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ASSOCIATION OF DIET WITH ABDOMINAL OBESITY

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Abstract:

Introduction: Pakistan. In today's society, being overweight or obese in the abdomen is seen as a growing public health concern. While the term "abdominal obesity" refers to an excess of abdominal body fat, the way that fat is distributed has a significant impact on many metabolic conditions. **Objectives:** The current study aimed to investigate dietary association with abdominal obesity. **Methodology**: A qualitative research study was followed in this study. A total of 200 housewives between the age group of 25 to 40 were enrolled in the study as the sample. A proper questionnaire was developed before the conduction of the research study. The data for the study was collected using a validated food frequency questionnaire approved by the supervisor of the project. **Results**: The results indicated waist-to-hip ratio for most of the respondents i.e., 56 percent was high i.e., 0.85 and above meaning that most of the respondents were having abdominal obesity.

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Body Mass Index results indicated that most of the respondents i.e., 55.71 percent of the total respondents were overweight. Most of the respondents i.e., 45.71 were having very high levels of visceral fats, while most of the respondents i.e., 67 percent were involved in moderate physical activity. **Conclusion**: The study recommended that women should choose moderate amounts of monounsaturated and polyunsaturated fats found in fish, nuts, and certain vegetable oils. The study also recommended strength training exercises at least twice a week for the women.

Keywords: BMI, diet, fats, obesity, physical activity

1. Introduction

One of the most significant public health issues today is abdominal obesity, which is on the rise both in industrialized and developing countries. According to recent studies, the prevalence of abdominal obesity in emerging nations has quadrupled over the last two decades. No country has been exempted from this rule, including Pakistan. In today's society, being overweight or obese in the abdomen is seen as a growing public health concern. While the term "abdominal obesity" refers to an excess of abdominal body fat, the way that fat is distributed has a significant impact on many metabolic conditions. Metabolic disease risk is elevated in Asians and other non-obese persons with abdominal obesity. Measuring the amount of fat stored in the belly is one way to identify someone as having abdominal obesity (Geiker, & Markus, 2018).

Globally, its prevalence has been well-documented throughout the last several decades. The frequency of abdominal obesity has tripled in emerging nations. Overweight and Abdominal obesity rates among adults have increased from 10% to 25% and 2% to 10%, respectively. According to these estimations, 28.2 percent of women and 22.0 percent of men in Pakistan are overweight or obese, which is a significant number. Abdominal obesity carries a slew of hazards for one's health, both tangible and intangible. Age, race, gender, and low socioeconomic position, as well as bad sleep habits, a lack of exercise, and irregular and lengthy work schedules, may all contribute to the development of type 2 diabetes and obesity. Obesity and its long-term implications have been linked to a wide range of bad eating behaviors, including insufficient and imbalanced diets. Body Mass Index (Body Mass Index) is the most widely used and convenient way to determine whether or not an adult is obese or overweight (Body Mass Index) (Kuryłowicz, Cąkała, 2020). Many non-communicable illnesses may be linked to obesity in the abdomen, which is an accumulation of fat in this area. Abdominal obesity in adults may be treated using non-surgical methods. Drug and pharmacological interventions were compared to no treatment at all to see which was most effective (Chatelain, & Bochud, 2018).

Those who are obese in the abdomen are at a higher risk of acquiring diabetes, hypertension, and dyslipidemia as well as cardiovascular diseases (CVD). Diabetes mellitus DM, metabolic syndrome, and coronary heart disease are all possible outcomes of abdominal obesity (CHD). Metabolic and cardiovascular disease risks are exacerbated

when a person has abdominal obesity, which is a contributing factor in this situation. Further study is required to better understand the ethnic and racial disparities in waist circumference and their impact on health, in addition to the fact that various measurements of obesity and the risk of different health consequences may vary (Geiker, & Markus, 2018).

Dietary changes and lack of physical exercise are two major contributors to the rising incidence of abdominal obesity among Americans, whether they live in urban or rural areas. Ethnic characteristics that contribute to abdominal obesity include poor socioeconomic position, genetic factors, and differing eating habits. Pakistani urban populations are more likely to be obese because of a history of abdominal obesity in their families, as well as their diet (Cureau, & Schaan, 2018).

As a result of the focus on starvation and malnutrition in poor nations like Pakistan, abdominal obesity is mostly ignored. Abdominal obesity is little studied in Pakistan, and there are few effective national, regional, and local measures to fight it. If the issue is not addressed sooner rather than later, it will only become worse, placing an enormous strain on Pakistan's health care system. The policymakers and other relevant sectors have to ensure that any negative repercussions are avoided (Rakvaag, & Gregersen, 2019).

On the other side, a shift in Pakistani eating habits over the last several decades has led to an increase in the intake of fattier and sweeter foods. The average amount of time spent exercising by people has reduced from 291.7 minutes to 263.9 minutes. Even in countries with rapidly developing economies, there has been an increase in fast food chains, street vendors, and the availability of products at very competitive prices due to the economical acquisition of inputs such as raw and processed foods, which has led to increased consumption of energy-dense food, primarily leading to overweight and obesity. In Pakistan, the number of daily servings of fruits and vegetables has dropped from 4 in 2017 to 1.8 by 2020, a significant fall (Ahmed, 2019).

There is no recent data available for associated factors of abdominal obesity in Pakistan. This population-based investigation focused mainly on providing estimates of dietary association with abdominal obesity.

2. Literature Review

Ojeda et al. (2019) analyzed that obesity in adults is on the rise. They examine the effects of a dietary change on the nutritional sufficiency and quality of food in adults who are obese around the abdomen. 101 individuals were randomly allocated to two groups: normal care or intensive care, both of which followed a Mediterranean-style diet with a modest intake of calories and received nutritional counseling. In the end, they found that an intensive lifestyle intervention was able to lower Body Mass Index-SDS in obese adults. Participants' dietary indexes increased dramatically, bringing them closer to the recommended daily intake.

Beige et al. (2018) investigated the incidence of eating fast food and being overweight. The researchers in this study were interested in finding out how common

fast-food intake is and whether or not it's linked to both abdominal and overall obesity. In this research, a random sample of 300 students was drawn from Iran's two main institutions. Fast food questionnaires and anthropometric measurements were used to obtain the data. 72.4 percent (67.4 percent in females and 80.7 percent in males) had had at least one fast food item in the last month, whereas 21.3 percent and 33.2 percent of those surveyed were obese based on Body Mass Index and Waist-to-Hip-Ratio, respectively. Fast food intake was linked to abdominal obesity as WHR, but not to overall obesity as Body Mass Index. Fast food intake and obesity/overweight are common among Iranian students. Based on WHR, eating fast food was linked to abdominal obesity.

Kesztyüs et al. (2018) performed research to investigate nonsurgical therapy alternatives. Drug and pharmacological interventions were compared to no treatment at all to see which was most effective. A randomized control study in Medline found that the interventions reduced waist circumference by 2.65cm (with a 95% confidence interval) as a measure of abdominal obesity. By –1.88cm (95 percent confidence interval), eight behavioral treatments lowered WC, while six combination behavioral and dietary and/or physical activity interventions reduced WC by –4.11cm (95 percent confidence interval) (95 percent CI), the WC was shown to be somewhat affected by the indicated treatments.

Onat et al. (2006) undertook long-term research to examine the underlying causes of abdominal obesity and its influence on metabolic syndrome (MS), diabetes (DM), and coronary heart disease (CHD) in males. 1638 male participants (aged 48.5 12.3), who were typical of Turkish males with a high incidence of MS, were included in the study's sample. A modified version of the NCEP recommendations for MS components was accepted, with the addition of criteria for abdominal obesity. Newly emerging abdominal obesity was predicted by insulin levels (relative risk), C-reactive protein (CRP), and heavy smoking (protective). Having high triglyceride levels and low HDL cholesterol was previously linked to a larger waist circumference. Abdominal obesity was characterized as having a waist circumference more than or equal to 95 centimeters, and an action level 1 of 87 centimeters was recommended for MS in this cohort based on sensitivity and specificity rates. Serum insulin and CRP levels were shown to be predictive of abdominal obesity in Turkish males, but heavy smoking was found to be negatively predictive. When adjusting for age and smoking, even small increases in waist circumference are linked to elevated blood pressure. Obesity in the abdomen suggests that IR is not a significant factor in the development of MS. MS was more closely associated with an expanding waist circumference than DM was. Due to the risk factors, abdominal obesity increases the risk of coronary heart disease.

Lee et al. (2008) show that the most basic assessment of overweight and obesity may accurately predict cardiovascular risk factors. Each of the four risk factors (obesity, overweight, hypertension, and type II diabetes) was included in a meta-analysis, and the results were combined using a random-effects model. Data from men and women were evaluated individually. Thus, Body Mass Index was shown to be the least accurate predictor of cardiovascular risk variables. It was shown that the WHR (waist-to-height ratio) was a good predictor of hypertension, diabetes, and dyslipidemia in both men and

women, with pooled AUC (95 percent confidence intervals) of 0.67 (0.64, 0.69) to 0.73 (0.70, 0.75) and 0.68 (0.63, 0.72) to 0.76 (070, 0.81) respectively. For both men and women, the researchers found that markers of centralized obesity, particularly WHR, outperformed Body Mass Index in diagnosing cardiovascular risk factors.

Cameron et al. (2009) sought to evaluate the prevalence of illness and death in the Australian population as a consequence of abdominal obesity. In the research, 6072 men and women between 25 and 75, who were not pregnant and had waist circumference data, were surveyed between May 1999 and December 2000 and again between June 2004 and December 2005. Result measurements comparing those with and those without excess abdominal weight or obesity in relation to their waist circumference. Obese individuals had a higher risk of myocardial infarction in males, but not in women. The rising quintiles of abdominal obesity did not seem to be associated with an increased risk of death from any cause. It was thus determined that abdominal obesity is significantly associated with an increased risk of type 2 diabetes, metabolic syndrome, and cardiovascular disease.

Lihua Hu et al. (2017) determine the prevalence of obesity and obesity-related risk factors in southern China. The research was conducted in Jiangxi Province, China, from November 2013 to August 2014, and covered 15,364 individuals ages 15 and older. The survey found that 25.8 percent of adults were overweight, while 7.9 percent were obese (8.4 percent in males and 7.6 percent in females). Abdominal obesity was found in 10.2% of the population. Obesity prevalence in urban and rural people was 37.1 percent and 30.2 percent respectively, with urban individuals having a far greater incidence of abdominal obesity. 1.3 percent of individuals with an underweight/normal Body Mass Index (Body Mass Index) nonetheless exhibited abdominal obesity, according to the study. People in southern China are suffering from an epidemic of obesity, which varies by gender and age. In addition, WC, Body Mass Index, and VAI had a strong, statistically significant positive connection.

Tande et al. (2009) used 24-hour recall to obtain HEI data, which includes both the overall HEI score and the scores for each of the HEI component parts. During a medical examination, WC measurements were collected. When it comes to males, abdominal obesity was classified as a waist circumference of 102 centimeters and for women, 88 centimeters. Men (n=74) and non-pregnant women (n=15) were all included in the research (n=8188). With each 10-unit rise in total HEI score, the risk of abdominal obesity decreased by 8.3 percent for women and 14.5 percent for men (95 percent CI 6.8, to 21.9 percent, P 0.001) for each 10-unit increase. Women's risk of abdominal obesity was reduced by 26 percent for each point rise in the fruit score (95 percent C 08, 44 percent, P 0.007). For males, the risk of abdominal obesity was reduced by 31% (95 percent CI 01, 60%, P 5 0.042) and 40% (95 percent CI 01, 77%, P 5 0.043) for each point increase in saturated fat and variety scores. People who adhere to a healthy eating plan are less likely to develop abdominal obesity, according to one research.

Onat et al. (2016) determined that waist circumference (WC) should be included in the evaluation of obesity and abdominal obesity in the prevalence of cardiovascular disease (CVD), type 2 diabetes mellitus (T2DM), hyperlipidemia (HLD), and high blood

pressure in primary care patients. A total of 17,80 patients from Spain ranging in age from 18 to 80 were included in the study. According to the National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III), 33% of the individuals had a Body Mass Index of above 30, and 51% had abdominal obesity. Despite the fact that Body Mass Index and WC have a connection. The research found a strong link between cardiovascular disease (CVD) and abdominal obesity. Some patients with abdominal obesity but a lean Body Mass Index had a higher risk of cardiovascular disease and diabetes than those with a normal Body Mass Index. Obesity in the abdomen was also linked to hypertension and dyslipidemia. According to the findings, even in individuals with normal Body Mass Index, abdominal obesity was highly linked to CVD and diabetes.

Nickolas et al. (2006) examined whether total and abdominal obesity were risk factors for the onset of chronic heart failure (CHF) in elderly men and women over the age of sixty-five. Three thousand seventy-five well-functioning older people aged 70 to 79 were enrolled in the research. They used dual-energy X-ray absorptiometry to determine their body composition, and computed tomography to determine the amount of visceral adipose tissue they had. The study's findings revealed that 2,435 individuals (1,081 males and 1,354 women) were found to be free of coronary heart disease or heart failure (CHF). CHF was verified in 166 patients at the start of the study. Abdominal fat distribution may be a larger risk factor for CHF than total obesity, according to the findings of the research

Nissen et al. (2008) affirmed that weight reduction and metabolic effects of the selection were examined in research. For those with metabolic syndrome and abdominal obesity, rimonabant, a cannabinoid type 1 receptor antagonist, slows the course of cardiovascular disease. Rimonabant vs. placebo in a randomized, double-blinded, placebo-controlled, two-group, parallel-group study at 112 facilities throughout North America, Europe, and Australia, 839 patients were given a placebo. At the beginning and end of the trial, patients got dietary counseling, were randomized to receive either rimonabant (20 mg daily) or a placebo, and had coronary intravascular ultrasounds. In addition to changes in normalized total atheroma volume, the major effectiveness metric was changes in percent atheroma volume (PAV) (TAV). To summarize, the research found that in the rimonabant versus placebo groups, PAV (95% CI) rose 0.25 percent (0.04 to 0.54 percent) and TAV reduced (P = .22) by 2.2 mm3. Patients who were given rimonabant saw more weight loss than those who were not. Rimonabant patients were more likely to have side effects related to mental health. After 18 months of therapy, the trial failed to demonstrate the impact of Rimonabant on disease progression for the main end goal (PAV) but showed a positive effect on the secondary endpoint (TAV).

Tande et al. (2009) found out that no one has looked at the association between the Health Eating Index (HEI) and waist circumference (WC), which might help minimize abdominal obesity risk. In order to better understand the relationship between HEI and abdominal obesity in adults, this research was conducted. They used a cross-sectional design for their research. We used 24-hour dietary recall to get our data. The research included men (n=7470) and non-pregnant women (n=15658) making up a total of 15=658 US adults (n=8188). Women's risk of abdominal obesity decreased by 8% (95 percent CI

1% to 14%) and men's risk decreased by 14% (95 percent CI 6% to 21%) with each 10-unit rise in overall HEI score (HEI scale, 0–100). Women's risk of abdominal obesity was reduced by 2.6 percent (95 percent CI 0.8, 4.4 percent, P = 0.007) for each point increase in the fruit score. Men's risk of abdominal obesity dropped by 31% (95 percent CI 0?1,6?0 percent, P 5 0?042) and 40% (95 percent CI 0?1,7?7 percent, P 5 0?043) for every point rise in saturated fat and variety scores. The researchers came to the conclusion that a decreased risk of abdominal obesity is connected with eating in accordance with the HEI.

Janssen et al. (2010) examined how the prevalence of abdominal obesity in Canadian adolescents and adults has changed over time; to estimate the prevalence of abdominal obesity in normal weight, overweight, and obese body mass index categories; and examine how the prevalence of abdominal obesity has changed over time over the period 2007–2009. All three surveys included WC measurements. The prevalence of abdominal obesity was estimated at 12.8% between 2007 and 2009. Men and women aged 20 to 69 were found to have higher mean WC values than those aged 20 to 29, with males increasing by 4.2 centimeters, ladies by 6.7 centimeters, and men increasing by 6.5 centimeters and females by 10.6 centimeters. Abdominal obesity affected 2.6 percent of normal-weight adults, 35.3% of overweight adults, and 93.0% of obese people in the 2007–2009 survey.

De Moraes et al. (2010) sought to examine existing literature on the prevalence of abdominal obesity (AO) in adolescents (10–19 years of age), analyze the cut-off points used for the diagnosis of AO, and compare the prevalence of AO between developed and developing countries. Online databases were used in the investigation. In the selection process, only original studies and those that used waist circumference as a diagnostic tool were evaluated. Thirty-nine studies fulfilled the inclusion criteria. These studies were conducted in wealthy nations in 14 of the cases. Teenagers from developing nations were found to have an AO prevalence of between 3.8% and 51.77%. Only 8.7 percent to 33.2 percent of people in industrialized nations were affected by the outcomes. There were a total of 18 distinct cut-off points. However, no agreement could be found on which sex had the highest incidence of AO, and it was shown that adolescents from poor nations had a higher rate of AO than those from developed countries.

Xi et al. (2011) aimed to look at changes in Body Mass Index, waist circumference, and the prevalence of overweight (Body Mass Index 25–27.49 kg m-2), general obesity (Body Mass Index 27.5 kg m-2), and abdominal obesity (Body Mass Index 27.5 kg m-2) (WC 90 cm for men and 80 cm for women) China was the focus of the research. The results of the China Health and Nutrition Survey were used to compile this information. A total of 52,621 Chinese individuals were studied between 1993 and 2009. According to the findings, men's mean Body Mass Index rose by 1.6 kg m-2, while women's mean Body Mass Index climbed by 0.8 kg m-2, while men's mean WC grew by 7.0 cm and women's mean WC increased by 4.7 cm. From 8.0 percent to 17.1 percent of men and 10.7 percent to 14.4 percent of females were overweight at the beginning of the study. In general, the prevalence of obesity climbed from 2.9 to 11.4 percent among men and 5.0 to 10.1 percent among women, while the prevalence of abdominal obesity increased from 8.5 to 27.8

percent among men and from 27.8 to 45.9 percent among women, respectively. As a result of this investigation, researchers determined that the prevalence of obesity among Chinese people has grown significantly over the previous 17 years.

Abu-Saad and Fraser (2010) stated that women should take a folic acid supplement of 400 micrograms per day up to the twelfth week of pregnancy before becoming pregnant. Increases in tissue development, red blood cell bulk, uterine expansion, and the growth of the placenta and fetus all raise the demand for folic acid. Pregnancy increases the daily need for vitamin C (ascorbic acid) from 75 to 85 milligrams. In addition to its role in the production and growth of connective tissue and the circulatory system, vitamin C also serves as an antioxidant. There are a variety of fruits and vegetables that may be used as a source of vitamin C. Vitamin D, which is found in milk, yogurt, and juice, as well as fortified cereals and breakfast bars, is another essential mineral for pregnant women. Pregnant women need 15 milligrams of vitamin D every day.

Muthayya (2019) found that the majority of babies born in Asia are born weighing less than 2,500 grams because of the serious problem of maternal malnutrition during pregnancy. Having a baby with a low birth weight is a good indicator of the health of both the mother and the baby. Low birth weight is most commonly caused by IUGR (intrauterine growth retardation) and prematurity. The majority of low-birth-weight infants in low-income countries are not prematurely born. IUGR was found to be the leading cause of low birth weight (96.4 percent), while only 3.6% of babies were born prematurely, according to a study conducted in rural Bangladesh. Despite a drop from 40% to 20% to 22%, the low birth weight rates in Bangladeshi babies remain among the highest in the world. LBW was found to be strongly associated with maternal height and Body Mass Index in Bangladesh, even after adjusting for other potential confounders.

Ratanasiripong and Burkey (2011) found that 1,798 college students from a large public university in the western United States differed by race and gender when it came to their actual body size compared to their perceptions of their size, as well as whether they were underreporting their levels of overweight and obesity. 3.3% were African Americans, 19.9% Asian Americans, 19.9% Latinos/Hispanics, and 43.3% of the pupils were White. The questionnaires the scientists used asked participants about their personal characteristics, such as their age, gender, weight, height, and perceptions of their own bodies. Differences in Body Mass Index and body image were evaluated using paired sample t-tests, and the results were statistically significant (p 0.01). 18 percent of female students were overweight or obese, although 28% of female students reported being overweight and 3% were obese, according to the statistics. More than a third of the male students were overweight or obese, although only a quarter of the male students self-identified themselves as overweight or obese. There was no significant difference in underreporting among the four ethnic groups (p 0.81), although male participants underreported substantially more than females. Ethnic and gender-specific interventions should be designed to raise awareness of body size and strengthen skills for healthy weight management, according to the findings of this study, which found that a large proportion of individuals underreported their real weight status.

Sira and Pawlak (2010), in a cross-sectional survey investigation, found that dieting attitudes, Body Mass Index categories, the prevalence of overweight and obesity, and any variations in dieting by gender and ethnicity were among their particular goals. More than 580 undergraduates answered a questionnaire on their demographics and self-reported weight and height. The shortened version of the Eating Attitudes Test (EAT 26) (Garner, Olmsted, Bohr, & Garfinkel, 1982) or questions on healthy diets were also included in the survey. There were 26 questions in the EAT 26, which were designed to measure a wide spectrum of anorexia and bulimia symptoms. Among the 582 students, 60% completed the EAT 26, and 40% completed the healthy dieting questionnaire portion of the survey. One-way analysis of variance (ANOVA), chi-square, and descriptive statistics (mean, range, frequency) were used to examine the data. To be statistically significant, the p-value has to be less than 0.01. 15.1 percent of the pupils were underweight, 21.4 percent were overweight, and 10.8 percent were obese. Both male and African American students had a much higher mean Body Mass Index than their white counterparts (p 0.001), and this difference was statistically significant. The mean Body Mass Index of white students was substantially lower than that of African American students (p 0.001), although the mean Body Mass Index of white and African American male students was not statistically different (p 0.506). Females reported more dieting practices than men on the EAT 26 scale, with a statistically significant difference (p 0.001). The EAT 26 test found that 12.64 percent of the 348 kids tested had a score greater than 20, indicating that some of the pupils had eating disorders. Study participants were more likely to be overweight or obese (p 0.001) than their white counterparts. There were more than 13% of students who had eating disorders, and 64% of female students who reported excessive dieting practices were within the Body Mass Index range for healthy weight, according to the EAT 26 study results.

Yohannes, Ejamo, Thangavel, and Yohannis (2018) conducted a community-based cross-sectional study in which they sampled 543 mothers who had children between the ages of 6 and 23 months. The data collected from this study were analyzed using bivariate logistic regression to determine the crude association, and multivariate logistic regression was used to model the predictors. In this study, the researcher noted that the percentage of timely introduction of CF was 34.3 percent with a 95 percent confidence interval of (30.31, 38.29). In addition, educational levels of study participants higher than high school, spouses, and nursing mothers attending postnatal care appointments (AOR = 1.94 with a 95 percent confidence interval of 1.19, 3.16) were found to be independent predictors of timely introduction of CF practice (Yohannes et al., 2018). The researchers concluded that an increase in educational level was associated with an increase in timely CF practice. As a result, it is recommended that caregivers be provided with adequate information regarding IYCF practices to guarantee an increase in the uptake of appropriate CF practices, especially given how important CF is in early childhood development.

3. Methodology

3.1 Research Design
Research design refers to the tools and techniques that are used to conduct the research. A community-based cross-sectional study was adopted to determine the association of diet with abdominal obesity.

3.2 Study Type
A qualitative research study was followed to complete the entire research work.

3.3 Population
Population refers to the whole lot from which the data is collected for analysis. In this study, housewives between the age group of 25 to 40 years were taken as the population of the current study.

3.4 Sample Size
A total of 200 housewives between the age group of 25 to 40 were enrolled in the study as the sample.

3.5 Study Location
The study was conducted on a household level in district Mardan.

3.6 Inclusion Criteria
The housewives between the age group of 25 to 40 years were included.

3.7 Exclusion Criteria
Those housewives who were not willing to participate in the study were excluded.

3.8 Research Tool
A proper questionnaire was developed before the conduction of the research study. The questionnaire included the below sections.

3.8.1 Dietary Intake
Food frequency questionnaires and 24-hour dietary recall methods were used to assess the dietary intake of the subjects. The FFQ consisted of different foods causing abdominal obesity being consumed by the housewives on a daily, weekly, or monthly basis.

3.8.2 Anthropometric Data
Anthropometric data including weight and height will be measured by using standard procedures.

a. Height

The height of an individual was measured by using an instrument known as a stadiometer. A stadiometer is an instrument used to measure human height. It is constructed out of a ruler and sliding horizontal headpiece which is adjusted to rest on the top of the head.

b. Weight

The weight of an individual was measured using a weighing scale or weight machine. A weight machine or weighing scale is an instrument used to measure weight or mass. The weight of an individual to be measured on the weighing scale was asked to remove any heavy extra clothing, shoes, and accessories in order to avoid extra weight, and then the individual was asked to stand still on the weight machine and his/her weight will be recorded in kgs.

c. Visceral Fats

Visceral fat is fat that wraps around your abdominal organs deep inside your body. You can't always feel it or see it.

d. Waist Size

Waist size was measured using inch tape. This is an easy way to get a rough estimate. Wrap a tape measure around your waist over your belly button. (Don't suck in your stomach!) In women, 35 inches or more is a sign of visceral fat. In men, it's 40 inches.

e. Hip-to-Waist Ratio

The hip-to-waist ratio is used to measure visceral fats. We divide the participant's waist size by hip size. The result gives a good idea of the risk for visceral fat. Dietary association with abdominal obesity.

3.9 Data Collection

The data for the study was collected using a validated food frequency questionnaire approved by the supervisor of the project. Data regarding socio-demographic parameters, anthropometric data, physical activity, sleep status, medication, and dietary patterns were collected

4. Results

4.1 Introduction

Below sections of the current study present the results of the analysis that were conducted in the current study.

4.2 Demographic Information

The below sections present the results of demographic information that were collected in the current study from the respondents.

4.2.1 Age of Respondents

The below options were given to respondents to determine their age group:

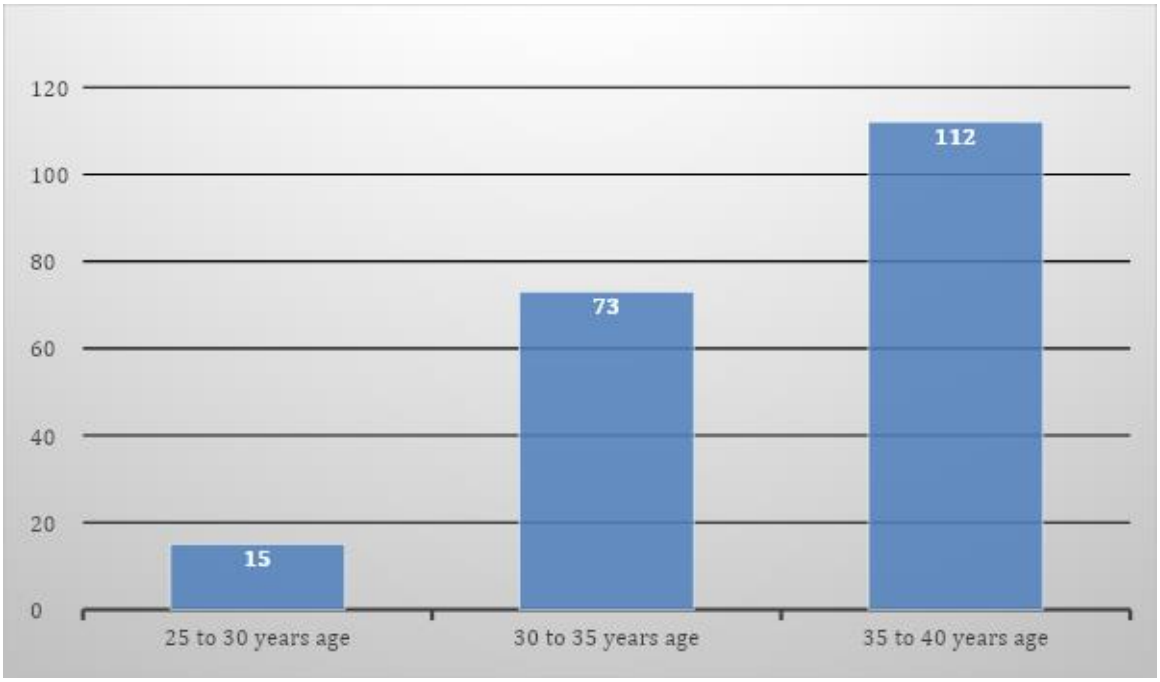
- 25 to 30 years age,
- 30 to 35 years age,
- 35 to 40 years age.

The results are presented in the below table.

Table 4.1: Age demographics

Age	Frequency	Percent (%)
25 to 30 years of age	15	7.6
30 to 35 years of age	73	36.5
35 to 40 years of age	112	56
Total	200	100

The table above shows that most of the respondents of the current study i.e., 56 percent were having age group 35 to 40 years, 7.6 percent were having 25 to 30 years and 36.5 percent were having 30 to 35 years age.



4.2.2 Education Status

The below table shows the education status, below options were given to the respondents:

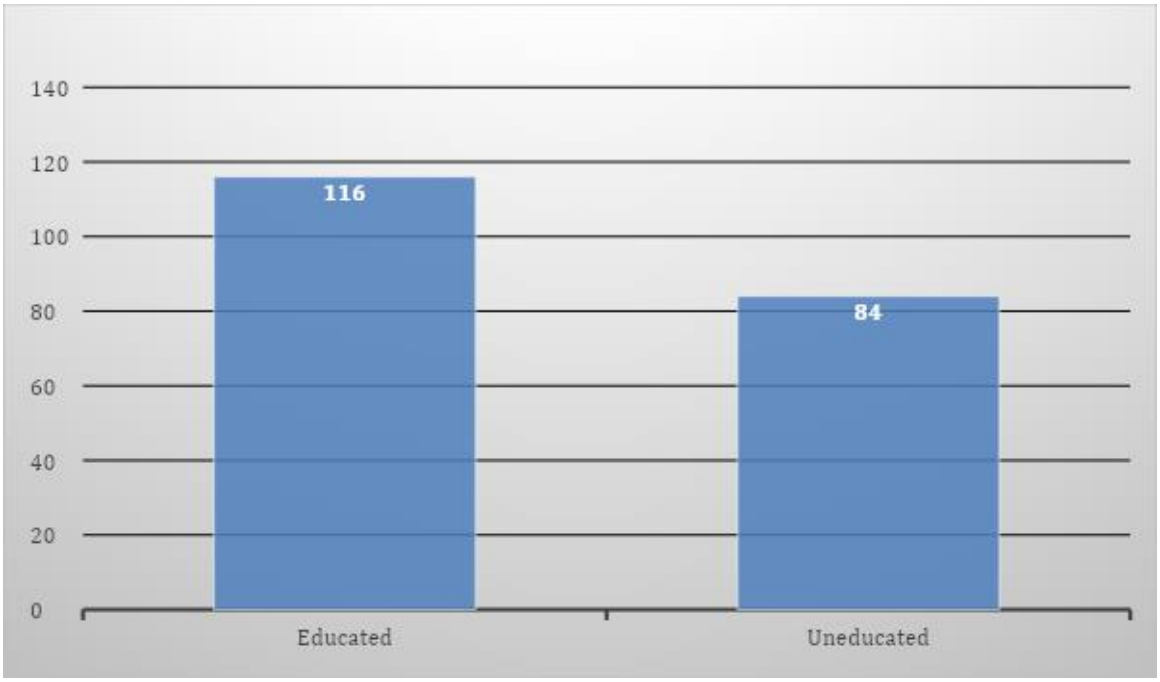
- Educated,
- Uneducated.

The results are presented in the below table.

Table 4.2: Education status

	Frequency	Percent (%)
Educated	116	58
Uneducated	84	42
Total	200	100

The above table shows that most of the respondents of the study i.e., 58 percent were educated, and the remaining 42 percent were uneducated.



4.2.3 Type of Family

The respondents were given the below options for the type of family.

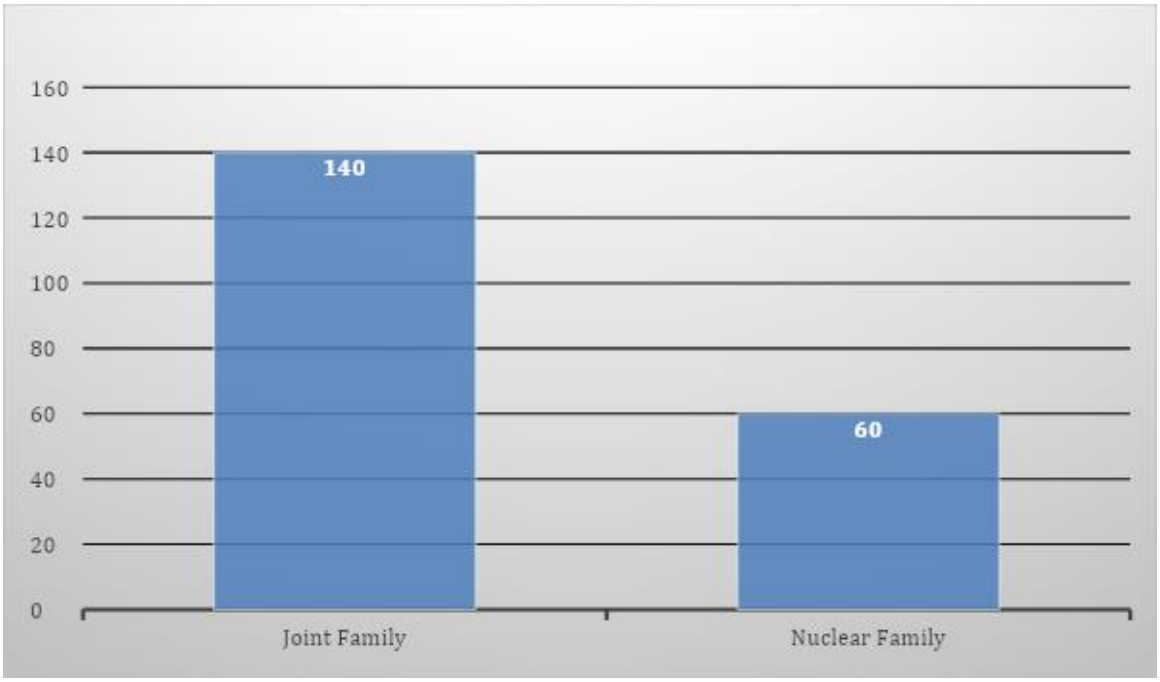
1) Joint Family,
2) Nuclear Family.

Results are shown in the table below.

Table 4.3: Type of family

	Frequency	**Percent (%)**
Joint Family	140	71.42
Nuclear Family	60	28.57
Total	210	100

The above table shows that most of the respondents i.e., 71.42 percent were from the joint family, while the remaining 28.57 percent were from the nuclear family.



4.3 Anthropometric Information

The below sections show the results of anthropometric information.

4.3.1 Waist-to-Hip Ratio (abdominal obesity)

The information regarding the waist and hip measurements was collected from the respondents to determine their waist-to-hip ratio for analyzing abdominal obesity. The ratio was determined based on the below formula.

WHR (waist to hip ratio) = waist circumference / hip circumference

Below are the results of the analysis based on the cutoff values of the WHR.

1) Low = 0.80 and below,
2) Moderate = 0.81 to 0.85,
3) High = 0.85 and above.

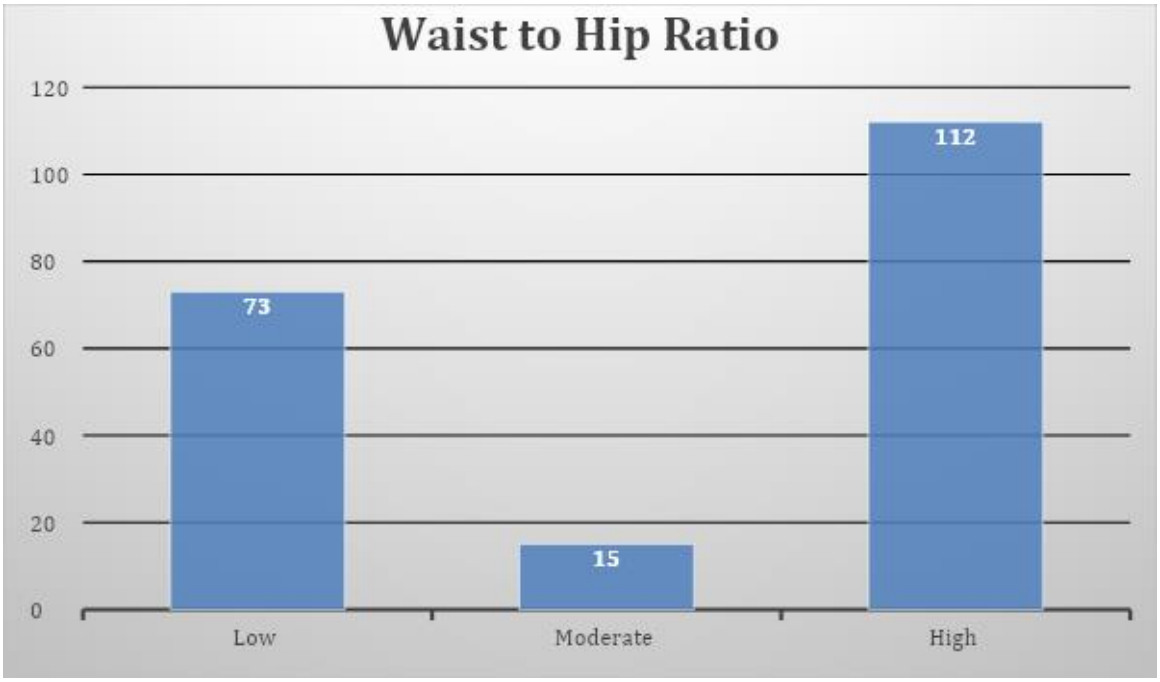
Results are shown in the table below.

Table 4.4: Waist-to-hip ratio

Age	Frequency	Percent (%)
Low	73	36.5
Moderate	15	7.6
High	112	56
Total	200	100

The above results show that waist to hip ratio for most of the respondents i.e., 56 percent was high i.e., 0.85 and above meaning that most of the respondents had abdominal

obesity, waist to hip ratio for 36.5 percent of respondents was low, and waist to hip ratio for 7.6 percent of respondents was moderate.



4.3.2 Body Mass Index (BMI)

The Body Mass Index of the respondents was analyzed by asking about their weight and height and thus the Body Mass Index was analyzed through the below formula:

Body Mass Index = Weight / Height

Below are the results of the analysis based on the cutoff values of the Body Mass Index.

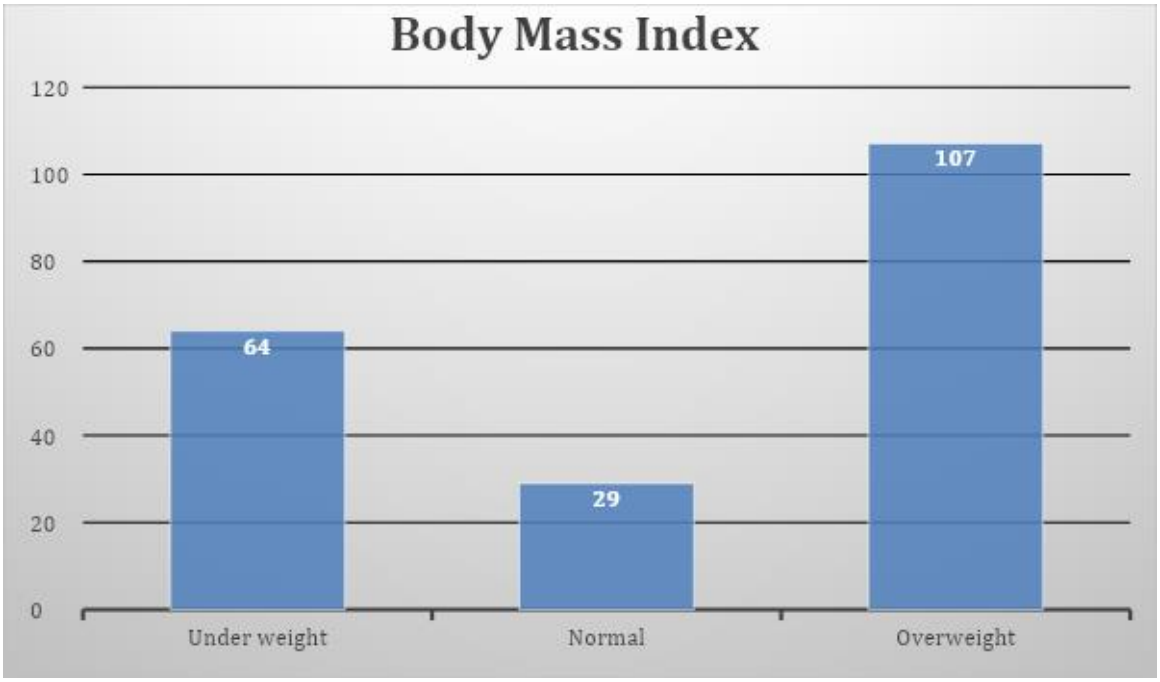
1) Underweight,
2) Normal,
3) Overweight.

Table 4.5: Body Mass Index (BMI)

	Frequency	**Percent (%)**
Underweight	64	30.47
Normal	29	13.80
Overweight	107	55.71
Total	200	100

The above table shows that most of the respondents i.e., 55.71 percent of the total respondents were overweight, 30.47 percent were underweight while the least respondents i.e., 13.80 were normal.

These results are graphically shown as under.



4.3.3 Visceral Fats

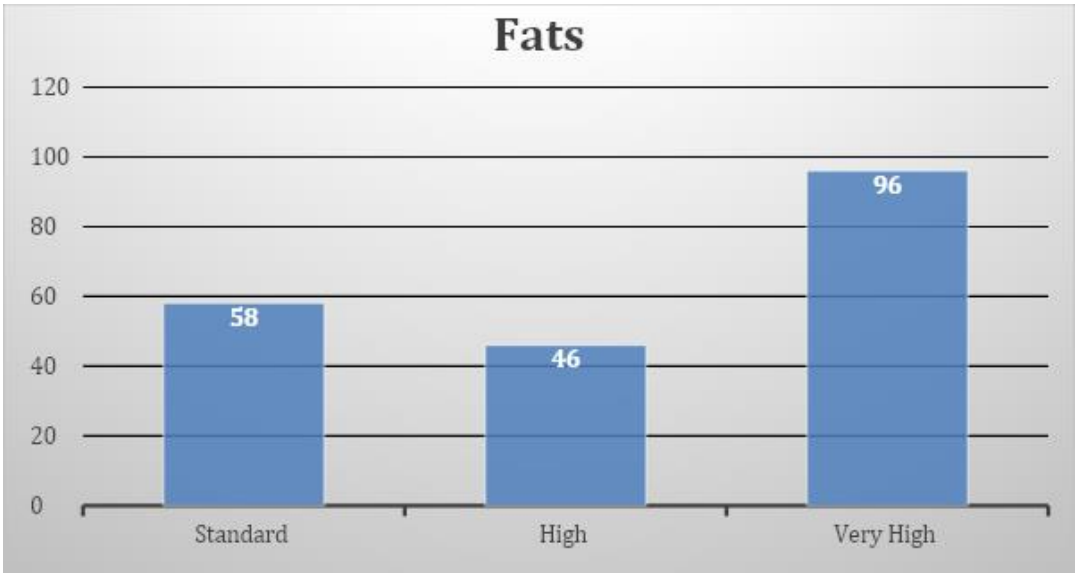
The visceral fats of the respondents were analyzed. Below are the results of the analysis based on the cutoff values of the visceral fats.

1) Standard = Below 9,
2) High = 10 to 14,
3) Very High = Above 15.

Table 4.6: Visceral fats

	Frequency	**Percent (%)**
Standard	58	32.38
High	46	21.90
Very High	96	45.71
Total	200	100

The above table shows that most of the respondents i.e., 45.71 had very high levels of visceral fats, 32.38 percent had standard levels of visceral fats and 21.90 percent had high levels of visceral fats.



4.3.4 Physical Activity

The below options were given to the respondents:

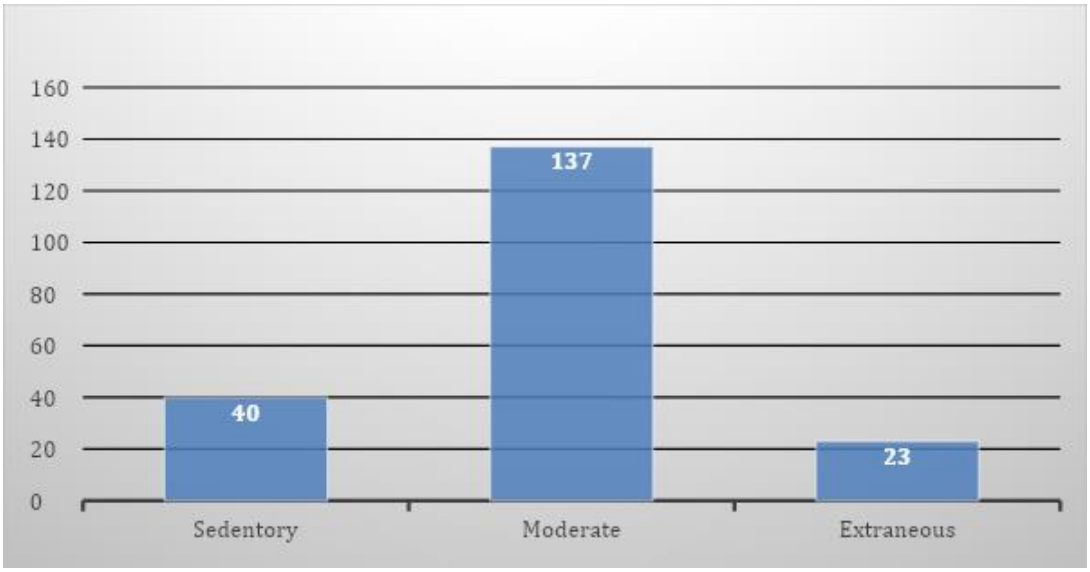
1) Sedentary,
2) Moderate,
3) Extraneous.

The below table shows the results of the physical activity demographics of the respondents.

Table 4.7: Physical activity demographics

Age	Frequency	Percent (%)
Sedentary	40	20
Moderate	137	68.5
Extraneous	23	11.5
Total	200	100

The table shows that most of the respondents i.e., 68.5 percent were involved in moderate physical activity. 20 percent were involved in sedentary activity and the remaining 11.5 percent were involved in extraneous activity.



4.4 Dietary Assessment

The dietary assessment of the respondents of the current study was conducted to analyze the association of the dietary assessment with their abdominal obesity. The results of the dietary assessment are presented in the below table.

Table 4.8: Dietary assessment

S.N.	Food item	Consumption		
		Rarely	Once a day	Once a week
1	Fast Foods	21%	28%	51%
2	Bakery Item	19%	51%	30%
3	Chicken Or Other Poultry (Eggs Etc.)	3%	85%	12%
4	Meat Or Mutton	24%	25%	50%
5	Fried Foods	20%	71%	09%
6	Carbonated Beverages	63%	23%	14%

The above table shows that most of the study respondents i.e., 51 percent respond that they consume fast food once a week, similarly, most of the study respondents i.e., 51 percent respond that they consume bakery items once a day, and most of the study respondents i.e., 85 percent responds that they consume chicken or other poultry (eggs etc.). Once a day, likewise, most of the study respondents i.e., 50 percent responded that they consume meat or mutton once a week, similarly, most of the study respondents i.e., 71 percent responded that they consume fried foods once a day and lastly most of the study respondents i.e., 63 percent responds that they consume carbonated beverages rarely.

5. Summary

One of the most significant public health issues today is abdominal obesity, which is on the rise both in industrialized and developing countries. In today's society, being

overweight or obese in the abdomen is seen as a growing public health concern. While the term "abdominal obesity" refers to an excess of abdominal body fat, the way that fat is distributed has a significant impact on many metabolic conditions. Metabolic disease risk is elevated in Asians and other non-obese persons with abdominal obesity. Measuring the amount of fat stored in the belly is one way to identify someone as having abdominal obesity. Dietary changes and lack of physical exercise are two major contributors to the rising incidence of abdominal obesity among Americans, whether they live in urban or rural areas. Ethnic characteristics that contribute to abdominal obesity include poor socioeconomic position, genetic factors, and differing eating habits. Pakistani urban populations are more likely to be obese because of a history of abdominal obesity in their families, as well as their diet. There is no recent data available for associated factors of abdominal obesity in Pakistan. This population-based investigation focused mainly on providing the estimates of Dietary association with abdominal obesity.

A qualitative research study was followed to complete the entire research work. In this study, housewives between the age group of 25 to 40 years were taken as the population of the current study. A total of 200 housewives between the age group of 25 to 40 were enrolled in the study as the sample. The study was conducted on the household level in district Mardan. A proper questionnaire was developed before the conduct of the research study. The data for the study was collected using a validated food frequency questionnaire approved by the supervisor of the project. Below are the major findings of the current study.

- Most of the respondents of the current study i.e56 percent were in the age group 35 to 40 years.
- Most of the respondents of the study i.e., 58 percent were educated, while most of the respondents i.e., 71.42 percent were from a joint family.
- Waist to hip ratio for most of the respondents i.e., 56 percent was high i.e., 0.85 and above meaning that most of the respondents were having abdominal obesity.
- Body Mass Index results indicated that most of the respondents i.e., 55.71 percent of the total respondents were overweight.
- Most of the respondents i.e., 45.71 had very high levels of visceral fats, while most of the respondents i.e., 67 percent were involved in moderate physical activity.
- Most of the study respondents i.e., 51 percent respond that they consume fast food once a week, similarly, most of the study respondents i.e., 51 percent respond that they consume bakery items once a day, and most of the study respondents i.e., 85 percent responds that they consume chicken or other poultry (eggs etc.) once a day.
- Lastly, most of the study respondents i.e., 50 percent responds that they consume meat or mutton once a week, similarly, most of the study respondents i.e., 71 percent responded that they consume fried foods once a day and lastly most of the study respondents i.e., 63 percent responds that they consume carbonated beverages rarely.

5.1 Recommendations

Below are the recommendations based on the above findings.

- The women should focus on plant-based foods, such as fruits, vegetables, and whole grains, and choose lean sources of protein and low-fat dairy products.
- Limit added sugar and saturated fat, which is found in meat and high-fat dairy products, such as cheese and butter.
- The women should choose moderate amounts of monounsaturated and polyunsaturated fats — found in fish, nuts, and certain vegetable oils.
- Aerobic activity, such as brisk walking, for at least 150 minutes a week, or vigorous aerobic activity, such as running, for at least 75 minutes a week is recommended.
- The study also recommends strength training exercises at least twice a week for the women.

6. Conclusion

The current study investigated the estimates of dietary association with abdominal obesity. A qualitative research study was followed to complete the entire research work. A total of 200 housewives between the age group of 25 to 40 were enrolled in the study as the sample. The results indicated waist-to-hip ratio for most of the respondents i.e., 56 percent was high i.e., 0.85 and above meaning that most of the respondents were having abdominal obesity. Body Mass Index results indicated that most of the respondents i.e., 55.71 percent of the total respondents were overweight. Most of the respondents i.e., 45.71 had very high levels of visceral fats, while most of the respondents i.e., 67 percent were involved in moderate physical activity. The study recommended that women should choose moderate amounts of monounsaturated and polyunsaturated fats found in fish, nuts, and certain vegetable oils. The study also recommended strength training exercises at least twice a week for the women.

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Conflict of Interest Statement

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interests or non-financial interests in the subject matter or materials discussed in the manuscript.

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