

LITERATURE REVIEW: THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND CENTRAL OBESITY IN ADULTS

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ABSTRACT

Central obesity occurs due to the accumulation of excess fat in the abdominal area. If this happens to individuals, it can increase the risk of chronic disease. One of the factors that can prevent central obesity is physical activity. Therefore, we aimed to examine scientifically related to the role of physical activity as a risk factor for central obesity in adult. This study is a literature review study using the PICO (population, intervention, comparators, and outcome) method. The databases used in this research are Embase, Pubmed, and Scopus. Literature that is eligible to be selected until the end is literature that has met the inclusion criteria based on the results of a full-text review. There were ten articles after going through the exclusion based on criteria. The results of five in ten articles show that physical activity has a statistically significant association with central obesity. High sedentary activity among men can increase the risk of central obesity. Low physical activity indicates that energy expenditure is also low so excess fat accumulates in the abdominal area can increase the risk of central obesity.

Keywords: Central obesity, physical activity, adult.

INTRODUCTION

Central obesity, also known as abdominal or visceral obesity, is a health problem characterized by excess fat accumulation in the abdominal area.¹ This can impact individual health, leading to conditions such as diabetes mellitus, hypertension, cardiovascular disease, various types of cancer, and death.¹ Central obesity can stimulate insulin resistance, dyslipidemia, endothelial dysfunction, and inflammation, all of which contribute to the development of chronic diseases.² Increased insulin resistance occurs simultaneously with increased body fat levels.

Research shows that the prevalence of central obesity in the United States is higher than general obesity, at 52.9%, and increases with age.³ Research by Ali et al. also shows that the risk of central obesity increases with age.⁴ The global prevalence of obesity is increasing due to a lack of physical activity and unhealthy food consumption. Lack of physical activity can lead to an energy imbalance, where excess energy is stored as fat reserves. Excess fat is often found in the abdominal area, causing abdominal enlargement and an increase in waist circumference.⁵

Research in Ethiopia showed that adults who were physically inactive had a 64.5% increased risk of abdominal obesity.⁶ A similar study in adults in Spain showed that adults who engaged

in more vigorous physical activity had a lower risk of abdominal obesity.⁷ Physical activity of less than 150 minutes per week is not sufficient to prevent central obesity in adults.⁷ Therefore, physical activity can be an effort to prevent weight gain and reduce the risk of chronic disease.⁸

Based on the above background, physical activity plays a significant role in the incidence of central obesity. Therefore, this study aims to scientifically examine the role of physical activity as a risk factor for central obesity, particularly in adults, systematically screened based on criteria related to the research topic..

METHODS

This study is a literature review study using the PICO (population, intervention, comparators, and outcome) method. The writing flow in this study uses PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) consisting of four stages, namely: Identification, screening, eligibility, include. In the initial stage, the researcher identified articles that comply with PICO and sourced from three databases, namely Embase, Pubmed, and Scopus with the keywords "Adult" AND "Physical Activity" AND "Central Obesity" OR "Abdominal Obesity" OR "Visceral Obesity". Then the literature was selected according to the inclusion and exclusion criteria that have been set. The following table 1. PICO and table 2. Inclusion and exclusion criteria in this study:

Tabel 1. *The Population, Intervention, Comparators, and Outcome (PICO)*

<i>Population</i>	<i>Intervention</i>	<i>Comparators</i>	<i>Outcome</i>
Adults Age 18-64 Years	Low of Physical Activity	Sufficient Physical Activity	Central Obesity

The selected literature has met the inclusion criteria including research articles from the last 10 years (2013-2023), observational cross-sectional study design, English language, and article type that can be accessed freely. The accessed literature will be entered into the Zotero application for screening by seeing whether there are articles with similar titles and authors (duplication). After checking for duplication, the eligible stage is carried out, namely checking articles that meet PICO and other inclusion criteria through abstract review. The final stage of this study is reviewing the full text of the article which aims to assess the quality of the study with a measuring tool in the form of a CEBM (Critical Appraisal) checklist. The CEBM checklist consists of 12 questions and scores. Later, the score with a cut-off point of $\geq 68\%$ of the number of questions (8 questions yes/complete) then the article that is assessed becomes the selected article.

DISCUSSIONS

Based on the results of the article search from three databases, a total of 2,683 articles were obtained. A duplication test was then conducted, and 912 articles were excluded due to similarities in title and author. The articles were then reviewed based on title and abstract. A total of 1,732 articles were excluded because they did not meet the research PICO. After

conducting a full-text search, 32 articles were obtained with free full text. The final stage of this study was to assess the quality of the studies, and 10 articles were found to meet the criteria and be accepted (Figure 1):

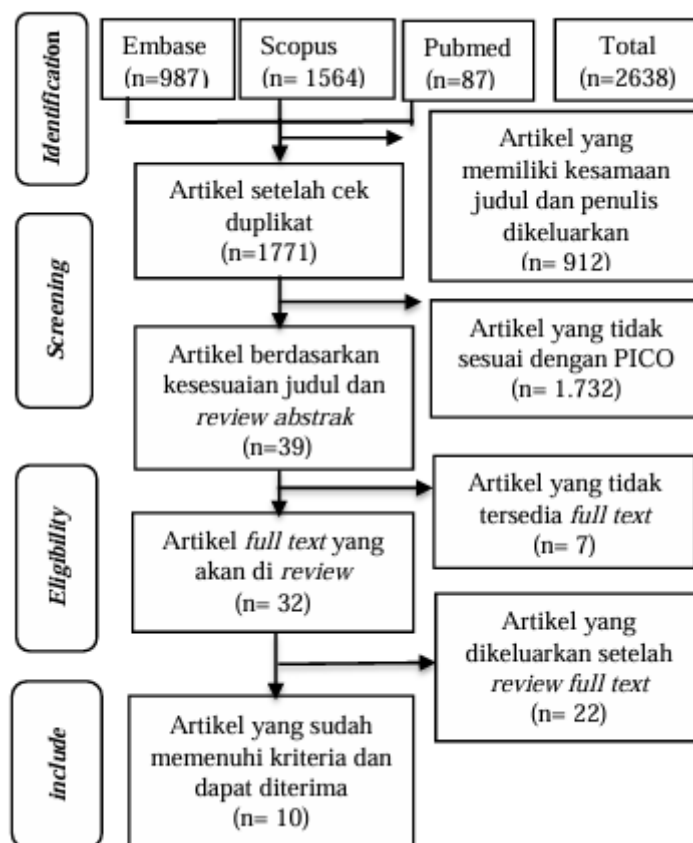


Figure 1.

Table 2 presents the results of a review of 10 articles with cross-sectional study designs, grouped by researcher name, study title, study location, sample size, and results. Five studies found a significant association between physical activity and central obesity. Furthermore, three of the five studies found no association with central obesity after adjusting for other factors. The findings also included articles assessing physical activity in relation to sedentary activity. Based on the literature obtained in this study, the cut-off points for central obesity vary, as do the questionnaires used to assess physical activity. This could influence the differences in results from each study



Table 2. Literature Review Findings Based on Three Online Databases

No	Name of Researcher/Year of Publication	Research Title	Location	Variable	Sampling Techniques and Sample Sizes	Results
1.	Islam et Al (2020) ¹⁰	Prevalence and associated risk factors of general and abdominal obesity in rural and urban women in Bangladesh	Bangladesh	Age, economic status, level of education, and physical activity	Teknik sampling: <i>systematic sampling</i> Sample: female age ≥ 18 year with 450 participants (210 rural and 240 urban)	Low physical activity was associated with abdominal obesity with OR = 1.82 (95% CI 1.28 – 2.34) and <i>p-value</i> < 0.001.
2.	Ali et al (2022) ⁴	Prevalence and risk factors of general and abdominal obesity and hypertension in rural and urban residents in Bangladesh: a cross-sectional study	Bangladesh	Age, gender, level education, socioeconomic status, BMI, residence, region geographical, hypertension, smoking status, and physical activity.	Teknik sampling: <i>systematic sampling</i> Sample: 1410 participants (626 rural and 784 urban) ≥ 18 years old.	Lack of physical activity significantly related to incidence of abdominal obesity (AOR= 1,13; 95% CI = 1,02 – 1,88; <i>p-value</i> 0,045)
3.	Bereka Et al (2022) ¹¹	Prevalence of abdominal obesity and associated risk factors among women civil servants in Addis Ababa, Ethiopia, 2021: an institution-based study	Ethiopia	Socio-demographics (age, status Marriage, Education, Religion, Income, and Size family), food intake, physical activity, and risky behaviors (smoking, alcohol consumption,	Sampling Technique: <i>Multistage random sampling</i> . Sample: 478 women who Work as an employee civil servants.	Physical activity < 600 minutes/week Not related to obesity central to working women as a civil servant (AOR=1.875, 95% CI: 0,540 – 6,515).



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4.	Ben Ayed et al. (2019) ¹²	Prevalence, determinants and outcomes of general and abdominal obesity in medical students	Tunisia	Gender, age, marital status, current place of residence, family financial situation, eating habits, current level of physical activity (type and time spent), smoking status, alcohol consumption, and stress level.	Teknik sampling: <i>stratified random sampling</i> Sample: 524 medical students	Light physical activity 4 or more times per week is a protective factor for abdominal obesity (AOR = 0.37, 95% CI = 0.15 - 0.9; p = 0.036)
5.	Lee, et Al (2022) ¹³	Effects of Recreational Physical Activity on Abdominal Obesity in Obese South Korean Adults	Korea	Sociodemographics, risky behaviors (smoking status, alcohol consumption, Sleep Time, Energy Intake Levels, physical activity)	2343 people $\geq$ 19 years old	Recreational physical activity in adult men and women can reduce the risk of abdominal obesity after adjusting for abdominal obesity with general characteristics and health behaviors (male OR = 0.69; 95% CI = 0.51–0.92); OR female = 0.61; 95% CI= 0.40–0.94).
6.	Ayogu et al (2022) ¹⁴	Epidemiological characteristics of different patterns of obesity among adults in rural communities of south-east Nigeria: a	South East Nigeria	Sociodemographics, physical activity, alcohol consumption, food intakeconsumption, food	Sampling technique: <i>multistage sampling</i> Sample: 500 adults aged 20–60 years	Individuals who engage in strenuous physical activity are protective factors for abdominal obesity (AOR= 0.76; 95% CI=0.30 – 1.91)



		population-based cross-sectional study		intake		
7.	Rathnayake et al (2014) ¹⁵	High carbohydrate diet and physical inactivity associated with central obesity among premenopausal housewives in Sri Lanka	Sri Lanka	Age, income level, education level, ethnicity, physical activity, and energy intake.	100 wanita premenopause Age 20-45 years old	Women who are not physically active are at 3.32 times the risk of developing central obesity compared to women who are active physical activity (OR = 3.32; 95% CI= 1.14 – 9.68)
8.	Tesfaye et al. 2020) ⁶	Dietary diversity and physical activity as risk factors of abdominal obesity among adults in Dilla town, Ethiopia	Ethiopia	Sociodemographics, food intake , physical activity, and risk behaviors.	Sampling technique: <i>multistage sampling</i> Sample: 634 adults aged 18-64 years	Respondents who were not physically active were 2.7 times more likely to experience abdominal obesity than respondents who were actively physically active (AOR=2.68; 95% CI = 1.70 - 4.22)



9	Kim et al. (2019) ⁹	Factors Affecting Obesity and Waist Circumference Among US Adults	United States	Physical activity, watching television or computer use, food intake	Sampling technique: <i>multistage sampling</i> Sample: 4118 adults aged 20-64 years	People who watched television or video for more than 2 hours a day had a 1.96-fold increase (95%, 1.29%–2.98%) in men and in women 1.66 times more likely to be centrally obese (95% CI, 1.06%–2.59%). Moderate recreational physical activity of more than 150 minutes a week was associated with a reduced likelihood of abdominal obesity for men (OR, 0.44; 95% CI. 0.22%–0.89%) and women (OR, 0.98; 95% CI 0.23%–0.67%).
10.	da Costa et al (2014) ¹⁶	Prevalence of obesity, overweight and abdominal obesity and its association with physical activity in a federal University	Brazil	Usia, jenis kelamin, warna kulit, status perkawinan, tingkat pendidikan, pendapatan, kebiasaan merokok, konsumsi alkohol, konsumsi makanan, dan aktifitas fisik.	Teknik sampling: <i>simple random sampling</i> . Sampel: 299 karyawan	Aktifitas fisik rendah dan sedang berhubungan dengan obesitas sentral dengan masing-masing PR yaitu (PR = 1,70; 95% CI 1,11 – 2,58) dan (PR = 1,74, 95% CI 1,14 – 2,66)

Central obesity is a risk factor for cardiometabolic syndrome. Central obesity can be measured using waist circumference, waist-to-hip ratio, and waist-to-height ratio. However, in our study, most of the literature focused on waist circumference measurements. Central obesity measurements were superior in predicting the risk of cardiovascular disease and mortality compared to general obesity measures, namely *Body Mass Index* (BMI).^{17,18}

Adults who are physically inactive are more likely to develop abdominal obesity than those who are physically active. Physical activity plays a crucial role in maintaining a balance between energy intake and expenditure, preventing obesity. Therefore, physical activity, ranging from light to high intensity, is highly recommended to prevent abdominal obesity.⁶ Based on research by Ali et al and Islam et al in Bangladesh, it was shown that the prevalence of abdominal obesity was greater in urban areas and in women.^{4,10} This is in line with research in India that central obesity has a strong association in women and urban populations.¹⁹

This is associated with urban residents engaging in less physical activity because more of them work as office workers.^{4,10} Research conducted in Ethiopia also showed that low physical activity was significantly associated with central obesity in office workers and staff working at the Federal University.^{16,20} However, in contrast to the research by Bereka et al, low physical activity was not associated with central obesity in women working as civil servants.¹¹ These results are in contrast to research by Ayogu et al., which showed that heavy physical activity had no relationship with the incidence of central obesity (AOR= 0.76; 95% CI=0.30 – 1.91; *p-value*

=0,746).¹⁴ This may be related to the possibility of inconsistent heavy physical activity.¹⁴ The risk of obesity can be reduced if individuals are consistently active. Regular physical activity can increase energy expenditure, which reduces the risk of general or central obesity.²¹

High levels of central obesity in women are also associated with physical inactivity. This is consistent with research in Ethiopia that found that central obesity in women is associated with less physical activity, as most women are housewives, spending more time at home.²² Research by Rathnayake et al. proved that premenopausal housewives who were not physically active were associated with central obesity and had a 3.32 times greater risk of experiencing central obesity.¹⁵ Women who are housewives usually do repetitive household chores every day.

This results in housewives engaging in minimal exercise, such as aerobics, cycling, jogging, and other upper body muscle-inducing activities that can reduce the risk of abdominal fat accumulation. Furthermore, in today's era, many household chores utilize practical, sophisticated tools that make them less energy-intensive, thus increasing physical activity.

in housewives do not meet the intensity of sufficient activity.¹⁵ Lack of physical activity indicates low energy expenditure, resulting in fat accumulation which can trigger central obesity.²⁰ Research shows that women have a higher percentage of body fat than men, and this is linked to changes in the hormone estrogen, which plays a role in fat distribution in women. Estrogen may play a role in protecting against abdominal fat accumulation in women. However, after menopause, estrogen levels decrease, which can increase the risk of central obesity.¹⁹

Research by Ben Ayed et al shows that light, moderate, and heavy activity in medical students can reduce the risk of obesity.¹² However, some medical students don't engage in regular physical activity like jogging or walking. This is due to technological advances like the

internet, games, private vehicle ownership, and so on, which encourage students to adopt a sedentary lifestyle.¹² In contrast to the research by Kim et al, the physical activity assessed was not only based on strong and moderate intensity, but also took into account sedentary physical activity and the duration of watching television.⁹ The results showed no association between moderate and vigorous-intensity physical activity. However, the study found a link between sedentary physical activity and television viewing and central obesity.⁹ This is related to the effects of sedentary physical activity and watching television, namely increasing the consumption of unhealthy foods and drinks and decreasing energy expenditure, thus triggering the accumulation of fat in the body.²³

In the research of Bereka et al, Ayogu et al, and Kim et al, it is explained that *recall bias* can occur in physical activity questions, because respondents have to report on physical activity activities they have done previously, so that it can cause the research results to be *underestimate* or *overestimate*.^{9,11,14} In contrast to the research by Islam et al, which had a relatively small sample, so it cannot be generalized to adult women in Bangladesh.¹⁰ The same thing happened in the research by Ben Ayed et al, that the results of the study of medical students can only be generalized to the Southern Tunisia region.¹¹ In the research of Ali et al, Bereka et al, and Kim et al, there were still factors that had not been taken into account, namely eating habits, food portions, and food frequency.^{9,11,14}

This research has limitations, namely that it can only cover research with a study design *cross sectional*, so that the researcher's findings can only describe the relationship but cannot describe the causal relationship.

CONCLUSIONS

Central obesity is a risk factor for cardiometabolic syndrome and can be prevented by regular physical activity. Physical activity is a major determinant of energy expenditure. Low physical activity levels result in low energy expenditure, leading to abdominal fat accumulation, which can lead to central obesity. Physical activity levels associated with central obesity are influenced by several factors, including residence, gender, and occupation. Low physical activity is more common among adults living in urban areas, women, or those working in offices. In women, central obesity is influenced not only by low physical activity but also by a higher percentage of body fat and decreased estrogen levels after menopause.

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