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Central Obesity and Associated factors Among Adults in Debre Tabor Town, Northeast, Ethiopia, 2021: A Community-Based Cross-Sectional Study

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BAHIR DAR UNIVERSITY
COLLEGE OF MEDICINE AND HEALTH SCIENCES
DEPARTMENT OF NUTRITION AND DIETETICS

**CENTRAL OBESITY AND ASSOCIATED FACTORS AMONG
ADULTS IN DEBRE TABOR TOWN, NORTHEAST, ETHIOPIA,
2021: A COMMUNITY-BASED CROSS-SECTIONAL STUDY**

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**A THESIS SUBMITTED TO THE DEPARTMENT OF
NUTRITION AND DIETETICS, COLLEGE OF MEDICINE AND
HEALTH SCIENCES SCHOOL OF PUBLIC HEALTH, BAHIR
DAR UNIVERSITY IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF
PUBLIC HEALTH NUTRITION**

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BAHIR DAR, ETHIOPIA

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COLLEGE OF MEDICINE AND HEALTH SCIENCES
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BASED CROSS-SECTIONAL STUDY.

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Abstract

Background: Central obesity nowadays is becoming a chronic non-communicable disease that is an indicator of mortality and morbidity. In Ethiopia obesity becomes a major public health problem. As far as we are concerned, there is no evidence in the study area on the prevalence of central obesity and factors affecting central obesity.

Objective: To assess the magnitude of central obesity and its associated factors among adults aged 18-64 years in Debre Tabor Town, northeast, Ethiopia, 2021.

Methods: A community-based cross-sectional study was conducted. A total of 616 study participants were included in this study. Systematic random sampling was employed to select the study participants. Waist circumference was measured to declare central obesity. The level of physical activity was measured using the global physical activity questionnaire (GPAQ). Depression, Anxiety and Stress Scale (DASS-21) was used to screen depression among adults. Data were entered using EpiData and analyzed using STATA/MP version 16 software. Bi-variable and multivariable logistic regression was employed to identify factors affecting central obesity. A P-value less than 0.05 was used to declare statistical significance.

Results: A total 582 study participants recruited with a response rate of 94.48%. The overall prevalence of central obesity among adults in Debre Tabor town 37.80% (95% CI: 33.94 – 41.82). Higher prevalence of obesity was observed among females (55.08 %) than male adults (26.01%). Female sex (Adjusted odds ratio (AOR) = 5.81, 95% Confidence interval (CI): 3.01 – 11.20), aged 18 - 35 years (AOR = 3.84, 95% CI: 2.30 – 6.41), aged 56-64 years (AOR = 5.90, 95% CI: 2.76 – 12.64), mild depressed (AOR = 9.72, 95% CI: 3.99 – 23.64) , and physical inactive (AOR = 1.58, 95% CI:1.01 – 2.51) were had high odds for central obesity; while daily labor workers (AOR =0.43, 95% CI: 0.20 – 0.91) was low odds for central obesity.

Conclusion: More than one-third of adults in Debre Tabor town had central obesity. Physically inactive and mild depression were modifiable factors for central obesity. Age and sex were non-modifiable factors for central obesity. Individuals and policymakers should give prior attention to modifiable factors for central obesity. Health promoters and policymakers should give primary attention for females.

Keywords: Central Obesity, Central Obesity, Physical Activity, Adults, Ethiopia.

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Abbreviations and acronyms

| | |
|-------|--|
| DASS | Depression Anxiety Stress Scale |
| FFS | Food Consumption Score |
| GOPA | Global Observatory for Physical Activity |
| GPAQ | Global Physical Activity Questionnaire |
| LMICs | Low- and Middle-Income Countries |
| METs | Metabolic Equivalent Tasks |
| NCDs | Non-Communicable Disease |
| STATA | Statistics and Data |
| WC | Waist Circumference |
| WHO | World Health Organization |
| WHR | Waist Hip Circumference |
| WHtR | Waist to Height Ratio |

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1. Introduction

1.1. Background

Central obesity is a medical condition defined as abnormal or excessive fat accumulation (regionally, globally, or both) which increases the health risk [1]. It is a health risk that increases body weights and fat distributions that lead to the expression of co-morbid diseases that occur at different thresholds depending on the population [2,3]. Obesity classification has different measurements. It would be based on a practical measurement widely available and easily practical depending on their setting. But the most accurate prediction of health risk (prognosis) measures of body fat (the major component of body weight responsible for adverse outcomes) such as underwater weighing, dual-energy x-ray absorptiometry (DEXA) scanning, computed tomography (CT), and magnetic resonance imaging (MRI) are impractical for use in everyday clinical encounters. Estimates of body fat including body mass index (BMI) and waist circumference do have limitations compared to these imaging methods, but still, provide relevant information and are easily implemented in a variety of practice settings [2]. In practice, according to the World Health Organization (WHO) central or truncal obesity is defined by waist circumference (WC) [4], which is $WC \geq 94$ cm for men and ≥ 80 cm for women were a cut point to declare central obesity. The International Diabetes Federation (IDF) puts different cut-off points for different ethnic groups such as 94 cm for males and 80 cm for females for Europeans, 90 cm for males and 80 cm for females for Asians) [4].

Based on excess body fat distribution obesity is classified into three. The first one is the general fat type of obesity in which the whole body from head to toe looks like a tub. The second is the Pear type in this type, the lower part of the body has the extra flesh. This type of obesity is more common for females. The flesh is somewhat flabby in the abdomen, thighs, buttocks and legs. The third, Android/Central type of obesity is likened to the shape of an apple. The shoulders, face, arms, neck, chest and upper portion of the abdomen are bloated. The stomach gives a stiff appearance. The lower portion of the body is thinner beyond proportion in comparison with the upper part. Though this type of obesity is found more in males, it is also present to a lesser extent in women. Android type of obesity is a major risk for heart damage and heart disease due to high cholesterol [5].

1.2. Statement of the problem

Central obesity nowadays is becoming a chronic non-communicable disease that is an indicator of mortality and morbidity [2]. It is also a problem in low- and middle-income countries [6]. World health organization (WHO) puts obesity as the fifth leading cause of mortality globally and it is one of the chief health challenges [7]. Worldwide, central obesity has nearly tripled since 1975 and in 2016, more than 1.9 billion and 650 million adults, older than aged 18 years, were overweight and obese, respectively [3]. Even though central obesity and overweight is a problem of high-income countries; low- and middle-income countries (LMICs), in particular urban settings of sub-Saharan Africa (SSA), face the challenge of an increasing trend [8]. Out of the 20 fast-rising countries with adult central obesity, nearly half of them are found in Africa [9].

The burden of obesity is higher among women and urban residents. On the other hand, previous studies evidenced that the risk of central obesity is multifactorial. Socioeconomic status, age, parity, marital status, physical inactivity, and increased energy are powerful predictors of central obesity in SSA [10]. Physical inactivity during the transition from adolescence to adulthood is related to overall obesity and severe central obesity in females [11]. Physical inactivity is the most important risk factor for the rising prevalence of obesity [12]. The number of people who are obese is increasing due to modern lifestyle changes, physical inactivity, and excessive consumption of energy-dense foods [13,14]. The odds of maintaining a healthy body weight significantly increased with engagement in > 500 MET per week (approximately 167 min per week) [15]. Adhering to vigorous-intensity physical activity of at least 1 h per week was associated with a significant decrease in the incidence of obesity [16].

Few studies in Ethiopia showed that a significant number of individuals were centrally obese. A study in Northwest, Ethiopia, Dilla town Ethiopia, Gondar and Woldiya town Ethiopia showed that 16.5% to 37.6% [17–20]. World Health Organization (WHO) recommends the reduction of obesity through healthy eating and physical activity [21]. The sustainable development goal (SDG) 3, target 3.4 calls to reduce by one-third premature mortality related to non-communicable diseases through prevention and treatment and promote mental health and well-being [22].

Globally obesity is a major public health problem including low and middle-income countries. The prevalence of overweight and obesity has increased significantly in the nutritional transition period, and the health burden of obesity-related complications is growing. The introduction of fast and westernized dietary habits is the mainstay of the reason for the increasing prevalence of obesity. A few years ago, countries were in a problem with under-nutrition but due to nutrition transition and sedentary behavior obesity becomes a major public health challenge and a double burden of Undernutrition especially in SSA. The cause of the non-communicable disease (NCDs) is mostly modifiable and can be preventable if diagnosed earlier. As one of the main modifiable risk factors for NCDs was obesity.

Different nutritional programs in Ethiopia [23,24] gives prior attention to undernutrition which undermines the alarming rise of obesity due to unhealthy diet. There is a paucity of evidence in the study area about the magnitude of central obesity and associated factors. Therefore, this study aimed to assess the level of central obesity and associated factors among adults aged 18-64 years at Debre Tabor Town, northeast, Ethiopia.

1.3. Significance of the study

Measuring central obesity is a key role in the diagnosis of this metabolic-related disease. Mostly the common method to measure obesity at community level body mass index. The finding of the study was helpful to encourage local people to improve current nutritional status by handling the risk factors and improving feeding pattern of healthy diet and physical activity. Encourage government and other stakeholders for the development of programs and policies related to nutrition based on the facts and figures generated by this study. Documentation of such information will provide insight into policy intervention to tackle the alarming increase of central obesity in Ethiopia.

Hence, the result or outcome of this study was providing the valuable information for researcher, policy makers, NGOs; governmental and non-governmental organizations as well as local administrations to plan future circumstances.

2. Literature Review

2.1. The magnitude of central obesity

A study conducted on a Spanish adult population revealed that the prevalence of central obesity was 33.4% of the higher prevalence observed among women (43.3%) than men (23.3%) [25]. A cross-sectional survey conducted at Madurai, Tamil Nadu, India showed that the magnitude of central obesity was 20.9% among adults [26]. A study conducted in rural Bangladeshi showed that the age-standardized prevalence of central obesity was 39.8 % of this the prevalence of central obesity was higher than among women than men [27].

Different cross sectional studies conducted in Africa evidenced that the prevalence of central obesity ranges from 11.8% to 67.8% [28–35]. The prevalence of central obesity in Africa was higher than among women (19.5% - 39.2%) than men (1.3% - 13.8%) [32–35].

A study conducted in Woldia town, Northeast Ethiopia revealed that the prevalence of central obesity was 16.5% (95% CI: 14.2– 19.2) which is higher than women (27.9%) than men (3.9%) [20]. In a study conducted by University employees in Ethiopia, the magnitude of waist circumference is 33.6% [19]. An institutional-based cross-sectional study in Ethiopian university employees showed that 33.6% of adults were abdominally obese [36]. Another study in urban areas of Northwest Ethiopia showed that central obesity among adults was 37.6% [17]. Furthermore, a community-based cross-sectional study in Dilla town, Ethiopia revealed that 24.4% of adults were abdominally obese and a higher prevalence was observed among women adults [18]. Generally, there are limited study on the prevalence of central obesity, even if some studies are available, there is a tool, sample size, and sociodemographic difference among inference population. In addition to this some of the variables significantly associated were inconsistent among literatures. Therefore, this study aimed to assess the level of central obesity and associated factors among adults aged 18-64 years at Debre Tabor Town, northeast, Ethiopia.

2.2. Factors associated with central obesity

2.2.1. Socio-demographic factors

A meta-analysis report among 13.2 million subjects showed that older adult individuals, female individuals, and urban residents had a statistically significant association with central obesity [37]. A study from Spain indicates that, males and aged older than 40 years were associated with a higher risk of central obesity, whereas those who had a higher level of education were associated with a lower risk of central obesity [38].

A study conducted from India, Tanzania, Eastern Sudan, and Uganda [31,33,39,40] revealed that females were more likely develop central obesity than males. Studies from India and Uganda showed that urban residents are also more at risk of developing central obesity than rural residents [33,39]. Previous studies from Uganda, Tanzania, and Eastern Sudan revealed that married or cohabiting had a higher odds of central obesity than their counterparts [31,33,40].

In a study conducted in India showed that higher socio-economic status, were a significant determinant factor for central obesity [39]. A study from Tanzania showed that age greater than 30 years were more likely to develop central obesity than younger adults [40].

A study in urban areas of Northwest Ethiopia showed that with a one-year increase in age the odds of developing central obesity would increase by 5%. As well this study revealed that female sex was a risk factor for central obesity [17]. On the other a community-based cross-sectional in Woldia town, Northeast Ethiopia showed that female sex, higher household wealth class, age from 35 to 55 years, aged older than 55 years, secondary educational level were risk factors for central obesity, whereas single marital status decreased the central obesity [20]. A study in Dilla town showed that abdominally obese were observed among adults with a high and middle house wealth class, and being female adults [18].

2.2.2. Behavioral factors

Different studies revealed that behavioral factors are associated with central obesity. A study in Spain showed that current smokers were 28% less likely to develop central obesity. On the other hand, individuals who had spent more than 75 minutes per week physical activity were less likely to develop central obesity [38]. Another study in China showed that alcohol drinking and former cigarette smokers were more likely centrally obese than their counterparts [41]. A longitudinal study evidenced that physical activity significantly lowers central obesity [42]. A population-based study from 31 countries revealed that ex-smokers were positively associated

with obesity, while light or moderate smoker were inversely related with central obesity among both men and women adult populations. This study also showed that moderate alcohol use was positively associated with obesity, while heavy alcohol use was negatively associated [43].

A study in Switzerland showed that current smokers had lower mean waist circumference compared with non-smokers [44]. In a study from Spain showed that individuals who had spent more than seven hours per day in sleeping was associated with a lower risk of central obesity [38]. A study in Brazil showed that physical activity either aerobic or resistance exercises, with a prolonged duration of moderate-intensity for men and walking or moderate intensity for women is suggested as the most adequate for the prevention strategies of central obesity [45]. A systematic review and meta-analysis review showed that exercise had a greater effect on the outward appearance of obesity (body mass index, waist circumference) than on its practical factors [46]. A study from Dilla town, Ethiopia showed that being physically inactive were more at risk to develop central obesity [18]. A study conducted in Jimma, Ethiopia showed that khat chewers had a lower body mass index and fat-free mass as compared to non-chewers [47].

2.2.3. Dietary factors

A longitudinal study showed that dietary fiber intake (increased fruit and low carbohydrate) significantly decreased the occurrence of central obesity [42]. A study from a sample of 31 countries indicates that the daily consumption of fruit and vegetables was found to be protective against central obesity [43]. Another study showed that poor dietary patterns had direct associations with central obesity only in men [48]. Previous studies evidenced that eating out of home was increased the risk of central obesity [49]. A study showed that high consumption of energy-rich diet increases excess body fat accumulation. This study also evidenced that bad eating habits such as calorie-rich foods, skipping breakfasts, drinking sugar-sweetened beverages, eating out frequently, and emotional eating increases the risk of central obesity [50].

3. Conceptual Framework

The Conceptual frameworks of central obesity are listed under the diagram.

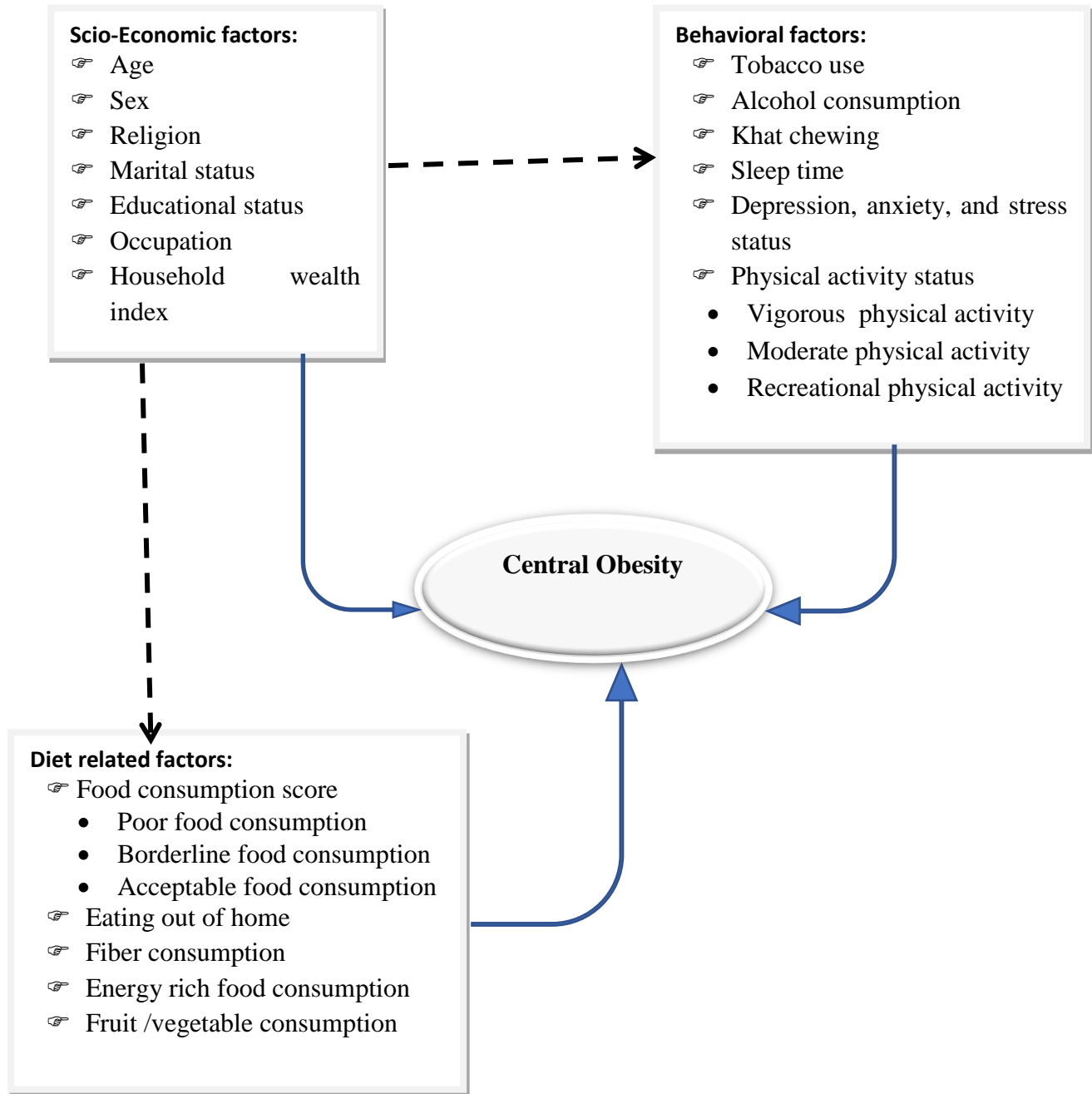


Figure 1: Conceptual framework for central obesity adapted from deferent literature [17,45,48,51,52].

4. Objectives

4.1. General objective

To assess the prevalence of central obesity and its associated factors among adults aged 18-64 years in Debre Tabor Town, Northeast, Ethiopia, 2021.

4.2. Specific objectives

To determine central obesity among adults aged 18-64 years in Debre Tabor Town, Northeast, Ethiopia, 2021.

To identify associated factors for central obesity among adults aged 18-64 years in Debre Tabor Town, Northeast, Ethiopia, 2021.

5. Methods and materials

5.1. Study setting and period

Debre Tabor town is the central town of South Gondar Zone, Amhara National Regional State. The town is located in northeast Ethiopia, 667 km away from Addis Ababa the capital city of Ethiopia. The city is found at approximately 11.64° latitude and 37.90° with an elevation of 2,706 meters above sea level. According to the 2007 national census report, the town has a total population of 55,596 populations, of whom 27,644 are men and 27,952 women. Debre Tabor has 6 kebeles with a total of 15, 549 households. The study was conducted from August/22/2021 to September/10/ 2021.

5.2. Study design

A community-based cross-sectional study was conducted.

5.3. Populations

5.3.1. Source populations

Among Adults aged 18 -64 years living in Debre Tabor town.

5.3.2. Study populations

Among Adults living in Debre Tabor town in the selected kebeles (01 & 06) during the data collection period.

5.4. Eligibility criteria

5.4.1. Inclusion criteria

Among Adults aged 18-64 years and living more than at least six months before the data collection period were included in this study.

5.4.2. Exclusion criteria

Pregnant women were excluded from this study.

5.5. Sample size determination and sampling procedure

5.5.1. Sample size determination

Sample size determination was calculated based on the objectives of the study as follows: Based on the first objective using Epidemiologic information version 7 software to calculate sample size by taking prevalence of the outcome using the single population proportion formula.

The formula is

$$n = \frac{(Z_{\alpha/2})^2 * p(1 - p)}{d^2}$$

Where n = the minimum sample size required for this study

$Z_{\alpha/2}$ = Z- value at the alpha value of 0.05 which is 1.96

d = margin of error which is taken as 4%

P = Prevalence of central obesity from the previous study.

To calculate the minimum sample size using the single population proportion formula a study conducted at Dabat Health and Demographic Surveillance Site (HDSSs) in Gondar [17] was appropriate instead of almost similar demography and recent study. In this study, the prevalence of central obesity is 37.6. But the prevalence is less than 50% the margin of error should be less than 5% which was an appropriate 4% to make representativeness. Assuming the above formula the final sample size was 616 after adding a 10% non-response rate.

Based on the second objective the sample size was calculated as follows using Kelsey [53] formula.

$$n1 = \frac{(Z_{\alpha} + Z_{1-\beta})^2 p'q'(r+1)}{r(p1-p2)^2} , \quad n2 = r * n1, \quad p' = \frac{p1+r*p2}{r+1} , \text{ and } q' = 1-p'$$

Where

n1 = number of exposed (non-reference category)

n2 = number of unexposed (reference category)

$Z_{\alpha/2}$ = z-score for a two-tailed test based on α level (5% level)

$Z_{1-\beta}$ = z-score for a one-tailed test based on β level (80% power)

r = ratio of reference group vs non reference group

p1 = proportion of central obesity among exposed

p2 = proportion of central obesity among unexposed

Based on the above formula the different sample size was calculated using different factors by Epi-Info version 7 software. Therefore, based on the above study in different factors.

| Factors | Assumption | Required sample size |
|---------|------------|----------------------|
|---------|------------|----------------------|

| | | |
|---|--|-----|
| Sex (male reference group) [17] | $r = 0.62 \square 1, p1 = 52\%, p2 = 13.8\%$ | 46 |
| Type of dietary oil (solid reference) [17] | $r = 2.29 \square 2, p1 = 57.9\%, p2 = 28.8\%$ | 99 |
| Physical activity (active reference) [18] | $r = 2.5 \square 3, p1 = 39.2\%, p2 = 18.5\%$ | 178 |

Therefore, the sample calculated using a single population proportion is the best representative.

5.5.2. Sampling technique and procedure

To made representativeness 30% of among the six Kebele, two Kebeles were selected using a lottery method; while kebele 01 and kebele 06 were selected. All are urban kebeles. The two kebeles had a total number of 5261 households. Systematic random sampling techniques was employed in those kebeles in the 9th interval. House to house survey was employed in systematically selected households. Marking of the household was done to avoid double selection.

Finally, one eligible adult was selected from the selected household and if more than one found is eligible adultin .the household the Kish grid sample size selection method was applied [54].

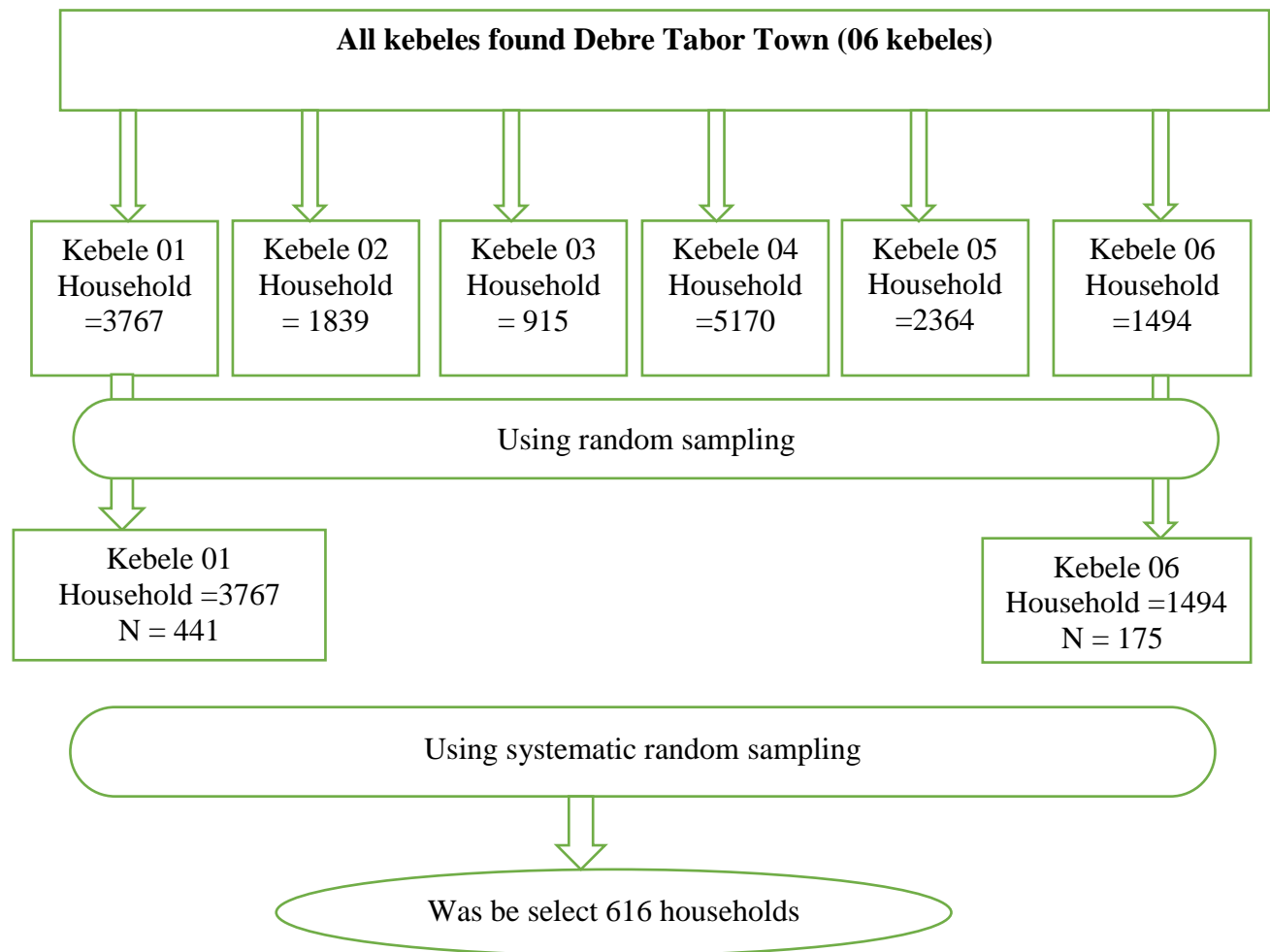


Figure 2: Sampling procedure to select study participants.

5.6. Variables of the study

5.6.1. Outcome variable

Central / abdominal obesity (Y/N)

5.6.2. Independent Variables

Scio-Economic factors:

Age

Sex

Religion

Marital status

Educational status

Occupation

Household wealth index

Behavioral factors:

Smoking status

Alcohol consumption

Khat chewing

Physical activity status

Depression, anxiety, and stress status

Diet-related factors:

Food consumption score

Poor food consumption

Borderline food consumption

Acceptable food consumption

Eating out of home

5.7. Operational definitions

Central obesity: Waist circumference (WC) \geq 94 cm for males and \geq 80 cm for females according to WHO definition [4].

Physically active: Individuals achieve moderate and vigorous-intensity physical activity achieving at least 600 metabolic equivalent tasks (MET) minutes [55].

Physically inactive: Individuals achieve moderate and vigorous-intensity physical activity achieving less than 600 metabolic equivalent tasks (MET) minutes [55].

Food consumption status: Individuals had a sum score was calculated from the eight food items using 0 – 21, 21.5 – 35, and $>$ 35 poor, borderline, and good food consumption status, respectively [56].

Depression, anxiety, and stress status: Normal (0-9), mild (10-13), moderate (14-20), severe (21-27), and extremely severe (28+) depression was declared according to their respective scores. Normal (0-7), mild (8-9), moderate (10-14), severe (15-19), and extremely severe (20+) anxiety scale was declared and normal (0-14), mild (15-18), moderate (19-25), severe (26-33), extremely severe (34+) stress scale was declared [57].

5.8. Data collection tools and procedures

The data were collected using a structured interviewer-administered questionnaire. The data were collected by four clinical nurses by house-to-house survey. Central obesity or central obesity was measured between the anterior superior iliac span and the lower coastal margin perpendicular to the midclavicular line using a non-stretchable tap meter. During measurement, the clothes were removed to get the true measurement.

Socioeconomic factors

We measured socio-demographic and economic-related factors found to be associated with the central obesity structured questionnaire. Household wealth index status was measured in five categories (poorest, poor, middle, rich, and richest) after the household questionnaire survey questionnaire.

Behavioral related factors

A structured interviewer-administered questionnaire was prepared from WHO-STEP wise for non-communicable diseases. Physical activity was assessed using the global physical activity questionnaire (GPAQ) developed by the WHO for physical activity surveillance [55]. The Global Physical Activity Questionnaire was developed by WHO for physical activity surveillance in countries. It collects information on physical activity participation in three domains as well as sedentary behavior, comprising 16 questions (P1-P16). The domains are categorized as vigorous work-related, vigorous recreational, moderate work-related, moderate recreational and recreational physical activity. The questionnaire assesses physical activity in the past seven days paraphrasing as in a typical week, on how many days do participate in physical exercise. The level of physical activity was in hours and minutes on a typical day in a week. Finally, the questionnaire was finalized in metabolic equivalent per task (METs) to classify physically active and inactive.

Depression, anxiety, and stress were assessed using the Depression, Anxiety and Stress Scale - 21 scale (DASS-21) is a set of three self-report scales designed to measure the emotional states of depression, anxiety and stress. Each of the three DASS-21 scales contains 7 items, divided into subscales with similar content. The depression scale assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest/involvement, anhedonia and inertia. The anxiety scale assesses autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect. The stress scale is sensitive to levels of chronic nonspecific arousal. It assesses difficulty relaxing, nervous arousal, and being easily upset/agitated, irritable / over-reactive and impatient. Scores for depression, anxiety and stress are calculated by summing the scores by multiplying two for the relevant items [57].

Dietary related factors

Dietary consumption of oil type, eating out of home and food consumption status was measured. The food consumption score (FCS) dietary consumption assessment tool was prepared by the United nation World food program [56]. The food consumption score (FCS) is a composite score

based on dietary diversity, food frequency, and relative nutritional importance of different food groups. Food items are grouped into 8 standard food groups (cereals and tubers, pulses, vegetables, fruit, meat and fish, milk, sugar and Oil) with a maximum value of 7 days per week. Sum score was done to calculate individualize score of the study participants. In the FCS the highest score is a good dietary habit.

5.9. Data quality control

The data quality was assured during tool development, data collection, coding, entry and analysis. A pretest was done before the date of data collection at kebele 04. The training was delivered for data collectors before the data collection period. The questionnaire was prepared in English then translated to Amharic again back to translate into English for its consistency. Waist circumference was measured in a non-stretchable tap meter and a double measurement was made. From two measurements the average value was taken.

5.10. Data management and analysis

The data were checked, coded, and enter in Epi-data version 4.6 software and it was imported in STATA/MP version 16 statistical software for further analysis. Descriptive statistics were reported in tables and graphs. The principal component analysis was employed to determine the household wealth index. The chi-square assumption was a check for the model assumption. Bivariable logistic regression was carried out. Two sides p-value less than 0.25 was used to select candidate variables for multivariable logistic regression. Hosmer and Lemeshow's goodness of fit test was checked for model fitness. Multicollinearity was checked using the variance inflation factor ($VIF < 10$). Two sides p-value less than 0.05 was considered to declare statistical significance. Finally adjusted odds ratio with a 95% confidence level was reported.

5.11. Ethical consideration

Ethical clearance was secured from the institutional review board (IRB) of Bahir Dar University. Letter permission was also secured from Debre Tabor City Administration. Informed consent was secured from each study participant. Hand warm was made during waist circumference measurement. Participants' identifiers were omitted from the questionnaire and respondents can withdraw at any time if they do not want to participate and data was kept confidential and anonymous.

6. Results

6.1. Socio-demographic and behavioral characteristics of the respondents

Overall, a total of 582 study participants were recruited with a response rate of 94.48%. The mean \pm SD age of the study participants was 36.10 ± 11.90 years. The majority (334, 57.39%) of the study participants were below the age group of 35 years. Fifty nine percent of the study participants were males. Almost all, (571, 98.11%) of the study participants were Christian Orthodox in their religion. Half of the respondents had college and above level of education. A total of 196 (33.68%) of study participants were in poor household wealth status. Overall, 39% of the respondents drunk standard alcohol (Vodka, Areki...) preceding one year of the survey. Of the total of respondents, 15 (2.59%) and 24 (4.12%) had a history of the current smoker and chat chewer, respectively. Moreover, 45.02% and 20.10% of the study participants were moderately and vigorously physically active, respectively. Overall, a total of 300 (51.55%) of study participants were physically active (Table 1).

Table 1: Socio-demographic and behavioral characteristics of the study participants, 2021. (n =582)

| Variables | Categories | Frequency (n) | Percentage (%) |
|---------------------|----------------------------------|---------------|----------------|
| Sex | Male | 346 | 59.45 |
| | Female | 236 | 40.55 |
| Age | Young adults (18–35 years) | 334 | 57.39 |
| | Middle-aged adults (36–55 years) | 196 | 33.68 |
| | Older adults (55 - 64 years) | 52 | 8.93 |
| Marital status | Union | 391 | 67.18 |
| | Not-union | 191 | 32.82 |
| Religion | Orthodox Christian | 571 | 98.11 |
| | Others § | 11 | 1.89 |
| Educational status | No education | 57 | 9.79 |
| | Primary | 103 | 17.70 |
| | Secondary | 134 | 23.02 |
| | College and above | 288 | 49.48 |
| Occupational status | Government employ | 220 | 37.80 |
| | Merchant | 91 | 15.64 |
| | Daily Labor | 98 | 16.84 |

| | | | | |
|--------------------------|----------|-----------|------------|------------|
| | | Housewife | 118 | 20.27 |
| | | Student | 55 | 9.45 |
| Household status | wealth | Poor | 196 | 33.68 |
| | | Middle | 147 | 25.26 |
| | | Rich | 239 | 41.07 |
| Alcohol use | | No | 113 | 19.42 |
| | | Yes | 469 | 80.58 |
| Standard alcohol use | | No | 355 | 61.00 |
| | | Yes | 227 | 39.00 |
| Current chat chew | | No | 558 | 95.88 |
| | | Yes | 24 | 4.12 |
| Current smoker | | No | 565 | 97.41 |
| | | Yes | 15 | 2.59 |
| Ever smoker | | No | 526 | 90.38 |
| | | Yes | 56 | 9.62 |
| Moderate activity | physical | Inactive | 320 | 54.98 |
| | | Active | 262 | 45.02 |
| Vigorous activity | physical | Inactive | 465 | 79.90 |
| | | Active | 117 | 20.10 |
| Physical activity status | | Inactive | 282 | 48.45 |
| | | Active | 300 | 51.55 |
| Total | | | 582 | 100 |

NB: § = Muslim and Catholic

6.2. Food consumption status among study participants

Overall, 261 (44.85%) had borderline food consumption status and 277 (47.59%) acceptable food consumption status. The mean \pm SD of food consumption score was 36.96 ± 12.44 ; the minimum and the maximum 7.5 and 82, respectively. Among the food items vegetables, pulses, cereals, and oils are the most consumed food in the typical week, while fruit and milk are the least consumed food (**Table 2**).

Table 2: Food consumption status in a typical week among adults in Debre Tabor town, 2021.

| Food item | Response | |
|--|-------------|--------------|
| | Yes (%) | Mean per day |
| In a typical week, on how many days do you eat fruit? | 272 (46.74) | 0.58 |
| In a typical week, on how many days do you eat vegetables? | 522 (89.69) | 2.20 |
| In a typical week, on how many days do you eat protein source foods from animals (beef, lamb, chicken, fish, and egg)? | 321 (55.15) | 1.08 |
| In a typical week, on how many days do you eat protein source foods from plants (pea, bean, chickpea, nuts, groundnuts)? | 575 (98.80) | 4.91 |
| In a typical week, on how many days do you eat energy source foods (cereal grains, energy-rich tubers such as potatoes, sweet potatoes)? | 548 (94.16) | 3.45 |
| In a typical week, on how many days do you eat milk and milk products (milk, cheese, Yogurt)? | 156 (26.80) | 0.75 |
| In a typical week, on how many days do you eat fats (fats and oils)? | 577 (99.14) | 6.74 |
| In a typical week, on how many days do you eat /drink discretionary calories (soft drinks, sugar, chocolates, honey...)? | 368 (63.23) | 2.37 |
| Over all Food Consumption Score (FCS) | | |
| ☞ Poor food consumption = 44 (7.56%) | | |
| ☞ Borderline food consumption = 261 (44.85%) | | |
| ☞ Acceptable food consumption = 277 (47.59%) | | |

NB: Food items in the yes category had at least one time per week otherwise no.

6.3. Prevalence of central obesity

The overall prevalence of central obesity among adults in Debre Tabor town was 37.80% (95% CI: 33.94 – 41.82). Females 130 (55.08%) were more obese than males 90 (26.01%) and central obesity was higher in older-aged adults. Central obesity was higher among physically inactive individuals 133 (47.16%). Moreover, central obesity was higher among depressed adults (**Table 3**).

Table 3: Magnitudes of central obesity among adults in Debre Tabor Town, 2021

| Variables | | Central Obesity status | |
|--------------------------|-----------------------------|-------------------------------|--------------------|
| | | Not obese n (%) | Obese n (%) |
| Sex of the respondent | Male | 256 (73.99) | 90 (26.01) |
| | Female | 106 (44.92) | 130 (55.08) |
| Age | Young adults | 256 (75.15) | 83 (24.85) |
| | Middle-aged adults | 90 (45.92) | 106 (54.08) |
| | Older adults | 21 (40.38) | 31 (59.62) |
| FCS | Poor food consumption | 31 (70.45) | 13 (29.55) |
| | Borderline food consumption | 171 (65.52) | 90 (34.48) |
| | Good food consumption | 160 (57.76) | 117 (42.24) |
| Depression status | Normal | 333 (72.23) | 128 (27.77) |
| | Mild | 10 (12.20) | 72 (87.80) |
| | Sever | 19(48.72) | 20 (51.28) |
| Anxiety status | Normal | 342 (68.13) | 160 (31.87) |
| | Mild | 5 (17.86) | 23 (82.14) |
| | Sever | 15 (28.85) | 37 (71.15) |
| Stress status | Normal | 309 (65.47) | 163 (34.53) |
| | Mild | 41 (65.08) | 22 (34.92) |
| | Sever | 12 (25.53) | 35 (74.47) |
| Physical activity status | Inactive active | 149 (52.84) | 133 (47.16) |
| | Active | 213 (71) | 87 (29) |
| Central obesity | | 362 (62.20) | 220 (37.80) |

6.4. Factors associated with central obesity

In bi-variable logistic regression analysis sex, age, marital status, occupation status, eating out of home, ever smoking status, household wealth status, type of oil use, depression, stress, and physical activity were statistically significant factors for central obesity. In multivariable logistic regression analysis sex, age, occupation status, depression, and level of physical activity were statistically significant with central obesity.

Keeping all other variables constant, the odds of central obesity among females were almost six times higher than males (AOR = 5.81, 95% CI: 3.01 – 11.20). The odds of developing central

obesity among individuals aged 36-55 years were four times more likely than younger adults aged (18 to 35 years) (AOR = 3.84, 95% CI: 2.30 – 6.41). Individuals aged 56-64 years were six times more likely to develop central obesity as compared to younger-aged adults (AOR = 5.90, 95% CI: 2.76 – 12.64). Daily labor workers were 57% less likely to develop central obesity as compared to government employees (AOR = 0.43, 95% CI: 0.20 – 0.91). The odds of developing central obesity among mild depressed adults were 9.72 times higher than their counterparts (AOR = 9.72, 95% CI: 3.99 – 23.64). Furthermore, physically inactive individuals were 58% more likely vulnerable for central obesity as compared to physically active individuals (AOR = 1.58, 95% CI: 1.01 – 2.51) (Table 4).

Table 4: Multivariable logistic regression analysis factors associated with central obesity among adults in Debre Tabor town, 2021.

| Independent variables | Central obesity | | COR (95%CI) | AOR (95%CI) |
|----------------------------|-----------------|-----|--------------------|-------------------------|
| | Yes | No | | |
| Sex | | | | |
| Female | 130 | 106 | 3.49 (2.45 – 4.96) | 5.81 (3.01 – 11.20) *** |
| Male | 90 | 256 | 1 | 1 |
| Age in years | | | | |
| Old adults | 21 | 51 | 4.46 (2.43 – 8.19) | 5.90 (2.76 – 12.64) *** |
| Middle age adults | 106 | 90 | 3.56 (2.45 – 5.18) | 3.84 (2.30 – 6.41) *** |
| Young adults | 83 | 251 | 1 | |
| Marital status | | | | |
| Not Union | 46 | 145 | 0.40 (0.27 – 0.58) | |
| Union | 174 | 217 | 1 | |
| Occupational status | | | | |
| Daily labor | 20 | 78 | 0.40 (0.23 – 0.70) | 0.43 (0.20 – 0.91) * |
| Merchant | 40 | 51 | 1.22 (0.75 – 2.00) | 1.33 (0.71 – 2.48) |
| House wife | 65 | 53 | 1.91 (1.22 – 3.00) | 0.49 (0.24 – 1.00) |
| Student | 9 | 46 | 0.30 (0.14 – 0.65) | 0.61 (0.22 – 1.67) |
| Government employ | 86 | 134 | 1 | |

| | | | | |
|--------------------------------|-----|-----|----------------------|-------------------------|
| Food consumption status | | | | |
| Good | 117 | 160 | 174 (0.87 – 3.48) | |
| Borderline | 90 | 171 | 1.26 (0.63 – 2.52) | |
| Poor | 13 | 31 | 1 | |
| Meals eat out of home | | | | |
| Yes | 49 | 150 | 0.40 (0.28 – 0.59) | |
| No | 171 | 212 | 1 | |
| Ever smoker | | | | |
| Yes | 105 | 46 | 0.33 (0.16 – 0.66) | |
| No | 210 | 316 | 1 | |
| Household wealth status | | | | |
| Rich | 79 | 160 | 0.62 (0.42 – 0.91) | |
| Middle | 106 | 90 | 0.73 (0.47 – 1.13) | |
| Young adults | 83 | 251 | 1 | |
| Oil use | | | | |
| Solid oil | 147 | 73 | 0.68 (0.47 – 0.98) | |
| Liquid oil | 271 | 91 | 1 | |
| Depression status | | | | |
| Sever | 20 | 19 | 2.74 (1.42 – 5.29) | 1.38 (0.55 – 3.48) |
| Mild | 72 | 10 | 18.73 (9.37 – 37.42) | 9.72 (3.99 – 23.64) *** |
| Normal | 128 | 333 | 1 | |
| Stress status | | | | |
| Sever stress | 37 | 8 | 10 (4.59 – 22.16) | |
| Mild stress | 23 | 5 | 10 (5.75 – 26.87) | |
| Normal | 160 | 349 | 1 | |
| Physical activity | | | | |
| Inactive | 133 | 149 | 2.19 (1.55 – 3.08) | 1.58 (1.01 – 2.51) * |
| Active | 87 | 213 | 1 | |

NB: *** = Significant at 0.001 level, ** = Significant at 0.01 level, * = Significant at 0.05 level, COR = Crude Odds Ratio, AOR = Adjusted Odds Ratio, CI = Confidence Interval.

7. Discussion

Central obesity is becoming a major public health problem in the general population and it becomes increasing in low-middle income countries [58]. Central obesity is a common health condition related to a wide range of non-communicable diseases such as cardiovascular diseases, type-2 diabetes mellitus, and cancers. Nowadays it is an emerging nutritional transition health problem in low and middle-income countries, including Ethiopia. Therefore, documenting and conducting possibly modifiable risk factors will help policymakers to curve the burden of the problem.

This study revealed that the prevalence of central obesity among adults in Debre Tabor town was 37.80% (95% CI: 33.94 – 41.82). The prevalence of central obesity was higher among females (55.08 %) than males (26.01%). The finding was similar to previous studies conducted in Ethiopia 37.6% [17] and Iran (40.7%) [59]. This finding is lower than a study conducted in South Africa (67%) [28], West Africa (50.8%) [60], Nigeria (52.6%) [61], India (71.2%) [62], and China (52%) [30]; whereas, this study is higher than a study conducted in Ethiopia (16.5 – 24.4%) [18,20], Uganda (11.8%) [63], Iran (28.3%) [20] and Tanzania (24.88%) [29]. The possible source of lower or higher prevalence variation might be the deference central obesity definition cut points, setting deference, central obesity measurement deference and study period difference. Different studies might be use different cut point for waist circumference and some studies might conducted in only urban of rural setting. Therefore, the discrepancy might be due to those reasons.

This study showed that the likelihood of developing central obesity among females were six times higher than males. This finding agreed with a study conducted in different countries in the world [17,29,31,64–68]. This might be because of female sex had less physically active during their daily life. The physiological changes during reproductive ages may contribute to the change of their status of obesity [69–71]. Additional explanations for higher central obesity for females might be genetic, biological factors with females having more steroid hormones which expose them to obesity [66,72,73]. The other possible source of variation could be that in the Ethiopian cultural context males were more engaged in activities that require higher energy than females.

This study revealed that the age of individuals is significantly associated with central obesity. Individuals aged older than 35 years were more likely to develop central obesity as compared to adults younger than aged 35 years. This finding is supported by a study conducted in different countries [31,60,68,74,75]. This might be due to the reason that ageing is associated with insulin

resistance that changes body fat distribution and metabolism [74,75]. The other justification might be older age related to low physical activities and a tendency for a more sedentary way of life exposed to obesity. Daily labor workers were 57% less likely to develop central obesity as compared to government employees. The possible justification might be daily works might engage with vigorous physical activity.

This study also revealed that depression symptom was directly related to central obesity. Mild depressive adults were almost ten times more likely vulnerable to central obesity than their counterparts. A systematic review and meta-analysis study supports that the odds of central obesity among depressive individuals were higher by 38% than the reference category [45]. In addition, previous studies showed that central obesity and level of depression symptoms had a positive association [76–78]. Molecular and clinical studies revealed evidence for the association between depression and central obesity i.e. there is influence on hypothalamic pituitary adrenal (HPA) axis, inflammatory pathways and insulin sensitivity [79], which is abnormal regulation of HPA axis, the elevation of certain inflammatory markers and insulin resistance being individuals obese. Disturbance of the hormones can affect the secretion or metabolism of neurotransmitters, such as serotonin, norepinephrine and dopamine in the brain leading to central obesity which consequently influences mood disturbance.

Physical activity was statistically significant with central obesity. The odds of developing central obesity among physically inactive adults were 58% higher than physically active adults. Previous studies [17,18,80] had similar evidence with this study. Physical activity increases total energy expenditure, which can help them stay in energy balance and lose [81,82]. Therefore, physical activity decreases fat accumulation around the waist and total body fat, which decreases central obesity. Besides, physical activity reduces depression and anxiety and this might enhance physical exercise. Thus, aerobic and resistance exercises with a prolonged duration of moderate-intensity for men and walking or moderate intensity for women is suggested for the prevention or treatment of central obesity [45]. This study follows some limitations. Since the data were collected using an interview-based survey, it might have social desirability bias and recall bias for food consumption assessment. As well, the depression, anxiety, and stress screening might be affected since the data were collected during the instability period. Moreover, the limitation of the cross-sectional design is inevitable.

8. Conclusion

More than one-third of adults in Debre Tabor Town were abdominally obese. Females were more vulnerable than males for central obesity. Physical inactivity and depression among adults were modifiable risk factors for central obesity. Sex and age were non-modifiable risk factors for central obesity.

9. Recommendations

According to the evidence of this study, we recommend that the community itself and policymakers should give prior attention to preventable (primarily physical inactivity and depression) risk factors for central obesity.

For the community:

They should practice regular physical activity to reduce central obesity as per the recommendations.

For the policymakers and health planners

The policymakers and health planners should promote the benefit of physical activity to reduce central obesity.

Health promoters should give primary attention for those females which are at risk for central obesity.

Health promotion and primary prevention should promote the risks of central obesity on non-communicable diseases.

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11. Annex

Hello! My name is _____ and I am collecting data for a study on the **central** obesity and its associated factors among adults aged 18-64 years in Debre Tabor Town, northeast, Ethiopia, 2021. I would like to ask you some questions about the risk factors of Central obesity and if you are willing, we will also take some **physical examination**. The interview would take about 15 minutes. Your participation in the study is very critical to know the magnitude of Central Obesity and its associated factors. However, your participation is fully voluntary. The data you provided will be kept in a highly confidential manner and none of your identifiers will be on the questionnaire.

Verbal consent obtained Yes No

Date of data collection ____ / ____ / ____
(Ethiopian calendar: Day Month Year)

| Part I: Socio-demographic characteristics | | |
|--|------------------------------|--|
| A0 | Unique Identification Number | ID _____ |
| A1 | What is your Sex | 1. Male 2. Female |
| A2 | What is your Ethnic group | 1. Amhara 2. Oromo 3. Tigre 4. Others (specify) _____ |
| A3 | What is your Age | -----years |
| A4 | What is your Religion | 1. Orthodox 2. Protestant 3. Moslim 4. Catholic 5. Other specify _____ |
| A5 | What is your Occupation | 1. Employ (both government and non governmental) 2. Merchant 3. Daily labourer 4. Housewife 5. Student 6. Others(specify) _____ |
| A6 | What is your Marital status | 1. Married |

| | | |
|---|--|--|
| | | 2. Single 3. Widowed 4. Divorced 5. Separated |
| A8 | What is your Level of educational status | 1. Can't read and write 2. can read and write but no formal education 3. primary(1-8) 4. Secondary(9-12) 5. Tertiary and above |
| Part II: Behavioral Measurements | | |
| Tobacco, chewing Khat and Alcohol use practice | | |
| B1 | Have you ever smoked any tobacco products, such as cigarettes, cigars, shisha or pipes? | 0. No 1. Yes |
| B2 | Do you currently smoke cigarettes? | 0. No 1. Yes |
| B3 | If yes to B2, do you currently smoke tobacco products daily? | 0. No 1. Yes |
| B4 | For how long do you smoke cigarettes | 0. No 1. Yes |
| B5 | Do you chew Khat? | 0. No 1. Yes |
| B6 | If yes, in a typical week how many days do you chew Khat? | -----days |
| B7 | How many grams do you chew on one of those days? | -----grams |
| B8 | Have you consumed any alcohol within the past 12 months? | 0. No 1. Yes |
| B9 | During the past 12 months, have you had a standard alcoholic drink? (Vodka, Whisky, Araki ETC.) | 0. No 1. Yes |
| Part III: food consumption status | | |
| D1 | In a typical week, on how many days do you eat fruit? | _____Days |
| D2 | How many servings of fruit do you eat on one of those days? | _____Servings |
| D3 | In a typical week, on how many days do you eat vegetables? | _____Days |
| D4 | How many servings of vegetables do you eat on one of those days? | _____Servings |
| D5 | In a typical week, on how many days do you eat protein source foods from animals (beef, lamb, chicken, fish, and egg)? | _____Days |
| D6 | In a typical week, on how many days do you eat protein source foods from plants (pea, bean, chickpea, nuts, groundnuts)? | _____Days |
| D7 | In a typical week, on how many days do you eat energy source foods (cereal grains, energy-rich tubers such as potatoes, sweet potatoes)? | _____Days |

| | | |
|-----------------------------------|---|--|
| D8 | In a typical week, on how many days do you eat milk and milk products (milk, cheese, Yogurt)? | _____ Days |
| D9 | In a typical week, on how many days do you eat fats (fats and oils)? | _____ Days |
| D10 | In a typical week, on how many days do you eat /drink discretionary calories (soft drinks, sugar, chocolates, honey...)? | _____ Days |
| D11 | In a typical week, on how many days do you eat foods fried /baked in an oil (egg? Chips, Biscuits, crackers, cakes)? | _____ Days |
| Oil Use Practice | | |
| D12 | What type of oil or fat is often used for meal preparation in your household? | <ol style="list-style-type: none"> 1. Liquid Vegetable oil 2. Solidified vegetable oil 3. Butter 4. Margarine / peanut butter 5. Sheno lega 6. Other 7. None in particular 8. None used 9. Don't know |
| D13 | On average, how many meals per week do you eat that were not prepared at a home? | _____ Meals |
| Part IV: Physical Activity | | |
| P1 | Does your work involve a vigorous-intensity activity that causes large increases in breathing or heart rate like [<i>carrying or lifting heavy loads, digging or construction work</i>] for at least 10 minutes continuously? | <ol style="list-style-type: none"> 0. No 1. Yes |
| P2 | In a typical week, on how many days do you do vigorous-intensity activities as part of your work? | _____ Days |
| P3 | How much time do you spend doing vigorous-intensity activities at work on a typical day? | ____ Hours ____ Minutes |
| P4 | Does your work involve a moderate-intensity activity that causes small increases in breathing or heart rate such as brisk walking [<i>or carrying light loads</i>] for at least 10 minutes continuously? | <ol style="list-style-type: none"> 0. No 1. Yes |
| P5 | In a typical week, on how many days do you do moderate-intensity activities as part of your work? | _____ Days |
| P6 | How much time do you spend doing moderate-intensity activities at work on a typical day? | ____ Hours ____ Minutes |
| P7 | Do you walk or use a bicycle (<i>pedal cycle</i>) for at least 10 minutes continuously to get to and from places? | <ol style="list-style-type: none"> 0. No 1. Yes |
| 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? | _____ Days |
| P9 | How much time do you spend walking or bicycling for | ____ Hours ____ Minutes |

| | | |
|-----|---|--------------------|
| | travel on a typical day? | |
| P10 | Do you do any vigorous-intensity sports, fitness or recreational (<i>leisure</i>) activities that cause large increases in breathing or heart rate like [<i>running or football</i>] for at least 10 minutes continuously? | 0. No 1. Yes |
| P11 | In a typical week, on how many days do you do vigorous-intensity sports, fitness or recreational (<i>leisure</i>) activities? | _____Days |
| P12 | How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a typical day? | ____Hours__Minutes |
| P13 | Do you do any moderate-intensity sports, fitness or recreational (<i>leisure</i>) activities that cause a small increase in breathing or heart rate such as brisk walking, [<i>cycling, swimming, and volleyball</i>] for at least 10 minutes continuously? | 0. No 1. Yes |
| P14 | In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational (<i>leisure</i>) activities? | _____Days |
| P15 | How much time do you spend doing moderate-intensity sports, fitness or recreational (<i>leisure</i>) activities on a typical day? | ____Hours__Minutes |

Sedentary Behavior

| | | |
|----|--|--|
| S1 | How much time do you usually spend sitting or reclining on a typical day? | ____Hours__Minutes |
| S2 | How many hours do usually sleep in a typical day | ____Hours |
| S3 | Do you often have a fragmented sleep with multiple wake ups and falling asleep cycles? | 1. No 2. Sometimes 3. Yes most of the time |
| S4 | How many days due you have night duties in one month(only for hospital workers) | -----days |

Depression, Anxiety and Stress Scale - 21 Items (DASS-21)

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you over the past week.

The rating scale is as follows:

- 0 Did not apply to me at all
- 1 Applied to me to some degree, or some of the time
- 2 Applied to me to a considerable degree or a good part of time
- 3 Applied to me very much or most of the time

| | | | | | |
|-------|--|---|---|---|---|
| 1 (s) | I found it hard to wind down | 0 | 1 | 2 | 3 |
| 2 (a) | I was aware of dryness of my mouth | 0 | 1 | 2 | 3 |
| 3 (d) | I couldn't seem to experience any positive feeling at all | 0 | 1 | 2 | 3 |
| 4 (a) | I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion) | 0 | 1 | 2 | 3 |
| 5 (d) | I found it difficult to work up the initiative to do things | 0 | 1 | 2 | 3 |

| | | | | | |
|---|--|------------------|---|---|---|
| 6 (s) | I tended to over-react to situations | 0 | 1 | 2 | 3 |
| 7 (a) | I experienced trembling (e.g., in the hands) | 0 | 1 | 2 | 3 |
| 8 (s) | I felt that I was using a lot of nervous energy | 0 | 1 | 2 | 3 |
| 9 (a) | I was worried about situations in which I might panic and make a fool of myself | 0 | 1 | 2 | 3 |
| 10 (d) | I felt that I had nothing to look forward to | 0 | 1 | 2 | 3 |
| 11 (s) | I found myself getting agitated | 0 | 1 | 2 | 3 |
| 12 (s) | I found it difficult to relax | 0 | 1 | 2 | 3 |
| 13 (d) | I felt down-hearted and blue | 0 | 1 | 2 | 3 |
| 14 (s) | I was intolerant of anything that kept me from getting on with what I was doing | 0 | 1 | 2 | 3 |
| 15 (a) | I felt I was close to panic | 0 | 1 | 2 | 3 |
| 16 (d) | I was unable to become enthusiastic about anything | 0 | 1 | 2 | 3 |
| 17 (d) | I felt I wasn't worth much as a person | 0 | 1 | 2 | 3 |
| 18 (s) | I felt that I was rather touchy | 0 | 1 | 2 | 3 |
| 19 (a) | I was aware of the action of my heart in the absence of physical exertion (e.g., sense of heart rate increase, heart missing a beat) | 0 | 1 | 2 | 3 |
| 20 (a) | I felt scared without any good reason | 0 | 1 | 2 | 3 |
| 21 (d) | I felt that life was meaningless | 0 | 1 | 2 | 3 |
| Household wealth, Does the household have any of the following properties? | | | | | |
| H1 | Functioning CD player | No 1. Yes | | | |
| H2 | Functioning Flat screen Television | No 1. Yes | | | |
| H3 | Gas Stove/Cylinder | No 1. Yes | | | |
| H4 | Refrigerator(fridge) | No 1. Yes | | | |
| H5 | Electric stove | No 1. Yes | | | |
| H6 | Bicycle | No 1. Yes | | | |
| H7 | Motor Cycle | No 1. Yes | | | |
| H8 | Cart/Gari | No 1. Yes | | | |
| H9 | Sofa | No 1. Yes | | | |
| H10 | Spring mattress | No 1. Yes | | | |
| H11 | Car | No 1. Yes | | | |
| H12 | Bajaj | No 1. Yes | | | |
| H13 | Taxi | No 1. Yes | | | |
| H14 | Own house | No 1. Yes | | | |
| H15 | Tablet computer | No 1. Yes | | | |
| H16 | Smart phone | No 1. Yes | | | |
| H17 | Digital Camera | No 1. Yes | | | |
| H18 | Washing machine | No 1. Yes | | | |
| H19 | Personal computer | No 1. Yes | | | |
| H20 | Iron (kawuya) | No 1. Yes | | | |
| Central obesity measurement | | | | | |
| Waist Circumference | | Reading 1-----cm | | | |
| | | Reading 2-----cm | | | |

| | | |
|--|--|--|
| | | |
|--|--|--|

12. Amharic version questionnaire

ሰላም ነው! ስሜ _____ እባላለው። እኔ ከመጠን በላይ ውፍረት እና የአካል ብቃት እንቅስቃሴ ደረጃ ንፅፅር እና ከ 18-64 ዓመት ዕድሜ ባላቸው ጎልማሳዎች መካከል በሰሜን ምስራቅ ፣ ኢትዮጵያ በማወዳደር ጥናት ላይ ለመስራት ነው ። ስለ ማዕከላዊ ውፍረት ተጋላጭነት ምክንያቶች አንዳንድ ጥያቄዎችን ልጠይቅዎ ከፈለጉ እና ፈቃደኛ ከሆኑ እኛ ደግሞ የአካል ምርመራ እናደርጋለን። ቃለ መጠይቁ 15 ደቂቃ ያህል ይወስዳል ። የማዕከላዊ ውፍረት እና ተጓዳኝ ምክንያቶቹን ለማወቅ በጥናቱ ውስጥ የእርስዎ ተሳትፎ በጣም ወሳኝ ነው ። ሆኖም የእርስዎ ተሳትፎ ሙሉ በሙሉ በፈቃደኝነት የሚደረግ ነው። ያቀረቡት መረጃ በከፍተኛ በሚስጥራዊ ሁኔታ ይቀመጣል እና ከግል መለያዎ ውስጥ አንዳቸውም በመጠይቁ ላይ አይኖሩም።

የቃል ስምምነት
የመረጃ መሰብሰቢያ ቀን _____ / _____ / _____

አዎ የለም
(በኢትዮጵያ አቆጣጠር የቀን ወር ዓመት)

| ከፍል አንድ፡ አጠቃላይ መረጃ | | |
|--------------------|--------------|---|
| A0 | መለያ ቁጥር | ቁጥር _____ |
| A1 | ፆታ | 1. ወንድ 2. ሴት |
| A2 | ብሄር | 1. አማራ 2. አሮሞ 3. ትግሬ 4. ሌላ ካለ ይጠቅስ |
| A3 | እድሜ | -----በአመት |
| A4 | ሃይማኖት | 1. ኦርቶዶክስ 2. ፕሮቴስታንት 3. እስላም 4. ካቶሊክ 5. ሌላ ካለ ይጠቅስ _____ |
| A5 | ስራ | 1. ተቀጣሪ (የመንግስት / መንግስታዊ ያልሆነ) 2. ነጋዴ 3. የቀን ሰራተኛ 4. የቤት እመቤት 5. ተማሪ 6. ሌላ ካለ ይጠቅስ _____ |
| A6 | የትዳር ሁኔታ | 1. ያገባ 2. ያላገባ 3. ጋለሞታ 4. የተፋታ 5. ተለያይተው የሚኖሩ |
| A7 | አማካኝ የአመት ገቢ | -----በብር |
| A8 | የትምህርት ደረጃ | 1. ማንበብና መጻፍ የማይችል |

| | | |
|---|---|---|
| | | 2. ማንበብና መጻፍ የሚችል 3. የመጀመሪያ ደረጃ 4. ሁለተኛ ደረጃ 5. ሶስተኛ ደረጃ እና በላይ |
| ክፍል ሁለት፡ የባህሪ መለኪያዎች | | |
| B1 | እንደ ሲጋራ ፣ ሺሻ ወይም ሌሎች ማናቸውንም የትምባሆ ምርቶች አጭሰው ያውቃሉ። | 1. በፋጹም 2. አዎ |
| B2 | አሁን ሲጋራ ያጨሳሉ? | 1. በፋጹም 2. አዎ |
| B3 | ለ B2 መለስዎ አዎ ከሆነ፣ በቀን በቀን ያጨሳሉ? | 1. በፋጹም 2. አዎ |
| B4 | ለምን ያክል ጊዜ ሲጋራ አጭሰው ያውቃሉ። | 1. በፋጹም 2. አዎ |
| B5 | ጫት ይቅማሉ? | 2. በፋጹም 3. አዎ |
| B6 | እልሴቆ አዎ ከሆነ፣ በሳምንት ለምን ያክል ጊዜ ይጠቀማሉ? | -----በቀን |
| B7 | ምን ያክል ግራም አጭሰው ያውቃሉ? | -----በግራም |
| B8 | ባለፉት 12 ወራት ውስጥ ማንኛውንም አልኮል ጠጥተዋል? | 1. በፋጹም 2. አዎ |
| B9 | ለባለፉት 12 ወራት ውስጥ መደበኛ የአልኮል መጠጥ አለዎት? (ቫይን ፣ ውስኪ ፣ አረኪ ወዘተ) | 1. በፋጹም 2. አዎ |
| ክፍል ሶስት፡ የአመጋገብ ሁኔታን የሚመለከቱ መጠይቆች። | | |
| ተ/ቁ | መጠይቅ | ምላሽ/ አማራጭ |
| 1 | በቀን ስንት ጊዜ ትመገቢያለሽ | 0. አንድ 1. ሁለት ጊዜ 3. ሶስትና በላይ |
| D2 | በአዘቦት ሳምንት፣ ለምን ያክል ቀን ፍራፍሬ ትመገቢያለሽ | _____ በቀናት |
| D3 | ፍራፍሬ በምትመገቢበት ቀናት፣ ምን ያክል ትመገቢያለሽ (መጠን) | _____ ቁራሽ /በፍሬ |
| D4 | በአዘቦት ሳምንት፣ ለምን ያክል ቀን አትክልት ትመገቢያለሽ | _____ በቀናት |
| D5 | አትክልት በምትመገቢበት ቀናት፣ ምን ያክል ትመገቢያለሽ (መጠን) | _____ ቁራሽ /መጠን |
| D6 | በአዘቦት ሳምንት፣ ለምን ያክል ቀን የእንሰሳት ተዋጽኦ ፕሮቲን (ሰጋ፣ ወተት፣ እንቁላል፣ አሳ ወዘተ) ትመገቢያለሽ | _____ በቀናት |
| D7 | በአዘቦት ሳምንት፣ ለምን ያክል ቀን የእጽዋት ተዋጽኦ ፕሮቲን (ባቄላ፣ አተር፣ ሽምብራ፣ ኦቾለኒ ወዘተ) ትመገቢያለሽ | _____ በቀናት |
| D8 | በአዘቦት ሳምንት፣ ለምን ያክል ቀን ሀይል ሰጪ ምግቦች (ጥራጥሬ፣ ድንች፣ ወዘተ) ትመገቢያለሽ | _____ በቀናት |

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| D9 | በአዘቦት ሳምንት፣ ለምን ያክል ቀን ወተት እና የወተት ተዋጽኦ ትመገባለሽ | በቀናት |
| D10 | በአዘቦት ሳምንት፣ ለምን ያክል ቀን ቅባትነት ያላቸው (ሱብና ዘይት) ትመገባሉያለሽ | በቀናት |
| D11 | በአዘቦት ሳምንት፣ ለምን ያክል ቀን ታፋጭነት ያለቸው ምግቦች እና መጠጦች (ለስላሳ መጠጥ፣ ስኳር፣ ቸኮሌት፣ ማር ወዘተ) ትመገባሉያለሽ | በቀናት |
| D12 | በአዘቦት ሳምንት፣ ለምን ያክል ቀን በዘይት የተጠበሱ ምግቦችን (ችፕስ፣ ሳቡሳ፣ ወዘተ) ትመገባሉያለሽ | በቀናት |

የዘይት አጠቃቀም ልምድ

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| D12 | በቤተሰብዎ ውስጥ ለምግብ ዝግጅት ብዙ ጊዜ ጥቅም ላይ የሚውለው ምን ዓይነት ዘይት ወይም ስብ ነው? | <ol style="list-style-type: none"> 1. ሳሽ የአትክልት ዘይት 2. የተጠናከረ የአትክልት ዘይት 3. ቅቤ 4. ማርጋሪን / የአቶሎኒ ቅቤ 5. ሸኖ ለጋ 6. ሌላ 7. 16. ምንም አንጠቅመም |
| D13 | በአማካይ በሳምንት ስንት ምግብ በቤት ውስጥ ያልተዘጋጁ ምግብ ይመገባሉ? | ምግቦች |

ክፍል አራት: የአካል ብቃት እንቅስቃሴ

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| P1 | ሥራዎ እንደ ትንፋሽ ወይም የልብ ምትን የመሰለ ክፍተኛ ጭንቀትን [ከባድ ሽክምትን መሸከም ወይም ማንሳት ፣ መቆፈር ወይም የግንባታ ሥራ] ቢያንስ ለ 10 ደቂቃዎች ያለማቋረጥ የሚጨምር ኃይለኛ እንቅስቃሴን ያካትታል? | <ol style="list-style-type: none"> 2. አያካትትም 3. ያካትታል |
| P2 | በተለመደው ሳምንት ውስጥ ሥራዎ ኃይለኛ የአካል ብቃት እንቅስቃሴዎችን ስንት ቀናት ያካሂዳሉ? | _____ በ ቀናት |
| P3 | በተለመደው ቀን በሥራ ላይ ኃይለኛ እንቅስቃሴዎችን ለማድረግ ምን ያህል ጊዜ ያጠፋሉ? | _____ ሰዓት _____ ደቂቃ |
| P4 | ሥራዎ በትንሹ ትንፋሽ ወይም የልብ ምት እንደ ድንገተኛ የእግር ጉዞ [ወይም ቀላል ሽክምትን] ቢያንስ ለ 10 ደቂቃዎች ያለማቋረጥ የሚጨምር መጠነኛ ኃይለኛ እንቅስቃሴን ያካትታል? | <ol style="list-style-type: none"> 2. አያካትትም 3. ያካትታል |
| P5 | በተለመደው ሳምንት ውስጥ ሥራዎ መጠነኛ የአካል ብቃት እንቅስቃሴዎችን በስንት ቀናት ያካሂዳሉ? | _____ በ ቀን |
| P6 | በተለመደው ቀን በሥራ ላይ መጠነኛ የአካል ብቃት እንቅስቃሴዎችን ለማድረግ ምን ያህል ጊዜ ያጠፋሉ? | _____ ሰዓት _____ ደቂቃ |
| P7 | በተከታታይ ቢያንስ ለ 10 ደቂቃዎች በብስክሌት ይጓዛሉ ወይም ይጠቀማሉ? | <ol style="list-style-type: none"> 2. አያካትትም 3. ያካትታል |
| P8 | በተለመደው ሳምንት ውስጥ ለምን ያክል ቀን በተከታታይ ቢያንስ ለ 10 ደቂቃዎች ስንት ቀናት በእግር ወይም በብስክሌት ይጓዛሉ? | _____ በ ቀን |
| P9 | በተለመደው ቀን ለጉዞ በእግር ወይም በብስክሌት ምን ያህል ጊዜ ያጠፋሉ? | _____ ሰዓት _____ ደቂቃ |
| P10 | እንደ [ፍጫ ወይም እግር ኳስ] ያለማቋረጥ ቢያንስ ለ 10 ደቂቃዎች ያለማቋረጥ ክፍተኛ የትንፋሽ ወይም የልብ ምትን መጨመር የሚያስከትሉ ኃይለኛ ስፖርቶችን ፣ የአካል ብቃት እንቅስቃሴዎችን ወይም የመዝናኛ (መዝናኛ) እንቅስቃሴዎችን ያደርጋሉ? | <ol style="list-style-type: none"> 2. አያካትትም 3. ያካትታል |

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| P11 | በተለመደው ሳምንት ውስጥ ኃይለኛ ስፖርቶችን ፣ የአካል ብቃት እንቅስቃሴዎችን ወይም የመዝናኛ (መዝናኛ) እንቅስቃሴዎችን በስንት ቀናት ያካሂዳሉ? | _____ በ ቀን |
| P12 | በተለመደው ቀን ጠንከር ያሉ ስፖርቶችን ፣ የአካል ብቃት እንቅስቃሴዎችን ወይም የመዝናኛ እንቅስቃሴዎችን ለማድረግ ምን ያህል ጊዜ ያጠፋሉ? | _____ ሰዓት _____ ደቂቃ |
| P13 | ያለማቋረጥ ለ 10 ደቂቃዎች በትንሹ ትንፋሽ ወይም የልብ ምት እንዲጨምር የሚያደርጉ፣ [ብስክሌት መንዳት ፣ መዋኘት እና ቮሊቦል] መጠነኛ ኃይለኛ ስፖርቶችን ፣ የአካል ብቃት እንቅስቃሴዎችን ወይም የመዝናኛ እንቅስቃሴዎችን ያደርጋሉ? | 2. አያካትትም 3. ያካትታል |
| P14 | በተለመደው ሳምንት ውስጥ መጠነኛ ኃይለኛ ስፖርቶችን ፣ የአካል ብቃት እንቅስቃሴዎችን ወይም የመዝናኛ (መዝናኛ) እንቅስቃሴዎችን በስንት ቀናት ያካሂዳሉ? | _____ በ ቀን |
| P15 | በተለመደው ቀን መጠነኛ ስፖርቶችን ፣ የአካል ብቃት እንቅስቃሴዎችን ወይም የመዝናኛ (መዝናኛ) እንቅስቃሴዎችን ለማድረግ ምን ያህል ጊዜ ያጠፋሉ? | _____ ሰዓት _____ ደቂቃ |

የመቆመጥ ባህሪ

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| S1 | በተለመደው ቀን ለመቆመጥ ምን ያህል ጊዜ ያጠፋሉ? | _____ ሰዓት _____ ደቂቃ |
| S2 | በተለመደው ቀን ውስጥ ስንት ሰዓት ይተኛሉ። | _____ ሰዓት |
| S3 | ብዙ ጊዜ እንቅልፍ መቅረጥ አለዎት? | 1. የለም 2. አንዳንድ ጊዜ 3. በአብዛኛው |
| S4 | በአንድ ወር ውስጥ ለምን ያህል ቀናት የማታ ስራ ተረኛ እንዳለብዎ (ለሆስፒታል ሠራተኞች ብቻ) | -----በቀን |

የጭንቀት እና የጭንቀት ልኬት - 21 መለኪያ (DASS -21)

እባክዎን እያንዳንዱን መግለጫ ያንብቡ እና ባለፈው ሳምንት ውስጥ መግለጫው ለእርስዎ ምን ያህል እንደተገባረ የሚመለከት ቁጥር 0 ፣ 1 ፣ 2 ወይም 3 ላይ ከበብ ያድርጉ።
የደረጃ አሰጣጡ መጠን እንደሚከተለው ነው
0 በጭራሽ በእኔ ላይ አልተገባረም
1 በተወሰነ ደረጃ ወይም በተወሰነ ጊዜ ለእኔ ተፈጻሚ ሆነ
2 ለእኔ በተወሰነ ደረጃ ወይም በጥሩ ጊዜ ላይ ተፈጻሚ ሆነኝ
3 ለእኔ ብዙ ወይም ብዙ ጊዜ አልተገባረም

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| 1 (s) | እራሴን ለማደስታ እቸገራለው። | 0 | 1 | 2 | 3 |
| 2 (a) | የአፈዎን ደረቅነት ያውቁ ነበር | 0 | 1 | 2 | 3 |
| 3 (d) | በጭራሽ ምንም አዎንታዊ ስሜት አይሰማኝም | 0 | 1 | 2 | 3 |
| 4 (a) | የአተነፋፈሪ ችግር አጋጥሞኛል (ለምሳሌ ፣ ከመጠን በላይ ፈጣን መተንፈስ ፣ አካላዊ ድካም በሌለበት መተንፈስ) | 0 | 1 | 2 | 3 |
| 5 (d) | ነገሮችን ለማድረግ ተነሳሽነቱን መሥራት ከባድ ይሆንብዎታል። | 0 | 1 | 2 | 3 |
| 6 (s) | በሁኔታዎች ላይ ከመጠን በላይ አጻፋዊ ምላሽ እሰጣለሁ። | 0 | 1 | 2 | 3 |
| 7 (a) | እንደ መንቀጥቀጥ አጋጥሞዎት ያውቅ ነበር (ለምሳሌ በእጆች) | 0 | 1 | 2 | 3 |
| 8 (s) | ብዙ ጊዜ የመቆጣት ባህሪ የጠቀማሉ። | 0 | 1 | 2 | 3 |
| 9 (a) | እራሴን ሞኝ የማደርግበት ሁኔታ አሳስቦኝ ያሳስበኛል። | 0 | 1 | 2 | 3 |
| 10 (d) | ምንም የምጠብቀው ነገር እንደሌለኝ ይሰማኛል። | 0 | 1 | 2 | 3 |
| 11 (s) | እኔ እራሴ ተበሳጭቼ አገኛለሁ። | 0 | 1 | 2 | 3 |
| 12 (s) | እራሴን ዘና ለማድረግ እቸገራለሁ። | 0 | 1 | 2 | 3 |
| 13 (d) | የተስፋ መቁረጥ ስሜት ይሰማኛል። | 0 | 1 | 2 | 3 |
| 14 (s) | እኔ የምሠራውን እንዳላደርግ የከለከለኝን ማንኛውንም ነገር አልታገስም | 0 | 1 | 2 | 3 |
| 15 (a) | ለድንጋጤ ቅርብ እንደሆንኩ ይሰማኛል። | 0 | 1 | 2 | 3 |

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| 16 (d) | ስለማንኛውም ነገር ቅን መሆን አልቻልኩም ወይም አይሰማኝም:: | 0 | 1 | 2 | 3 |
| 17 (d) | እንደ ሰው ብዙም ዋጋ እንደሌለኝ አይሰማኝም:: | 0 | 1 | 2 | 3 |
| 18 (s) | ዝም ብሎ እኔ የተነካው ይመስለኛል :: | 0 | 1 | 2 | 3 |
| 19 (a) | ምንም ነገር በሌለበት ፍራት ፍራት ይሰማኛል (ለምሳሌ የልብ ምት መጨመር ፣ የልብ ምት ማጣት) | 0 | 1 | 2 | 3 |
| 20 (a) | ያለ ምንም ምክንያት ፍርሃት ይሰማኝ | 0 | 1 | 2 | 3 |
| 21 (d) | ሕይወት ትርጉም የለሽ እንደሆነ ይሰማኝ | 0 | 1 | 2 | 3 |
| የቤት ሀብት ፣ ቤተሰብ፣ ከሚከተሉት ንብረቶች ውስጥ አንዳቸውም አሉት? | | | | | |
| H1 | የሲዲ ማጫወቻ | 0 የለም 1. አለ | | | |
| H2 | የሚሰራ ጠፍጣፋ ማያ ገጽ ቴሌቪዥን | 0 የለም 1. አለ | | | |
| H3 | የጋዝ ምድጃ/ሲ.ሊ.ንደር | 0 የለም 1. አለ | | | |
| H4 | ማቀዝቀዣ ፍሪጅ | 0 የለም 1. አለ | | | |
| H5 | የኤሌክትሪክ ምድጃ | 0 የለም 1. አለ | | | |
| H6 | ሳይክል | 0 የለም 1. አለ | | | |
| H7 | ሞተር ሳይክል | 0 የለም 1. አለ | | | |
| H8 | ጋራ | 0 የለም 1. አለ | | | |
| H9 | ሶፍ | 0 የለም 1. አለ | | | |
| H10 | ፍራሽ | 0 የለም 1. አለ | | | |
| H11 | መኪና | 0 የለም 1. አለ | | | |
| H12 | ባጃጅ | 0 የለም 1. አለ | | | |
| H13 | ታክሲ | 0 የለም 1. አለ | | | |
| H14 | የግል ቤት | 0 የለም 1. አለ | | | |
| H15 | ታብሌት ኮምፒተር | 0 የለም 1. አለ | | | |
| H16 | ስማርት ስልክ | 0 የለም 1. አለ | | | |
| H17 | ዲጂታል ካሜራ | 0 የለም 1. አለ | | | |
| H18 | የልብስ ማጠቢያ ማሸን | 0 የለም 1. አለ | | | |
| H19 | ላፕቶፕ | 0 የለም 1. አለ | | | |
| H20 | ካውያ | 0 የለም 1. አለ | | | |
| ቦርጭ መጠን መለኪያ | | | | | |
| | የወገብ መጠን | መጠን 1-----ሴ.ሜ | | | |
| | | መጠን 2-----ሴ.ሜ | | | |

13. Declaration

This is to certify that the proposal title entitled **central obesity and its associated factors among adults aged 18-64 years in Debre Tabor Town, northeast, Ethiopia, 2021**, submitted in partial fulfilment of the requirements for the degree of /Master of public health in human nutrition department of nutrition and dietetics, Bahir Dar University, is a record of original work carried out by me and has never been submitted to this or any other institution to get any other degree or certificates. The assistance and help I received during this investigation have been duly acknowledged.

Principal investigator

Tigist Yismaw (BSc in PHO)

Name

_____ signature

_____ Date

Advisors

Dr. Netsanet Fentahun(Double PhD, Associate Prof)

Name

_____ Signature

_____ Date

Ms. Hanna Demelash(MPH, Ass,t Prof)

Name

_____ Signature

_____ Date