%)	Unadjusted OR (95 % C.I)	p value
Moderate + low	55.4	1	
High	52.6	0.89 (0.63 – 1.27)	0.60

(Source: Primary survey, Salem, 2010)

c. Diet as a factor for overweight:

Consumption of chocolates and sweets were not found to be associated with overweight status. The diet pattern was classified into three types namely good, bad and intermediate. The classification for good diet was consumption of sunflower oil plus consumption of sweets and chocolates less than one consumption per month and consumption of bakery items less than 4 consumptions per month. The bad diet includes consumption of oil other than sunflower oil and consumption of chocolates and sweets more than 10 times and consumption of bakery items more than 15 times per month.

Table 3.17. Association of diet with overweight:

Variable	Overweight (%)	Unadjusted OR (95 % C.I)	p value
Eating pattern			
Chocolates and sweets/month			
0-1 time	55.6	1	
2-4 times	60.9	1.24 (0.76 – 2.02)	0.38
5-9 times	49.1	0.77 (0.48 – 1.25)	0.29
More than 10 times	49.5	0.786 (0.48- 1.28)	0.32
Bakery items per month*			
0-4	54.1	1	
5-9	53.7	0.98 (0.60- 1.62)	0.98
10-15	60.5	1.30 (0.79 – 2.14)	1.3
More than 15 times	48.5	0.80 (0.5 – 1.28)	0.79
Diet pattern			
All good	66.2	1	
Intermediate	52.7	0.30 (0.09-0.95)	0.041
All bad	37.5	0.57 (0.33 – 0.98)	0.045
Fruits and vegetables			
> 1.5 servings	55.7	1	
<1.5servings	52.5	0.87 (0.61 – 1.25)	0.53
Fasting			
No	55	1	
yes	50	0.81 (0.53- 1.26)	0.42

(Source: Primary survey, Salem, 2010)* Cakes, puffs, ice creams, fried chips

The intermediate diet consists of consumption of sunflower oil and consumption of chocolates and sweets between 4 and 10 per month and consumptions of bakery items between 4 and 15 per month. Since the consumption pattern of fruits and vegetable together was less than 5 servings per day the median consumption pattern was taken as 1.5 and it was not found to be significantly associated with overweight.

d. Perception towards overweight:

The body image discrepancy score was found to be very significantly associated with overweight status. Thus women who tend to think of themselves as thinner than they actually weigh are more likely to be overweight as compared to those who think of themselves as normal or above normal weight. It is difficult to know the direction of this association whether the erroneous perception precedes becoming overweight or vice versa. The health awareness scoring is explained in the methodology chapter. Health awareness score was not found to be significantly associated statistically with overweight status.

Table 3.18. Perception related to overweight as a factor

Variable	Overweight (%)	Unadjusted OR (95 % C.I)	p value
Body Image Discrepancy Score (BID)			
Positive	29	1	
Negative	78.3	8.82 (5.87 – 13.27)	<.001
Awareness about health consequences of obesity			
Inadequate knowledge	52	1	
Adequate knowledge	56.5	1.2 (0.84 – 1.71)	0.35
Motivation to reduce weight 1 year:			
Wish to remain the same	26.7	1	
Willing to reduce weight	78.2	9.89 (6.04 - 16.19)	<0.001
Not willing to reduce weight	15.8	0.52 (0.26 – 1.02)	0.058
Effect of physical activity and diet on overweight :			
Feels no difference	24.1	1	
It will reduce the weight	74.1	9.03 (5.42 – 15.02)	<0.001
It will not reduce the weight	17.1	0.65 (0.31 – 1.34)	0.243
Not practical to exercise daily			
Practical to exercise daily	54.7	1	
Not practical to exercise daily	44.4	1.51 (0.76 – 2.99)	0.30

(Source: Primary survey, Salem, 2010)

3.3.2. Bivariate analysis- for abdominal obesity as an dependent variable (Waist Circumference >80 cms)

a. Socio demographic characteristics

Table 3.19. Socio-economic and demographic factors:

Variable	Abdominal obesity(%)	Unadjusted OR (95 % CI)	p value
1.Age			
< 35 yrs	62.5	1	< .001
> 35 yrs	74.2	1.72 (1.16 - 2.54)	
2.Religion			
Others	69	1	
Hindu	66.9	0.91 (0.58 – 2.54)	0.76
3.Caste			
SC/ST	60	1	
Others	68.8	1.47 (0.90 – 2.40)	0.15
4.Marital status			
Currently single	62	1	
Married	68.8	1.35 (0.86 – 2.12)	0.24
5.Husband'seducation			
<10 years of schooling	61.4	1	
> 10years of schooling	71.4	1.51 (0.98 – 2.30)	0.07
6.Husband occupation			
Daily labourer	58.2	1	
Govt/private employed	73.8	2.02(1.19 – 3.45)	< 0.001

3.19. Socio-economic and demographic factors (contd..)			
Variable	Abdominal obesity(%)	Unadjusted OR (95 % CI)	p value
Self employed	70.6	1.72 (1.04 – 2.84)	0.003
7.Women's education			
<10 years of schooling	59	1	
>10 years of schooling	71.8	1.78 (1.00-2.11)	0.005
8.Ever pregnant			
No	60.2	1	
Yes	69.3	1.49 (0.95- 2.3)	0.10
9.Number of pregnancies			
0	59.1	1	
1-2	71.9	1.77 (1.12 - 2.79)	0.01
3+	62.5	1.15 (0.65 - 2.05)	1.15
9.Occupation of women			
Others	61.9	1	
Home makers	70.4	1.46 (0.99 – 2.14)	0.06
10.Wage earners			
Yes	63.9	1	
No	71.8	0.69 (0.40 – 1.17)	0.22
11.Socio-economic status			
Low	57.1	1	
Middle	71.5	1.89 (1.26 – 2.81)	0.002
High	80.6	3.12 (1.57 – 6.12)	0.001

(Source: Primary survey, Salem, 2010)

As in case of overweight, age and husband's occupation had a statistically significant association with abdominal obesity. In addition socio-economic status was also found to have a statistically significant association with abdominal obesity. women over 35 years of age, who belonged to middle and higher socio-economic groups (Table 3.17) and whose husbands are government employees or self-employed were at a higher risk of abdominal obesity as compared to women below 35 years of age from the low socio-economic group and whose husbands are labourers.

b. Diet:

Diet was not found to be significantly associated with abdominal obesity.

Table 3.20. Association of diet with abdominal obesity

Variable	Abdominal obesity (%)	Unadjusted OR (95 % C.I)	p value
Eating pattern			
Chocolates and sweets per month			
0-1 time	67.3	1	
2-4 times	72.2	1.26 (0.75 – 2.13)	0.38
5-9 times	63.4	0.84 (0.50 – 1.37)	0.50
More than 10 times	66.7	0.97 (0.58- 1.62)	0.91
Bakery items*			
0-4	63.7	1	
5-9	70.4	1.35 (0.75- 2.30)	0.26
10-15	77.2	1.93 (1.1 – 3.35)	0.02
More than 15 times	60.6	0.87 (0.5 – 1.42)	0.60

Table 3.20.Association of diet with abdominal obesity(contd..)			
Variable	Abdominal obesity (%)	Unadjusted OR (95 % C.I)	p value
Diet pattern:			
All good	70.8	1	
Intermediate	67.8	0.32 (0.10-0.98)	0.041
All bad	43.8	0.87 (0.49 – 1.54)	0.63
Fasting			
No	68.1	1	
Yes	64.7	0.86 (0.54 – 1.35)	0.56
Fruits and vegetable			
> 1.5 servings	67.5	1	
<1.5servings	67.3	0.99 (0.68 – 1.44)	1.00

(Source: Primary survey, Salem, 2010) * Cakes, puffs, ice-creams, fried chips

c. Physical activity

Physical activity was not found to be significantly associated with abdominal obesity.

Table 3.21. Association of physical activity with abdominal obesity

Variable	Abdominal obesity (%)	Unadjusted OR (95 % C.I)	p value
Physical activity:			
Moderate + low	69.7	1	
High	65.1	0.80 (0.56 – 1.17)	0.30

(Source: Primary survey, Salem, 2010)

3.4. Multivariate analysis (Binary logistic regression)

Multiple logistic regressions are carried out to estimate the predictors related to overweight and abdominal obesity as given in the given table. The analysis measures the effect of change in variation of one of the variable (independent) on variation of the other variable (dependent) adjusted for the other independent variables in the model. The purpose of the model is to understand how important both individually and when acting together, the independent variable are for explaining the variation in the dependent variable. The net bearing effect of the different independent variables is explained in terms of Odds ratio (OR).

The model selected examined the changes in one outcome variable (Overweight BMI >35kg/m^2). The analysis was done by Forward stepwise (Likelihood Ratio) model in SPSS for window version 15.0. Three variables were found to be significantly associated with overweight.

It is found that age more than 35 years of age, husband's being self employed and considering themselves as being thinner than they are, are factors significantly associated with overweight status according to BMI.

Similarly, it is found that age more than 35 years of age, who belong to middle or higher socio-economic groups are factors significantly associated with abdominal obesity.

Table 3.22.Significant independent variables for overweight found in multivariate analysis#

VARIABLE	ODDS RATIO$^{\Delta}$	ODDS RATIO (95% C.I)		P VALUE
		LOWER LIMIT	UPPER LIMIT	
1. Husband are self employed	1.73	1.06	2.82	0.002*
2. Aged more than 35 years	2.60	1.61	4.19	<0.001*
3. Who think thinner than they are actual	9.74	6.05	15.80	<.001*

(Source: Primary survey, Salem, 2010)

Δ- Adjusted Odds Ratio *p value <0.05.

Other independent variables used but not found significant are caste, marital status, respondent's educations status, ever pregnant status and socio economic status.

Table 3.23. Significant independent variables for abdominal obesity found in multivariate analysis#

VARIABLE	ODDS RATIO$^{\Delta}$	ODDS RATIO (95% C.I)		p VALUE
		LOWER LIMIT	UPPER LIMIT	
1. Aged more than 35 years	2.05	1.20	3.50	0.008*
2.Middle socio economic status	2.93	1.70	5.05	<0.001*
3. Higher socioeconomic status	4.46	1.57	12.66	<.001*

(Source: Primary survey, Salem, 2010)

Δ- Adjusted Odds Ratio *p value<0.05.

Other independent variables used but not found significant are caste, marital status, religion, ever pregnant status, Respondent's education status

CHAPTER-4

DISCUSSION AND CONCLUSION

4.1. **DISCUSSION**

The objective of the study was to find out the prevalence of overweight among urban women (19-49 years) in Salem and to examine the factors associated with overweight among them. This chapter is discusses the major findings in the light of the existing literature. It is organised under three sections namely: sample characteristics, prevalence of overweight and review of factors associated with overweight.

4.1.1. **Sample characteristics**

Most of the respondents are married (80 percent) and 41.2 percent of the women belonged to 19 and 30 age group. The mean age is 33.3 ± 8.42 years. Two thirds of the sample population are home makers and among them 25.6 percent are involved in earning wages through employment in the informal sector.

Around 50 percent of the respondents report high levels of physical activity, but not a single person engaged in rigorous sports activity. Only two out of the 500 respondents consume the recommended levels fruits and vegetable of more than 5 servings per day. Though 75 percent of the population are consume meat and meat products, 67.4 percent of them use sunflower oil for cooking which contains less saturated fat. The interesting thing to note here is that overweight women tend to think that they are thinner than their actual weight.

4.2. **Prevalence of overweight:**

The prevalence of overweight in the study population is 54 percent which is four times more than the national figures (14.8 percent)(NFHS-3,2005) and more than twice (24.4) (NFHS-3) for Tamil Nadu figures. The level of overweight among the study population is high as compared to the prevalence of overweight among urban Punjabi women which was found to 20 percent (2002)[41] and very high when compared to Naga tribal women of Manipur, where the prevalence is 9.8(2010).[38] But when compared to the study done in Mecheri, Salem district, where the prevalence of overweight was found to be 47 percent (2009), the current study has shown higher levels.[28]

The current study has a prevalence of obesity (BMI>= 30 kg/$m^{2)}$ as 21.6 percent. However this value seems to less when compared to studies among urban Punjab women where the prevalence of obesity was 25.3(2002)[41] and among Khatri females in Uttar Pradesh where the prevalence rate was 23.1(2006)[42] The rates of obesity is also less when compared to studies from metropolitan cities like Delhi where the prevalence of obesity is 33.4 percent (1994) and Hyderabad where prevalence was 36.3 (1995).[38] It is interesting to note that while the prevalence of overweight in the present study is many times higher than comparable Indian studies, prevalence of obesity is actually lower. However, this also implies the potential for preventing overweight from moving into obese category.

When compared to studies done in United Arab Emirates where the obesity levels is around 45 percent(2010), it shows generalised prevalence rather than concentrated in a small minority.[43]When compared to countries like Senegal where the prevalence of overweight and obesity is 22.3 percent and 8.3 percent(2010), the current study seems to be high.[44] Studies in Nigeria shows the prevalence of overweight as 17.4

percent and obesity as 8.8 percent.[45]Thus the current study has prevalence rate which is very less when compared to developed countries whereas it is higher when compared to the other developing countries.

The prevalence of abdominal obesity (Waist Circumference >80 cms) in the current study population is around 70 percent. This is very high when compared to study done by Deepa et al,(Chennai 2007) shows the prevalence of abdominal obesity among South Indian urban women as 35.4 percent and study done by Gupta et al, 2004 (waist circumference > 88cms) where the prevalence was among North Indian urban women to be 44 percent.[16]This is also very high when compared to 21.2 percent of abdominal obesity from the Senegal study.[44]

The present study has waist circumference mean, as 85.4 cms which is very high when compared to a study done in Bangladesh, India, Vietnam, Indonesia and Thailand where the mean waist circumference between 70-74 cms except Thailand where the mean was 82.6 cms.[46]

With the recommendations made by the WHO expert consultation, 2004 where revised BMI cut off values were set for public health action, (that is BMI is taken as 23.0 instead of 25and the various cut-off points set as BMI 27.5, 32.5, and 37.5 kg/m2 for the Asian population the levels of overweight and obesity are likely to increase substantially forcing the public health professionals to work on war footing.

4.3. Factors related to overweight:

a. Socio-demographic characters:

In the current study, women of age more than 35 years are found to be significantly associated with overweight. This finding is similar to a study done in China and Nigeria where the rates of overweight was also higher among middle aged(45-59) women.[41,44]Similar findings are also found in India where women of age 40-49 have 12 times the risk of overweight when compared to women of age 15-19[24] and similar findings were found in a study in North India.[35] From another study done in in Bangladesh, India, Vietnam, Indonesia and Thailand Asian, where overweight increases with age initially and then declines at the highest age group. [46] But since the study did not involve older women (more than 49 years), this finding may not be significant in this study.

Parity of women is found to very highly significant with overweight especially with women who have 5 children or more[35] it the current study it was not found to be significant though women with 1-2 children were significantly associated in the bivariate analysis. The sample size of women who have 5 children was very less. Considering the falling fertility rates in Tamil Nadu to below replacement levels, the questions on parity with 5 children is going to be more obsolete in the future.

The current study showed that Hindus are more likely to be overweight but not statistically significant. In a study done in North India, the prevalence is high among Sikh community and another study had Muslim and Sikh women to have more tendency to gain weight.[25,20] In the current study however the Muslim women were not having increased prevalence due to small sample size.

The prevalence of overweight was high among the backward and the forward caste when compared to Scheduled caste and Scheduled tribe in the current study. A study done in North India(2004) found that women from backward class, scheduled caste and scheduled tribe are less likely to gain weight.[25]Such a similarity is not the same in South India because of different social setting. In Salem, the backward caste do not all belong to economically weaker sections and therefore only scheduled caste and scheduled tribes had lower prevalence of underweight.

Women from higher socio economic status were found to be more overweight among studies done in India[20,25,35] In the current study the middle socio economic status women are found to be more significantly associated in the bivariate analysis, whereas women from higher socioeconomic status were not found to be significant because of the smaller sample size.

By logistic regression the husband's occupation if self employed remains as an important factor for overweight. However from the literature review there are no such similar studies. Other studies have taken variables like Wealth Index and Standard of living Index.[25,20] Since there was a high correlation between the women's education and the husband's education the variable was not used in logistic regression.

Women's education is correlated to overweight among studies done in India and the in the Asian countries.[25,46,35] Though it was found to significant in the bivariate analysis, in the logistic regression it was not found to be significant. In a study conducted in North India[35], self employed women were found to be more obese, but in the current study most of the participants were homemakers, it was difficult to find similar relationship

b. Physical activity

In a study done to find out the diet and physical activity among Indian women it was found that women who were less involved in labour intensive chores are likely to overweight.[29] However in the current study it is found that the levels of physical activity was around 50 percent which is very high which does not correlate with overweight.

c .Dietary pattern:

The fruit and vegetable consumption among the entire study population is below the recommended WHO levels (more than 5 servings of vegetable and fruits). In a study done on the dietary pattern among Indian women it was found that women who consumed daily fried food, sweets and ice cream items were found to have higher prevalence of overweight.[30] There was no reporting of ice cream or sweet consumption daily among the study population. In the current study dietary pattern was not found to be statistically significant.

d. Perceptions related to overweight:

Studies done in Africa[45] have shown that white women tend to perceive themselves as overweight in spite of being normal, whereas black woman tended to think themselves as obese. In another study done in Bogalusa[40], the black women tend to perceive themselves to be thinner than their actual weight whereas white women tend to tend to think them heavier. In the current study, it is found that women are more likely to resemble the African women in Bogalusa, who think they are thinner. This brings us an interesting point whether women in Tamil Nadu tend to accept overweight as normal since it can be culturally and socially acceptable among them.

4.4. Factors related to abdominal obesity:

A study done in China showed that abdominal obesity was higher among middle aged women (45-59 years) when compared to younger women(19-44 years).[47] Similar finding is found in the current study where waist circumference is high among women more than 35 years of age.

4.5. Strengths of the study:

This study looks into the perspective aspects related to overweight which are a lacking in studies done related to overweight in India. All the anthropometric measurements were taken by the principal investigator to avoid observer bias. Since the study is of cross- sectional type, all drawbacks of the study including temporality can be an issue. The pamphlet given to the respondents after the interview schedule had an easy to read BMI chart. The respondent's height and weight was written in the pamphlet and were immediately told where they stood in the BMI status using the chart. This could be later used at homes where they can monitor their weight at regular intervals and take necessary steps. This helped many women to understand about BMI and its importance.

4.2. Limitations of the study:

Many women from higher socioeconomic status refused to participate in the study. Information on diet was not captured in detail. The consumption patterns of few food items were asked and few participants had difficulty in answering them. In the physical activity section, there were questions related to severe recreational activity which had no response from the participants.

4.3. Conclusion and recommendations

Overweight which was earlier only in the high and very high income countries is spreading to the low and middle income countries. In countries like India, the rates of under nutrition are decreasing along with increase in the number of overweight and obese women. The change in our lifestyle has also health implications including chronic disease like diabetes, hypertension and cancer. The problem of chronic disease is largely neglected. Since lifestyle diseases are developed during the course of one's life, changes in lifestyle can be made possible. The government should focus on the changing scenario from under nutrition to overweight and should frame policies focusing on women as the prevalence rates are high among women.

The levels of overweight, obesity and abdominal obesity among women aged 19-49 years in urban setting of Salem is high. With increasing levels of modernization the levels are only likely to increase. Most factors related to overweight in the study (age , husband's occupation) are not modifiable but perceptions where women despite being fatter consider themselves to be thin can be changed. This can be a potential intervention point wherein women are alerted to their overweight status fairly early when weight reduction may be easier. Thus the solution is easier said than done. Measures for lifestyle change should begin early as elderly women are more likely to increase in weight.

The fruit and vegetable consumption among the study population is low than the WHO recommended levels (More than 5 servings per day). The reasons are more likely to be socially related where women in the household who consume less fruits and vegetables when compared to other family members. Another reason is that the high cost of fruits and vegetables which are beyond the reach of lower socio economic status.

Hence the government can subsidize the prices of vegetables and fruits so that people can consume them daily.

The current study shows that women who are overweight consider themselves as thin. These perceptions related to overweight among women has to change considerably. Effective use of media like newspaper, television can be used for educating women about adverse health effects of obesity.

Since child birth is attributed as one of the reasons for increase in weight, women should be educated about post partum exercises which should be ideally taught before the mother is discharged from the hospital. Follow up can be done when the mother visits the clinic with the child for immunization. Along with the immunization card for the child a card for the mother can also be given. Doctor can advise women who are unable to maintain their weight.

The read to use BMI chart used at the end of the interview schedule in the study had many women to know about Body Mass Index (BMI) using height and weight. Simple interventions such as this can be popularized among women so that they can be readily used at home for regular monitoring of their BMI. Physicians thus have an important role to play in alerting women about overweight status.

Since many women felt that it is practically not possible for them to exercise daily, establishments of 'women friendly spaces' in parks should be established. The self help groups (SHG) in urban areas in Tamil Nadu can engage themselves in such work by providing suitable facilities and support group.

Since very few studies related to perception about overweight is done in India, the future studies should not concentrate not only on the quantitative aspects

but also on the qualitative methods so that people friendly policies related to overweight can be framed.

Many participants had difficulty in answering questions related to physical activity. Questions related to severe recreational activity had no response as most of the Indian women are not likely to be involved in such activities. Hence a more practical and easy tool for measuring physical activity needs to developed.

Similarly there needs to a tool developed for diet. In the present study the consumptions of few food items were asked. Some participants found difficulty in answering them. Hence a tool needs to be developed for Indian setting.

Waist circumference can also be used to measure abdominal obesity as Indians also tend to have excess body fat, abdominal and truncal adiposity [20]which may be more appropriate for measurement of obesity among Indians.

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APPENDIX-I

WRITTEN INFORMED CONSENT FROM THE RESPONDENT

ENGLISH VERSION

I, _____ (Name of the data collector) hereby seek your consent to be interviewed for the *Study on Prevalence and Factors Related to Overweight among urban women in Salem Corporation, Tamil Nadu*. The study is being conducted by Dr. Aarthy, a Post Graduate student at Acutha Menon Centre for Health Science Studies, Shree Chitra Thirunal Institute of Medical Sciences and technology in Trivandrum, Kerala as a part of course requirement. Hereby I am conducting an interview to get related information for this research. This would take 30-45 minutes of your time. This is a routine procedure to obtain informed consent from the participant in a study.

While there is no benefit for you as an individual, it is possible that the findings of the study will enhance the scientific knowledge and enable us to develop better health policies to help people.I, therefore request you to participate in the study.

The information given by you shall not be disclosed to anyone under any circumstances anywhere in the public at any time. It shall be kept confidential and used for research purposes only. Participation is only voluntary nature. If at any time you want to stop answering the questions or choose not to answer some of the questions you can refuse to do so.

Kindly feel free to clarify your doubts and I shall try to clear them right now or in the future as well. If you still have queries you want to clarify, then you can call Dr.Aarthy.R Phone number: 9037829834, mail id is aarthu28@gmail.com).In any case you need her credentials, you can also contact Dr.Manju Nair, faculty at the department of public health, AMCHSS, SCTIMST, Trivandrum-695011[phone number 0471-2524235], or Dr.Anoop Kumar Thekkuveetil [Member-secretary of the Institutional ethics committee at SCTIMST, Trivandrum.[Phone number 0471-2520256/2520257]

Are you willing to participate in the study?

Yes: _____ No: _____

As a part of the requirement, I need your signature/thumb impression which indicates your willingness to participate. Will you be able to sign below?

Signature of the participant

_____

Thumb impression

If you are unwilling to sign/give thumb impression, but willing to be interviewed, signature of an independent witness to consent being taken.

_____

Signature of the witness

_____

Signature of the interviewer

Date:

Time:

Place:

A STUDY ON THE PREVALANCE AND FACTORS RELATED TO OVERWEIGHT AMONG URBAN WOMEN (19-49 years) IN SALEM ,TAMILNADU.

WARD NO ☐ HOUSE NUMBER ☐ DATE ☐ / ☐ / 20

COLLECTED BY _____

SECTION.1 : SOCIO-DEMOGRAPHIC DETAILS			
	INFORMATION	CODE	COMMENTS
1.	IDENTITY NUMBER		
2.	AGE (in completed years)	_____ (years)	
3.	RELIGION	1.HINDU ☐ 2.CHRISTIAN ☐ 3.MUSLIM ☐ 4.OTHERS (SPECIFY) _____	
4.	CASTE	1.FORWARD ☐ 2.BACKWARD ☐ 3.SCHEDULED CASTE ☐ 4.SCHEDULED TRIBE ☐	
5.	MARITAL STATUS	1.UNMARRIED ☐ 2.MARRIED ☐ 3.WIDOWED ☐ 4.DIVORCED/SEPARATED ☐	IF 1 THEN SKIP TO 10
6.	What is your husband's education?	_____(specify)	
7.	What is your husband's occupation?	1..GOVERNMENT EMPLOYED ☐ ☐	

		2.UNEMPLOYED 3.MANUAL LABOURER/UNSKILLED ☐ 4.SELF EMPLOYED ☐ 5.OTHERS SPECIFY_____ ☐	
8.	Have you ever been pregnant?	1. YES ☐ 2. NO ☐	IF 2 THEN SKIP TO 10
9.	Age at pregnancy	1 | 2 | 3	
10.	What is the highest level of education you have completed?	_____(specify)	
11.	What is your current occupation?	1.GOVERNMENT EMPLOYEE ☐ 2.HOME MAKER ☐ 3.MANUAL LABOURER/UNSKILLED ☐ 4.STUDENT ☐ 5.OTHERS ☐ Specify _____	IF ANSWER 2 THEN GO TO 12 OTHERWISE SKIP 12,13 GOTO 14.
12	Are you engaged in any kind of wage earning activity?	1.Yes ☐ 2.No ☐	IF 2 THEN SKIP TO 14

13	What types of wage earning activity are you engaged?	_____(specify)	☐
14	Economic status (subjective assessment)	1.Low ☐ 2. Medium ☐ 3.High ☐	

SECTION 2: PHYSICAL ACTIVITY

PART 1: **Job /house work –related physical activity**. Next I am going to ask you about the time you spend doing different types of physical activity in a typical week. Please answer these questions even if you do not consider yourself to be a physically active person.

Think first about the time you spend doing work. Think of work as the things that you have to do such as paid or unpaid work, study/training, household chores, harvesting food/crops, seeking employment.

In answering the following questions 'vigorous-intensity activities' are activities that require hard physical effort and cause large increases in breathing or heart rate, 'moderate-intensity activities' are activities that require moderate physical effort and cause small increases in breathing or heart rate.

P1	Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like [carrying or lifting heavy loads, digging or construction work] for at least 10 minutes continuously?	1. YES ☐ 2. NO ☐	Source: GPAQ questionnaire. IF 2 THEN GO TO P4
P2	In a typical week, on how many days do you do vigorous-intensity activities as part of your work?	Number of days ☐	
P3 (a-b)	How much time do you spend doing vigorous-intensity activities at work on a typical day?	Hours : minutes └┘└┘ : └┘└┘ hrs mins	
P4	Does your work involve moderate-intensity activity that causes small increases in breathing or heart rate such as brisk walking [or carrying light loads] for at least 10 minutes continuously?	1. YES ☐ 2. NO ☐	IF 2 THEN GOTO P7

P5	In a typical week, on how many days do you do moderate-intensity activities as part of your work?	Number of days ☐	
P6 (a-b)	How much time do you spend doing moderate-intensity activities at work on a typical day?	Hours : minutes └─┴─┘ : └─┴─┘ hrs mins	
Travel to and from places: The next questions exclude the physical activities at work that you have already mentioned. Now I would like to ask you about the usual way you travel to and from places. For example to work, for shopping, to market, to place of worship. [insert other examples if needed**]**			
P7	Do you walk or use a bicycle (pedal cycle) for at least 10 minutes continuously to get to and from places?	1. YES ☐ 2. NO ☐	IF 2 THEN GOTO P10
P8	In a typical week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places?	Number of days ☐	
P9 (a-b)	How much time do you spend walking or bicycling for travel on a typical day?	Hours : minutes └─┴─┘ : └─┴─┘ hrs mins	
Recreational activities The next questions exclude the work and transport activities that you have already mentioned. Now I would like to ask you about sports, fitness and recreational activities (leisure), [insert relevant terms].			
P10	Do you do any vigorous-intensity sports, fitness or recreational (leisure) activities that cause large increases in breathing or heart rate like [running or football,] for at least 10 minutes Continuously?	1. YES ☐ 2. NO ☐	IF 2 THEN GOTO P13
P11	In a typical week, on how many days do you do vigorous-intensity sports, fitness or recreational (leisure) activities?	Number of days ☐	
P12 (a-b)	How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a typical day?	Hours : minutes └─┴─┘ : └─┴─┘ hrs mins	

P13	Do you do any moderate-intensity sports, fitness or recreational (leisure) activities that causes a small increase in breathing or heart rate such as brisk walking,(cycling)for at least 10 minutes continuously?	1. YES ☐ 2. NO ☐	IF 2 THEN GOTO P16.
P14	In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational (leisure) activities?	Number of days ☐	
P15 (a-b)	How much time do you spend doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical day?	Hours : minutes └┘└┘ : └┘└┘ hrs mins	
Sedentary behaviour : The following question is about sitting or reclining at work, at home, getting to and from places, or with friends including time spent [sitting at a desk, sitting with friends, travelling in car, bus, train, reading, playing cards or watching television], but do not include time spent sleeping.			
P16 (a-b)	How much time do you usually spend sitting or reclining on a typical day?	Hours : minutes └┘└┘ : └┘└┘ hrs min s	
SECTION-3 : DIET: Kindly answer the following questions related to your diet.			
D1	What is your diet pattern for the past one year?	1. Vegetarian ☐ 2. Non-vegetarain ☐ 3. Vegetarain + egg ☐	
D2	What type of oil do you use for cooking? (Tick the main one used)	1. Sunflower oil ☐ 2. Palm oil ☐ 3. Gingley oil ☐ 4. Mustard oil ☐ 5. Rapeseed oil ☐ 6. Coconut oil ☐ 7. Groundnut oil ☐ 8. Others ☐	

		_____(specify)	
D3	In a typical week, on how many days do you eat fruit?	Number of days ☐☐	IF ZERO THEN GOTO D5
D4	How many servings of fruit do you eat on one of those days?	Number of servings ☐☐	
D5	In a typical week, on how many days do you eat vegetables?	Number of days ☐☐	IF ZERO THEN GOTO D7
D6	How many servings of vegetables do you eat on one of those days?	Number of servings ☐☐	
D7	On average, how many meals per week do you eat that were not prepared at a home? By meal, I mean breakfast, lunch and dinner.	Number of days ☐☐	

In a typical month how often do you consume the following (actual number of consumption). Mark according to the actual number of the consumptions.

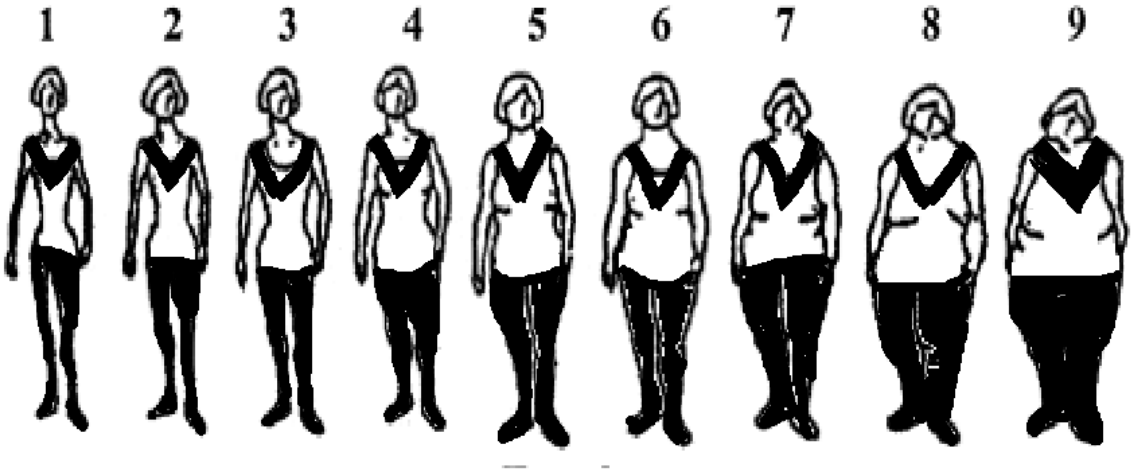
D8	Food item	Daily	weekly	Monthly	Never	More Comments
	1.Milk					
	2.Eggs					
	3.sweets					

	4.cold drinks					
	5.Bakery bicuits/biscuits					
	6.puffs/burgers/pizzas					
	7.Ice cream					
	8.sweets					
	9.chocolates					
	10.Any fried Chips					
	11.cakes/pastries/ jams					

D9	Do you usually fast?	1. YES ☐ 2. NO ☐	IF 2 THEN GO TO SECTION 4
D.10	How often do you fast?	a._____ days/month	

SECTION 4: KNOWLEDGE, ATTITUDE AND PERCEPTION: The following are questions related to your perception, knowledge and attitude related to overweight. Answer the following question below.

4a. FIGURE RATING SCALE:



(Adapted from the paper by A. R. Bhuiyan, J. Gustat, S. R. Srinivasan, and G. S. Berenson, Differences in Body shape representations among Young adults from a biracial (Black-white),semirural community, *American Journal of Epidemiology, 2003)*

C.1	How do you perceive your body weight at present?	1.Normal weight ☐ 2.Under weight ☐ 3.Overweight ☐ 4.Obese ☐	
C2	In the picture given below select the number/figure that matches most closely with you? (select any of the nine pictures)	☐	
C3	How would you ideally like to look? (select any of the nine pictures)	☐	
C4	How would you like to be in the next 1 year? (select any one of the pictures)	☐	

C5	What would you look like if you exercised regularly? (select any one of the pictures)	☐	
C6	What would you look like if you followed a healthy diet? (select any one of the nine pictures)	☐	
C7	What would you look if you exercised and followed a healthy diet? (select any of the nine pictures)	☐	
C8	According to you, what would be the major barriers in trying to achieve this?	1._____ 2._____ 3._____	
4 b. Perception related to thinness			
C9	Modern clothes are worn by thin people	1.Agree ☐ 2.Disagree ☐ 3.Dont know ☐	
C10	Thin people are not beautiful	1.Agree ☐ 2.Disagree ☐ 3.Dont know ☐	

4.c.Perception related to overweight:			
C11	Overweight reflects prosperity	1.Agree ☐ 2.Disagree ☐ 3.Dont know ☐	
C12	People who are overweight are less active than normal people	1.Agree ☐ 2.Disagree ☐ 3.Dont know ☐	
C13	People who are overweight are found to be less healthier than normal people	1.Agree ☐ 2.Disagree ☐ 3.Dont know ☐	
4.d .Perception related to weight gain:			
C14	Weight gain is hereditary	1.Agree ☐ 2.Disagree ☐ 3.Dont know ☐	
C15	Weight gain is related to too much eating	1.Agree ☐ 2.Disagree ☐ 3.Dont know ☐	

C16	What according to you are the three main reasons for increase in weight?	1._____ 2._____ 3._____	
4 e. Perceptions related to weight control			
C17	One has to eat expensive food to lose weight	1.Agree ☐ 2.Disagree ☐ 3.Dont know ☐	
C18	If one exercises daily, one feels healthy	1.Agree ☐ 2.Disagree ☐ 3.Dont know ☐	
C19	It is not practical for a woman to exercise daily	1.Agree ☐ 2.Disagree ☐ 3.Dont know ☐	
4.f. Knowledge related to overweight			
C20	What according to you are the three adverse health conditions related to overweight	1._____ 2._____ 3._____	
C21	Does overweight causes		

	a. Hypertension b. Heart diseases c. Diabetes mellitus d. Cancer				
SECTION 5: Anthropometric measurement					
	1. Height (in cms) 2. Weight (kgs) 3. Waist circumference				

APPENDIX -III

Levels of total physical activity

Description: Percentage of respondents classified into three categories of total physical activity.

Instrument questions:

- **P1-P6a&b:** activity at work
- **P7-Pa9&b:** travel to and from places
- **P10-P15a&b:** recreational activities

Level of totalphysical activity							
Age Group (years)	Gender						
	n	% Low	95% CI	% Moderate	95% CI	% High	95% CI

Questions Used	P1-P15a&b
Program	**Ptotallevels** (unweighted), **PtotallevelsWT** (weighted)
Equations	Total physical activity MET-minutes/week (= the sum of the total MET minutes of activity computed for each setting) Equation: Total Physical Activity = [(P2 * P3 * 8) + (P5 * P6 * 4) + (P8 * P9 * 4) + (P11 * P12 * 8) + (P14 * P15* 4)]

Level of total physical activity	Physical activity cutoff value
High	• IF:(P2 + P11) ≥3 days AND Total physical activity MET minutes per week is ≥1500 **OR** • IF: (P2 + P5 + P8 + P11 + P14) ≥7 days AND total physical activity MET minutes per week is ≥3000
Moderate	• IF: level of physical activity does not reach criteria for high levels of physical activity **AND at least one of the following:** • IF: (P2 + P11) ≥3 days AND ((P2 * P3) + (P11 * P12)) ≥3*20 minutes **OR** • IF: (P5 + P8 + P14) ≥5 days AND ((P5 * P6) + (P8 * P9) + (P14 * P15) ≥ 150 minutes **OR** • IF: (P2 + P5 + P8 + P11 + P14) ≥5 days AND Total physical activity MET minutes per week ≥600
Low	IF level of physical activity does not reach the criteria for either high or moderate levels of physical activity

Program Information	Places each respondent into one of 3 categories of physical activity. Before any of the below variables are created ALL CleanRecode programs are called. To be included in the output, the respondent must have either left blank or given a valid response to each subset of the physical activity questions AND have given a valid response to at least one subset of the physical activity questions (CLN=1).