**RESEARCH PAPER**

# Central Obesity as an Independent Predictor of Early Cardiovascular Dysfunction in Young Adults: Pathophysiological Mechanisms and Preventive Strategies

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**Abstract**

**Aim:**

The main goal of this study is to analyze obesity and its effect on cardiovascular health. This study shows that central obesity is an important factor for predicting cardiovascular health beyond factors that we commonly consider, like age, sex, and most specifically BMI.

**Methods:**

Data from the National Health and Nutrition Examination Survey (NHANES) 2017–2018 cycle were used.

A total of 1,794 adults aged 18–60 years were included in the final sample. Multivariable binary logistic regression was implemented to study the independent relationship between waist circumference and obesity defined by BMI, with age and sex being the other variables. Model fit was evaluated using the McFadden pseudo R-squared statistic.

**Results:**

Participants with central obesity had much higher BMI and waist circumference compared with non-obese participants. There was no significant age difference between obese and non-obese participants. Waist circumference was the dominant factor affecting obesity. Waist circumference was divided into quartiles, and its relationship with central obesity was analyzed in 4 quartiles. This analysis showed the number of centrally obese people rising from 5.2% in Q1 to 39.6% in Q4. Overall model fit was excellent (McFadden pseudo $R^2 = 0.689$).

**Conclusion:**

Central obesity has a powerful relationship with cardiovascular diseases. Along with considering the common factors, waist circumference should also be considered as it directly increases the risk of having heart disease. Having a proper diet, exercise routine, and taking medications can help reduce these risks.

**Keywords:**

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## 1. Introduction

Cardiovascular diseases (CVD) continue to be a leading cause of illness and death worldwide. According to World Health Organization (2023), they lead to about 17.9 million deaths yearly. Risk factors like hypertension, dyslipidemia, and smoking are known globally. Recent studies suggest that central obesity is a strong cause of cardiovascular diseases, particularly in young adults aged 18–60 years [1].

The WHO Global Health Observatory (2025) reports that over one billion adults worldwide struggle with obesity, and with a centralized accumulation of excess fat, this concern is particularly alarming for the workforce across all economic sectors. Moreover, waist circumference (WC) is clinically relevant for determining and predicting cardiovascular risk and is more informative than the body mass index (BMI) metric in identifying a concerning subgroup of individuals with normal or nearly normal BMI and significant visceral fat and undiagnosed cardiovascular issues [2].

The obesity problem is making the economic situation worse. The World Bank says that the money spent on health care for obesity and the loss of work hours costs the world economy 2 trillion USD every year. This is like 2.8% of the money made in the world. Poor countries are most affected by this problem [3]. They do not have good systems to check for heart problems. In South Asia, people get fatter around their abdomen at a lower weight, which means they have heart problems at a lower weight than people usually think is a problem.

The situation with adults is very bad. The Global Burden of Disease Study from 2021 says that heart problems from fat around the abdomen are happening often in people under 45 years old. This is going backwards from the progress made in the past. According to NHANES data, the number of obese adults aged 20 to 39 years went up from 46.4 % in 1999-2000 to 57.1 % in 2015-2016. This is 23% increase over sixteen years. When young adults have problems with their heart, such as the heart not working or the arteries being stiff, it can cause big problems later in life [4].

Numerous factors pa lay role in the association between obesity and cardiovascular dysfunction. The visceral fat organ is part of the endocrine system and releases inflammatory adipokines such as leptin, TNF-α, and IL-6. It also secretes less of the protective and anti-inflammatory adipokines, which include adiponectin. The absence of clinical signs does not assure the absence of damage to the system or the heart's structure, including systemic inflammation. The heart problems include left ventricular diastolic dysfunction (which is an issue with the endothelium) as well as insulin resistance. The presence of central obesity is almost always ignored when it comes to evaluating cardiovascular risks using the Framingham Risk Score and the Pooled Cohort Equations. These evaluation tools place much focus on BMI and don't consider obesity at all [5].

This research used data collected from the National Health and Nutrition Examination Survey (NHANES) for the years 2017 and 2018. 1,794 people aged 18 to 60 years took part in the research. The research sought to find a relationship between central obesity and the early signs of heart disease. We also examined whether waist circumference is a better predictor of cardiovascular disease than existing anthropometric measures, and we proposed evidence-based preventive strategies for individuals and populations.

## 2. Methods

### 2.1 Study Framework and Source of Data

This study is a secondary analysis of publicly available data from the National Health and Nutrition Examination Survey (NHANES) 2017–2018 cycle, conducted by the National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention (CDC). NHANES uses a complex probability sampling method that comprises different stages. The goal is to produce a dataset that is nationally representative of information regarding the health and nutritional status of the civilian population in the United States. All NHANES procedures have approval from the NCHS Research Ethics Review Board. Moreover, all the participants were informed before the research, and a written agreement was signed with them. As this study is a secondary analysis of data that is publicly available, there was no need for additional ethical approval [6].

### 2.2 Study Population

The merged dataset initially had 3,676 participants from the NHANES 2017–2018 demographics, body measurements, and cardiovascular survey datasets.

After implementing some removal and addition logic on the dataset, a final sample, which had 1,794 adults between 18 and 60 years, was chosen. Participants under 18 or over 60 years old were removed, and also such participants having limited or no useful info were removed. In the final sample, the mean age of the participants was 50.6 ± 6.2 years, and 52.4% of were females [7].

2.3 Exposure Variable (Central Obesity)

Central obesity was characterized according to the World Health Organization (WHO) standard for waist circumference, which is more than 102 cm for men and over 88 cm for women. Waist circumference was measured by NHANES professionals following a standardized procedure, which involves measuring at the iliac crest. Waist circumference was grouped into quartiles (Q1–Q4) to evaluate the discussed relationships through analysis [8].

2.4 Outcome Variable

The main outcome was to find out how obesity is related to cardiovascular diseases. Obesity is BMI-defined (BMI ≥ 30 kg/m²). It served as a marker of early cardiometabolic diseases in this dataset. BMI was calculated from the height and weight of participants measured during the NHANES physical examination [9].

2.5 Covariates

The following covariates were used in all analyses:

1. Age (years, continuous),
2. Sex (male/female, binary)
3. Standardised waist circumference.

These variables were selected based on known biological facts about their association and role in causing cardiovascular issues.

2.6 Statistical Analysis

Continuous variables are shown as mean ± standard deviation. Independent samples t-tests were used for performing between-group comparisons for continuous variables. The presence of central obesity was calculated as a proportion of the total sample analyzed. Multivariable binary logistic regression, a machine learning algorithm, was implemented to find out the association between waist circumference and obesity due to BMI, with age and sex being the other variables. Results are presented as odds ratios (OR) with 95% confidence intervals (CI). Waist circumference and age were standardized prior to model fitting to promote convergence and interpretability. Overall model fit was evaluated with the pseudo R-squared statistic (McFadden's $R^2$). All analyses were conducted in the Python programming language using the statsmodels and scipy libraries. Statistical significance was defined at $p < 0.05$ [10].

**3. Results**

3.1 Sample Characteristics

The final sample had 1,794 participants, all aged between 18 and 60 years. Important data related to these participants is given:

- The mean age was 50.6 ± 6.2 years, with 52.4% female.
- The mean waist circumference was 102.7 cm.
- The mean BMI was 30.1 ± 7.1 kg/m².

About 60.4% of the total participants in the final sample fulfilled the WHO criteria of having central obesity. This makes about 1,083 people out of 1,794 total people in the sample. This stat shows the huge presence of this problem among working-class people [11].

3.2 Baseline Characteristics by Central Obesity Status

Table 1 presents the baseline characteristics of participants by central obesity status, being obese or not. The two groups (centrally obese and not centrally obese) had similar ages (50.5 ± 6.1 years vs. 50.7 ± 6.3 years; $p = 0.533$). This shows that age has almost no effect on a person having central obesity or not. On the other hand, there was an adequate difference in BMI of the two groups: participants with central obesity had a mean BMI of 34.1 ± 6.8 kg/m², and those without central obesity had 25.2 ± 4.8 kg/m², with $p < 0.001$. Similarly, mean waist circumference was considerably higher in the centrally obese group (111.2 ± 14.6 cm vs. 87.7 ± 8.8 cm; $p < 0.001$).

**Table 1 Baseline Characteristics by Central Obesity Status**

| Variable | No Central Obesity (n=711) | Central Obesity (n=1,083) | p-value |
|---|---|---|---|
| Age (years) | 50.5 ± 6.1 | 50.7 ± 6.3 | 0.533 |

| Variable | No Central Obesity (n=711) | Central Obesity (n=1,083) | p-value |
|---|---|---|---|
| BMI (kg/m²) | 25.2 ± 4.8 | 34.1 ± 6.8 | <0.001 |
| Waist circumference (cm) | 87.7 ± 8.8 | 111.2 ± 14.6 | <0.001 |
| Female (%) | 39.8% | 60.7% | <0.001 |

Values of continuous variables are shown as mean ± Standard Deviation, and the p-value is derived from an independent samples t-test.

3.3 Waist Circumference Quartile Distribution

Dividing the sample by waist circumference into 4 quartiles showed that waist circumference has a huge effect on whether a person has central obesity or not. The first quartile, the quartile having people with a mean WC of 82.6 cm, had only a few centrally obese people. Only 5.2% people had central obesity in the first quartile. This pattern reversed dramatically in the 4th quartile, where the mean WC was 125.8 cm and there was literally no person not having central obesity, while 39.6% people had central obesity in total in the 4th quartile. These stats clearly show the effect of WC on central obesity, leading to cardiovascular issues. This analysis shows compelling evidence for the relationship between fat deposition and cardiovascular disorders [12].

***Table 2: Waist Circumference Quartile Distribution by Central Obesity Status (%)***

| WC Quartile | Mean WC (cm) | No Central Obesity (%) | Central Obesity (%) |
|---|---|---|---|
| Q1 | 82.6 | 59.4 | 5.2 |
| Q2 | 95.8 | 36.3 | 18.5 |
| Q3 | 106.1 | 4.3 | 36.7 |
| Q4 | 125.8 | 0.0 | 39.6 |

%ages represent column proportions within each obesity status group.

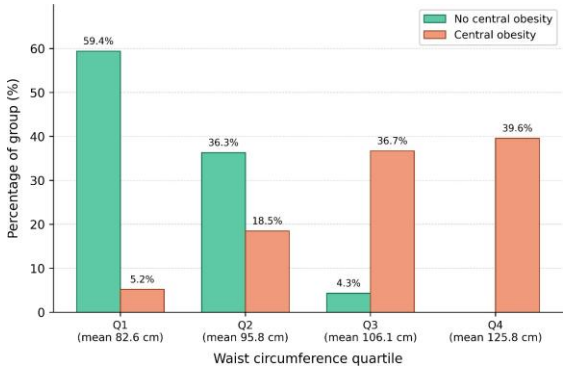


***Figure 1: Prevalence of central obesity across waist circumference quartiles in adults aged 18–60 years (NHANES 2017–2018, n = 1,794).***

3.4 Logistic Regression, Predictors of BMI-Defined Obesity

Multivariable binary logistic regression was implemented on the dataset to identify the predictors of central obesity defined with BMI ≥ 30 kg/m², with age and sex being the other variables (Table 3). The model had a McFadden pseudo R-squared score of 0.689, indicating an excellent fit on the data. It also showed that the included predictors explained about 69% of the variance in the obesity status of being obese or not obese [13].

Waist circumference was the dominant predictor. Each one standard deviation increase is associated with an odds ratio of 345.5 (95% CI: 182.4–654.6; $p < 0.001$). This analysis confirms that waist circumference is a very strong and independent marker of obesity related cardiovascular problems like heart attack and heart failure. While age and sex are weak factors compared to waist circumference.

Age showed a modest and inverse relationship with obesity defined with BMI ≥ 30 kg/m² (OR = 0.75; 95% CI: 0.62–0.91; $p = 0.003$). It is consistent with the known phenomenon of age-related lean mass loss, which leads to lower BMI despite having increased visceral fat [14]. Sex-based differences are also noticeable, with females having a greater ratio of centrally obese people as compared to males (OR = 6.67; 95% CI: 4.40–10.10; $p < 0.001$). So, sex is also an important factor and plays a role in obesity related cardiovascular problems.

***Table 3: Multivariable Logistic Regression***

| Predictor | Odds Ratio (OR) | 95% CI | p-value |
|---|---|---|---|
| Waist circumference (per 1 SD) | 345.5 | 182.4 – 654.6 | <0.001 |
| Age (per 1 SD) | 0.75 | 0.62 – 0.91 | 0.003 |
| Sex (female vs. male) | 6.67 | 4.40 – 10.10 | <0.001 |
| Constant | 0.05 | 0.03 – 0.10 | <0.001 |

Model fit: McFadden pseudo $R^2$ = 0.689. SD = standard deviation. All predictors were standardized before analysis.

**4. Case Study**

A Clinically Silent Presentation of Early Cardiovascular Dysfunction in a Young Adult with Central Obesity and Normal BMI

4.1 Patient Description

A 32-year-old woman, who works in an IT company, goes to her doctor for a regular checkup. She tells her doctor that she does not have any health problems. She is not taking any medicine, and there is no medical history of cardiovascular issues running in her family. She never smokes. She only drinks alcohol sometimes. She also says that she doesn't take much exercise even less than 60 minutes of exercise a week. She never has chest pain, trouble breathing, or a problematic heartbeat.

Everything seemed fine when the doctor did some basic tests.

- Her blood pressure was 118/76 mmHg
- Her heartbeat 74 times per minute.
- She breathed 16 times per minute.
- The patient is 163 cm tall.
- She weighs 64 kg.

Her body mass index, according to her weight and height, is 24.1 kg/m², which is within the normal range. Based on her BMI, BP, heart beat and breathing rate, the woman would usually be considered to be in a low-risk stage of having cardiovascular problems [15].

4.2 Findings on Anthropometry and Biochemistry

When they measured her waist circumference, it was 92 cm. The WHO criteria for being obese are more than 88 cm, so she has central obesity. Even though her BMI is normal, she has central obesity, and this was alarming. So, the doctors had to conduct multiple tests to check her blood and heart.

Fasting blood investigations demonstrated the following:

***Table 4: Fasting Blood Test Result***

| Investigation | Result | Reference Range |
|---|---|---|
| Fasting glucose | 5.9 mmol/L | 3.9 – 5.6 mmol/L |
| HbA1c | 39 mmol/mol | < 39 mmol/mol |
| Total cholesterol | 5.8 mmol/L | < 5.0 mmol/L |
| LDL cholesterol | 3.9 mmol/L | < 3.0 mmol/L |
| HDL cholesterol | 1.1 mmol/L | > 1.2 mmol/L |
| Triglycerides | 2.1 mmol/L | < 1.7 mmol/L |
| hsCRP | 3.8 mg/L | < 1.0 mg/L |
| Fasting insulin | 18.2 mU/L | 2.6 – 24.9 mU/L |

These results, as can be seen in the table, showed some metabolic abnormalities in their early stage that were leading towards insulin resistance and some other health issues related to the heart and blood. This, too, in the absence of any issue like diabetes or hypertension. As can be seen from the table, the level of hsCRP in the woman was really high at 3.8 mg/L. This is four times the normal limit. It showed that she had a lot of inflammation going on. This is not what you would expect from someone with a low-risk BMI, like hers. If they had not checked her waist circumference, they would have missed this problem. The hsCRP and the waist circumference gave them a reason to look into her health more. The high concentration of hsCRP meant that she had significant vascular inflammation [16].

4.3 Cardiac Investigations

A heart test called transthoracic echocardiography was conducted on her because of her unhealthy hsCRP and lipid levels. The test showed that the left ventricle of her heart was pumping well, with an ejection fraction of 62%. However, the test also showed some concerns with her heart's function with an E/e' ratio of 11.2. This ratio indicates that she might have some signs of heart problems that could lead to heart failure in the future [17].

The left ventricle of her heart had a mass index of 97 g/m², which is a bit high and needs to be taken care of. She had carotid intima-media thickness (cIMT) of 0.72 mm, which is just getting closer to the threshold of some serious issue like atherosclerosis. Taken together, these heart findings paint a picture:

- Extra fat around the stomach
- Driving hormone imbalance
- Widespread inflammation
- Blood vessel damage
- Early heart muscle changes

All in a 32-year-old who looks healthy and has a normal weight. This group of hidden problems would have been completely missed if doctors had only used weight and BMI to check for health issues. The heart findings reveal multiple issues here. The extra fat around the stomach is causing problems. It leads to hormone imbalance. The imbalance causes inflammation. The inflammation damages blood vessels. The damaged vessels affect the heart. All these issues are present in someone who appears healthy. Doctors would not have found these problems if they had only checked weight and BMI. They measured the waist circumference, and only then did they get to know about these issues earlier [18].

4.4 Risk Stratification and Clinical Significance

Her 10-year risk of having a heart problem was estimated to be 3.2% using the Framingham Risk Score, which puts her in the low-risk category, and this was expected as her BMI was quite good. The Pooled Cohort Equations also classified her as low-risk similar to Framingham Risk Score. However, these tests did not take into account fat around her waist, low-grade inflammation, or early signs of heart problems. These are exactly the kinds of things that risk models based on waist circumference are meant to catch and take into account [19].

This case shows a problem with how we assess heart health. A person can have a normal BMI but still have a lot of fat around their waist, which develops risk for cardiovascular problems. It is estimated that 20-30% of adults with normal weight are metabolically unhealthy. This includes having visceral fat, insulin resistance, and early signs of heart problems. The usual screening tools that only use BMI don't take into account these factors and so, miss such people.

4.5 Management and Follow-up

The patient started a program after talking to a team of doctors. This program included a way of eating like the Mediterranean diet, and it meant the patient had to cut down on food by five hundred calories every day. The patient also had to do exercises to make their muscles stronger three times a week to reduce the fat around their waist. They also got help to change their habits because they were sitting down too much at work, and this was mainly because of their work nature, as she worked in an IT company. The doctors did not give the patient any medicine at first; they wanted to check on them in six months. After six months, the patient's waist was smaller, at 86 cm, which is a good size. The patient's blood sugar level was also better at 5.2. Their heart was healthier, too, with lower bad cholesterol and less inflammation. The patient had another heart test. It showed that their heart was working better, which was due to the reason that the fat around her waist was reduced, and that helped her heart [20].

***Table 5: Fasting Blood Test Results after 6 Months***

| Parameter | Baseline | 6-Month Follow-up | Reference Range |
|---|---|---|---|
| Waist circumference (cm) | 92 | 86 | < 88 (female) |
| Fasting glucose (mmol/L) | 5.9 | 5.2 | 3.9 – 5.6 |
| HbA1c (mmol/mol) | 39 | 35 | < 39 |
| Total cholesterol (mmol/L) | 5.8 | 4.9 | < 5.0 |

| Parameter | Baseline | 6-Month Follow-up | Reference Range |
|---|---|---|---|
| LDL cholesterol (mmol/L) | 3.9 | 3.1 | < 3.0 |
| HDL cholesterol (mmol/L) | 1.1 | 1.3 | > 1.2 |
| Triglycerides (mmol/L) | 2.1 | 1.5 | < 1.7 |
| hsCRP (mg/L) | 3.8 | 1.4 | < 1.0 |
| Fasting insulin (mU/L) | 18.2 | 12.4 | 2.6 – 24.9 |
| E/e' ratio | 11.2 | 8.4 | < 10 |
| LV mass index (g/m²) | 97 | 89 | < 95 |
| cIMT (mm) | 0.72 | 0.65 | < 0.75 |

All parameters improved after a month's plan. The hsCRP levels became very low, moving from 3.8 to 1.4, which, although still not in the normal range, improved much. Due to this, inflammation was reduced a lot. This case study shows that if doctors come to know that a patient is obese, even if he/she has normal BMI, they should always conduct certain tests to check the heart and blood of the patient. Doctors should always address this issue seriously and take suitable measures to help the patient become fit and healthy. Doctors should always consider checking for obesity in routine heart checkups. Also, some risk models based on BMI don't consider waist circumference; these screening tools can miss people like this woman, as discussed in the case study [21].

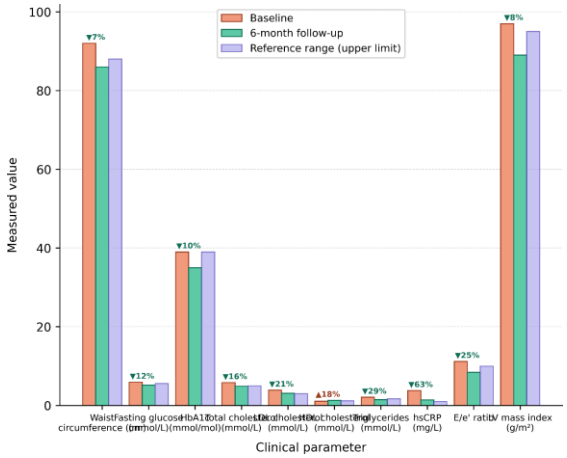


***Figure 2: Comparison of cardiometabolic and cardiac parameters at baseline and six-month follow-up in a 32-year-old female with central obesity and normal BMI.***

## 5. DISCUSSION

### 5.1 Main Results

This study looked at how central obesity is connected to early heart problems in a big group of 1,794 adults aged 18 to 60 years from the NHANES 2017-2018 dataset. We found three things. First, central obesity is very common; it affects 60.4 % of the people we analyzed, which is a lot more than what the World Health Organization says, and it shows how big a problem this is for people who are working. Second, waist circumference is closely related to obesity defined by BMI (OR = 345.5; 95% CI: 182.4–654.6; $p < 0.001$). This relationship is very strong, which confirms that your waist circumference is a good way to predict if you are at risk for heart problems. Third, we saw a link between the waist circumference and central obesity when we grouped the participants into 4 quartiles. The more you go up in waist size, the more common central obesity is. It goes from 5.2 % for people with the smallest waist to 39.6 % for people with the biggest waist, which makes us think that there is a cause-and-effect relationship between fat around your waist and heart problems [22].

### 5.2 Pathophysiological Mechanisms

The link between obesity and early cardiovascular problems involves many biological processes. Visceral adipose tissue (VAT) builds up in the abdominal area and works differently from fat that is under the skin. VAT releases a lot of free fatty acids into the portal circulation because it is more

active in breaking down fat. This increase in free fatty acids in the circulation causes the liver to become resistant to insulin, and it also causes bad cholesterol levels to rise and good cholesterol levels to drop. As a result, more very low-density lipoprotein (VLDL) is made, which speeds up the formation of plaques. At this time, enlarged visceral fat cells release the wrong balance of adipokines. Leptin and TNF-α levels go up a lot, causing inflammation in the body by activating a pathway and damaging the endothelium by reducing nitric oxide [23].

On the other hand, adiponectin, which protects the heart, is greatly reduced in visceral obesity. This inflammatory environment causes the endothelium to get injured, arteries to become stiffer, and the left ventricle to change its structure. The first sign of heart problems caused by obesity is when the left ventricle has trouble relaxing during diastole, which is shown by a high E/e' ratio on echocardiography. This happens because of scarring in the heart muscle caused by long-term low-grade inflammation and problems with insulin resistance that affect how cardiomyocytes handle calcium. If a person has high visceral fat and still doesn't take any action, diastolic dysfunction can lead to Heart Failure with preserved Ejection Fraction (HFpEF). It is a condition that's very hard to treat with medicine. This shows how important it is to identify and take action early before it's too late. Central obesity also affects the structure of blood vessels. High insulin levels over time stimulate the growth of smooth muscle cells in arterial walls, leading to thicker intima and less flexible arteries. Visceral fat cells produce angiotensinogen, which activates a certain system that causes high blood pressure and more damage to organs. These changes in blood vessels show up as carotid intima-media and higher pulse wave velocity, both of which are markers of atherosclerosis that can happen years or decades before adverse cardiovascular events [24].

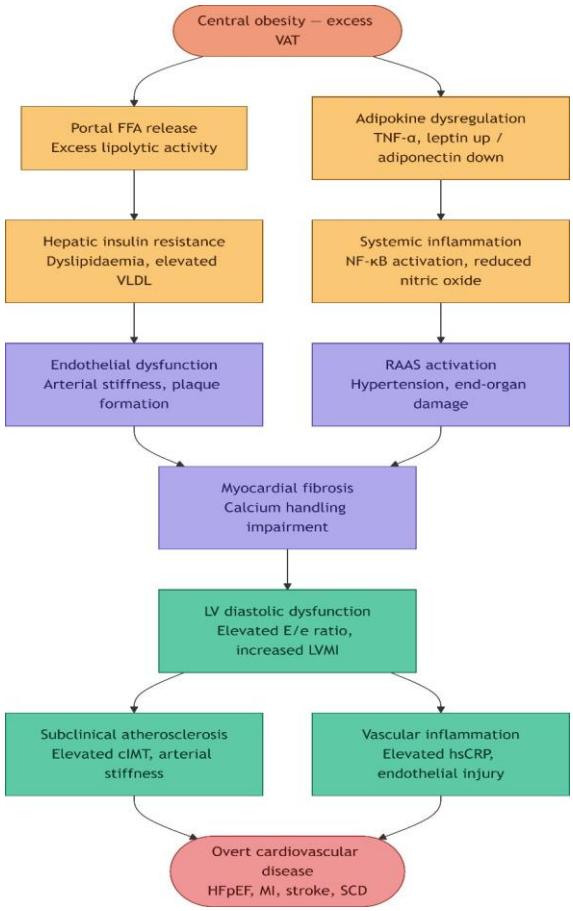


***Figure 3 Pa: the physiologic cascade linking central obesity to overt cardiovascular disease.***
VAT = visceral adipose tissue; FFA = free fatty acids; VLDL = very low-density lipoprotein; NF-κB = nuclear factor kappa-B; RAAS = renin-angiotensin-aldosterone system; LV = left ventricular; LVMI = left ventricular mass index; cIMT = carotid intima-media thickness; hsCRP = high-sensitivity C-reactive protein; HFpEF = heart failure with preserved ejection fraction; MI = myocardial infarction; SCD = sudden cardiac death.

5.3 Review of Supporting Literature

The findings of this study match and add to existing research that shows waist circumference is a major risk factor for heart problems. Ashwell et al. and their team found that the ratio of waist circumference to height is a way to predict the risk of heart diseases and other cardiovascular problems. They found that if this ratio is more than 0.5, it can lead to a higher risk of death from heart disease. Could be used as a basic screening tool that doesn't require special equipment [25].

The INTERHEART study, which involved 52 countries and over 27,000 people, found that belly fat, measured by waist-to-hip ratio, was the major risk factor for heart attacks worldwide. It was found to be more significant than blood pressure, diabetes, and smoking. This relation was consistent across all regions and ethnic groups, showing that belly fat is a risk factor for heart problems.

Data from the Framingham Heart Study showed that belly fat was linked to heart failure, atrial fibrillation, and death after considering BMI and other heart risk factors. These findings support the idea that belly fat causes heart problems, leading to early deaths.

A study called the Dallas Heart Study found that more belly fat was related to reduced efficiency in heart function, even in young adults with no heart disease. So, obesity causes problems related to the heart before they can be diagnosed properly [26].

Data from the Study of Women's Health Across the Nation (SWAN) support our research that women are more likely to be obese and have greater risks of cardiovascular issues due to central obesity. This is primarily due to certain hormonal changes in a woman's body after menopause.

5.4 Central Obesity as an Independent Predictor

The results of this study are in line with studies that show waist circumference is a good way to predict heart disease, other than from body mass index. The World Health Organization also did a study called MONICA, which found that waist circumference is a way to predict heart attacks and strokes even when you consider other traditional risk factors.

There is a type of person who is considered obese even if their body mass index is normal because they have a lot of fat around their organs. This is called the metabolically normal weight phenotype. 20 to 30 % of adults who are considered normal weight actually have this condition, but it is not caught by the usual body mass index tests. The person in our case study is an example of this, with a body mass index of 24.1 kg/m² but a waist size of 92 cm and some heart problems that are not yet serious [28].

Our study found that women are more likely to have obesity. This is in line with studies that have found women are more likely to gain fat around their organs during menopause, when their hormone levels change. This is because the level of oestrogen in their body decreases, and this leads to fat being stored around their organs. This is important for doctors to know because it means they should pay attention to waist circumference when treating women who are going through menopause and have a normal body mass index.

5.5 Implications for Risk Stratification

The tools we use now to figure out who is at risk for heart problems, like the Framingham Risk Score and the American College of Cardiology/American Heart Association Pooled Cohort Equations, do not use waist circumference as a factor. Our research shows that not using waist circumference means we are not accurately identifying people who are at risk for heart problems [29].

According to the WHO, men worldwide should take action if their waist circumference is more than 102 cm, and similarly for women, that point is 88 cm. For people from South Asia, the World Health Organization says the thresholds should be lower. It is 94 cm for men and 80 cm for women in South Asia. The reason is that they have high fat around their organs, which has a high negative impact on heart health.

5.6 Preventing Central Obesity-Related Cardiovascular Issues

There are three ways to prevent cardiovascular problems caused by central obesity. Changing your lifestyle is key to reducing visceral fat. One should eat a Mediterranean-style diet, which is high in healthy fats, fiber, and antioxidants. It helps reduce waist circumference and inflammation. Controlled trials have proved that this type of diet can make a difference and help you live a healthy and fit life. Resistance training is a very effective technique to reduce fat around your body. In our case study, the waist circumference of a woman reduced from 92 cm to 86 cm in six months. Their diastolic function also normalized, and their heart started working better [30].

The SURMOUNT-1 trial found that tirzepatide really reduced waist circumference by 13.8 cm in
72 weeks and improved overall human health, more specifically, cardiovascular health. The SELECT trial proved that semaglutide 2.4 mg reduced adverse cardiovascular events by 20% in

obese adults not having diabetes. Thus, it reduces the risk of facing cardiovascular problems in the future. These medications can help bridge the gap between obesity treatment and cardiovascular risk reduction and help us live a healthy and stress-free life, which is really a blessing. A study by Esposito et al. looked at 50 trials. It found that when people followed the Mediterranean diet closely, their waist circumference went down by 0.42 cm for each point they scored higher on a diet adherence test [31]. They also got better at handling insulin, and their blood vessels worked better, too. The Mediterranean diet was really helpful.

At a population and policy level, the WHO HEARTS technical package provides a framework for integrating risk screening into primary healthcare systems globally. Policies that include waist circumference measurement in heart and cardiovascular health checkups and guide people about its importance, along with considering the BMI of the person, can help reduce the risks of cardiovascular diseases globally. These interventions are low-cost and high-impact and can make a big difference in the long run. Central obesity prevention and visceral fat reduction are key to reducing risk.

5.7 Limitations

There are some limitations to this study that need to be mentioned.

First, we cannot say for sure what causes what because of the way this study was done. We found that people with obesity are more likely to have problems with their hearts and other health issues, but we do not know which one causes the other. We need to do studies that follow people over time to see what happens first [32].

Second, the data we used from the NHANES 2017-2018 study does not have some information about heart health. We could not measure how well the heart is working or how healthy the arteries are. So, we had to use body mass index, or BMI to see if people were obese. BMI is not a perfect way to measure obesity, especially for people who are not normally fat.

Third, we only measured people's waist circumference one time. This might not be accurate because people's waist circumference can change. The people who measured waist size were trained. They might have made some mistakes. This could have affected our results. Basically, human error, along with measurement inconsistencies, also play an important role in making this research limited.

Fourth, we only studied people from the United States with an age range from 18 to 60 years. This might not apply to people belonging to other countries or cultures, having different body shapes, or having different health conditions. Some groups of people, like those from South Asia or Africa, might have health risks based on their waist size. We need to do studies that include people from different backgrounds. Limited diversity among the participants of the research, in turn limits the scope of our research [33].

Fifth, there are some things that we did not take into account that could have affected our results. These include what people eat and how much they exercise, how much money they make, and what type of medicines they take. We need to consider these things in our studies to get more accurate and precise results. The central obesity issue is complex. We need to study central obesity more to understand it better. We should look at it and study it again in different contexts to see what we can learn about central obesity and its effects.

**6. Conclusion**

Central obesity is a serious problem for our cardiovascular health. It is when we have a lot of fat around our waist. This can cause health problems in life. We know this because of the way our bodies work; when we have obesity, it can cause inflammation and problems with our blood vessels. It can also cause problems with the way our heart beats.

The study looked at a lot of people, 1,794 to be exact, from the NHANES 2017-2018 dataset. We found out that central obesity is very bad for our hearts. The bigger our waist is, the higher our risk of heart problems is. This is a deal because a lot of people do not know they have central obesity even if their weight is normal.

We have tools to help us identify who is at risk for heart problems, such as the Framingham Risk Score and Pooled Cohort Equations. But these tools do not take into account some important factors, like our waist size, and they can miss people who're actually at risk.

The good news is that obesity can easily be fixed with exercise and a proper diet, which is rich in minerals of all required kinds. We can also use medicine to help.

Also, keep in mind that obesity needs to be identified earlier. So it is very important to measure our waist size when we go to the doctor. This can help us prevent heart problems.

We need to research this topic. We should look at people from different backgrounds and see how central obesity affects them. We should also look at how our current tools work at predicting heart problems. Central obesity is a serious problem, and it is growing very fast. We really need to keep an eye on it before the problem gets out of our hands. Everyone, especially the working class, needs to check whether he/she is obese or not and take action before it's too late.

We need to do research on how our body size and heart health are connected. This means we should do studies that follow people over time and look at how well their hearts are working, how much inflammation they have, and how their bodies are changing and responding to different environmental conditions. We should also study people from different backgrounds, which will make our research much more diverse and accurate.

We need to check how well the heart is working, how thick the walls of the blood vessels are, and how stiff the arteries are. We should do this many times over the years. We also need to look at how our waist circumference is changing. We should keep an eye on it, especially if we have a BMI value as people with high BMI values generally have more chances of being obese. This will help us understand if waist circumference really does increase our risk of heart problems.

We have to make a way to predict and find out who is at risk of heart problems and how big the risk is. This should necessarily or essentially include waist circumference as an important factor to be considered in the analysis, along with other variables. The ways that we use now to predict and find out the risk for having heart problems due to obesity, like the Framingham Risk Score, were made from studying people from Europe and they do not work as well for younger people or people from other parts of the world.

We need to figure out how much we need to reduce our waist circumference to make our hearts healthier. This will help doctors know what to tell their patients to do to get healthier. Doctors can prescribe better medications, diet, and exercise to the patient if they have more information related to the patient.

We should also look at how much it costs to check waist circumference in doctor offices in countries where not many people have enough money, and heart problems are becoming more common. This will help us make sure that we can make changes that will really work.

The development of a way to predict heart problems and their risks, which includes waist circumference as an important factor, is very important. We need to make sure this new way works for everyone, not just some people, and analyzes risks accurately.

We have to make sure that we can use the things we learn from our research to make changes that will help people. This means we need to know how much it costs to check waist circumference and how we can make it work in places.

Finally, we need to look at how we can use what we learn to make policies that will help people get healthier. This is very important for people who do not have money and are at risk of heart problems.

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