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The Relationship Between Waist–Hip Ratio and Physical Activity Among Medical Students

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Abstract:

Background: Physical inactivity contributes to central obesity and metabolic disorders among young adults with sedentary academic lifestyles. Waist–Hip Ratio (WHR) is a sensitive indicator of abdominal fat distribution and cardiometabolic risk, and medical students are particularly vulnerable due to demanding study schedules.

Aim: To analyze the relationship between physical activity level and WHR among medical students of the Faculty of Medicine, Universitas Muslim Indonesia, Class of 2022.

Methods: A cross-sectional study included 80 students selected through simple random sampling. Physical activity was measured using the Global Physical Activity Questionnaire (GPAQ) and categorized as low, moderate, or high based on the MET-min/week metric. WHR was assessed using standardized anthropometry and classified according to the WHO Asian cut-offs. Data were analyzed using univariate statistics and the Chi-square test ($p < 0.05$).

Results: Most respondents were female (75%) and aged 21 years (75%). Normal WHR was found in 62.5% of students, while 37.5% were classified as having central obesity. The majority engaged in moderate physical activity (61.3%), followed by low (20.0%) and high (18.8%) activity levels. A significant relationship was identified between physical activity level and WHR ($p < 0.001$). Students with low physical activity showed a higher proportion of central obesity (75.0%), whereas those with moderate and high activity were predominantly within normal WHR.

Conclusion: Physical activity level is significantly associated with WHR among medical students. Promoting regular physical activity is essential to prevent central obesity and associated metabolic risks in this population.

Keywords: Physical activity, waist–hip ratio, central obesity, medical students, GPAQ

INTRODUCTION

Physical activity is any bodily movement produced by skeletal muscles that requires energy expenditure. Lack of physical activity can affect a person's health and nutritional status. Low physical activity may influence fat storage in the body; adipose tissue tends to undergo anabolism, storing energy. Nutrient intake absorbed from the intestinal epithelium is transported mainly in the form of triglycerides and cholesterol, which are then stored as energy reserves in adipose tissue.[1]

Physical activity levels in Indonesia, according to the 2018 Basic Health Research (Riskesdas) data, remain very low at <50% (33.5%). This figure increased from the 2013 Riskesdas data, which was 26.1%. According to data from the World Health Organization (WHO), more than a quarter of the world's adult population (1.4 billion adults) are not sufficiently active. Globally, approximately 1 in 3 women and 1 in 4 men do not engage in sufficient physical activity to maintain health. Insufficient activity increased by 5% (from 31.6% to 36.8%) between 2001 and 2016.[1,2]

Obesity is a condition characterized by excessive fat accumulation in adipose tissue; abdominal fat is known as central obesity, whereas gluteal fat is referred to as peripheral obesity. This fat accumulation leads to impaired adipokine secretion from adipose tissue and the formation of low-grade chronic inflammatory mediators.[3] One method to determine a person's level of obesity is by measuring the Waist–Hip Ratio (WHR). WHR is an anthropometric measurement that can describe the amount of fat deposition in the abdominal cavity. WHR is obtained from the ratio between waist circumference and hip circumference.[4]

Indicators used to measure obesity include waist circumference, waist–hip ratio (WHR), and Body Mass Index (BMI). A limitation of anthropometric measurements using BMI is that it cannot assess body fat distribution, making it less sensitive for determining abdominal obesity. Measurement of waist circumference is more sensitive for assessing body fat distribution, particularly in the abdominal wall, and is also used to identify two types of fat distribution: android (upper body) and gynecoid (lower body). Waist circumference measurement has good sensitivity (82%) and specificity (72%). The World Health Organization (WHO) recommends Asia-specific cut-off points of ≥90 cm for men and ≥80 cm for women, whereas the cut-off points for WHR are ≥1.0 for men and ≥0.85 for women. Measurements exceeding these cut-off points are classified as being at risk of central obesity.[5]

Medical students tend to engage in less physical activity off campus because their lecture schedules run from morning until evening, which can disrupt their physical activity patterns. Lack of physical activity can lead to increased abdominal fat accumulation, which in turn raises the risk of hypertension and other cardiovascular problems.

Research on the relationship between physical activity and central obesity (waist-to-hip ratio, WHR) has grown rapidly in public health and preventive medicine. In general, the state of the art indicates that:

1. WHR as a key indicator of metabolic risk. Modern research confirms that WHR is more sensitive than BMI in detecting visceral obesity and cardiometabolic risk.
2. Physical activity as a key protective factor. Global and regional studies show that moderate to high physical activity is associated with: Loss of visceral fat, Increased insulin sensitivity, and decreased chronic inflammation. Loss of visceral fat, Increased insulin sensitivity,
3. Chronic inflammation decreases. Focus on the student population. In recent years, students—especially medical students—have become the focus of research because of high academic load, Sedentary lifestyle, and risk of early metabolic disorders. Dominance of cross-sectional design

The majority of studies use a cross-sectional design to identify an early relationship between lifestyle and obesity indicators. Recent research has shown that physical activity is significantly associated with WHR, particularly among young adults and college students, using standardized instruments and quantitative epidemiological methods.

LITERATURE REVIEW

Waist–Hip Ratio (WHR) is a widely used anthropometric index for assessing body fat distribution, particularly central or abdominal obesity. WHR is calculated by dividing waist circumference by hip circumference, both measured in centimeters. This measurement is considered more sensitive than Body Mass Index (BMI) in identifying visceral fat accumulation, which is strongly associated with metabolic and cardiovascular risks. The World Health Organization defines abdominal obesity as a WHR greater than 0.90 in men and greater than 0.85 in women. Higher WHR values indicate predominant fat deposition in the abdominal region, which has been consistently linked to increased risk of type 2 diabetes mellitus, hypertension, dyslipidemia, and coronary heart disease (WHO, 2011).

Standardized procedures are required to ensure accurate WHR measurement. According to WHO protocols, waist circumference should be measured at the midpoint between the lower margin of the last rib and the iliac crest, whereas hip circumference should be measured at the widest point of the buttocks. The measuring tape must be placed horizontally, without compressing the skin, and parallel to the floor. Measurement is recommended at the end of normal expiration with the subject in a relaxed standing position and feet together. Several factors may influence measurement accuracy, including respiratory phase, abdominal muscle tension, and gastrointestinal fullness; therefore, fasting prior to measurement is advised to minimize variability (WHO, 2011; NIH, 2013).

Numerous factors influence WHR, including dietary intake, sex, age, lifestyle, and physical activity. Low dietary fiber intake has been associated with reduced insulin sensitivity, leading to increased abdominal fat storage. Sex-related differences in body composition also play a role: women generally have higher total body fat, whereas men tend to have more central fat distribution. With advancing age, WHR increases due to hormonal changes and gradual accumulation of visceral fat, even without substantial changes in BMI. Unbalanced dietary patterns characterized by high energy, fat, and refined carbohydrate intake further contribute to central obesity (Fahmida & Dillon, 2007).

Physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure. It encompasses activities performed during work, transportation, household tasks, and leisure time. The World Health Organization recommends adults aged 18–64 years to engage in at least 150–300 minutes of moderate-intensity or 75–150 minutes of vigorous-intensity physical activity per week, or an equivalent combination. Insufficient physical activity is recognized as a major contributor to the global burden of non-communicable diseases and is closely related to the rising prevalence of obesity and metabolic disorders (WHO, 2020).

Physical activity is commonly classified into light, moderate, and vigorous intensity based on energy expenditure. Light activities require minimal effort and expend less than 3.5 kcal/minute, such as sitting, light household chores, or slow walking. Moderate activities expend 3.5–7 kcal/minute and include brisk walking, gardening, and recreational cycling. Vigorous activities require more than 7 kcal/minute, such as running, fast cycling, or competitive sports. In research settings, physical activity is frequently assessed using standardized instruments such as the Global Physical Activity Questionnaire (GPAQ), which

assesses activity across occupational, transportation, and leisure domains and converts it into MET-minutes per week (WHO, 2012).

Regular physical activity provides numerous health benefits, including weight control, improved insulin sensitivity, reduced blood pressure, improved lipid profile, and prevention of cardiovascular disease. The Indonesian Ministry of Health emphasizes that physical activity also improves musculoskeletal strength, mental health, and overall quality of life. Conversely, sedentary behavior promotes positive energy balance and adipocyte anabolism, leading to increased triglyceride storage in adipose tissue, particularly in the abdominal region (Kemenkes RI, 2018).

Evidence suggests a significant relationship between physical activity and WHR. Low physical activity reduces energy expenditure and facilitates visceral fat accumulation, resulting in elevated WHR. Central obesity is characterized by chronic low-grade inflammation and dysregulated adipokine secretion, which contribute to metabolic syndrome and cardiovascular complications. Conversely, adequate physical activity enhances lipolysis, improves muscle glucose uptake, and reduces abdominal fat deposition, thereby lowering WHR and related health risks (WHO, 2020).

Studies among young adults and university students have shown that individuals with higher physical activity levels tend to have better anthropometric profiles, including lower WHR. However, lifestyle factors common among students—such as prolonged sitting, irregular eating patterns, and academic stress may limit the protective effect of physical activity. Therefore, assessment of physical activity using validated tools such as the GPAQ, combined with WHR measurement, is essential for identifying individuals at risk of central obesity and for developing targeted preventive interventions.

Based on the existing literature, WHR is a reliable indicator of central obesity, while physical activity represents a major modifiable determinant of body fat distribution. Understanding the relationship between physical activity levels and WHR among medical students is important to support early prevention of metabolic and cardiovascular diseases. This study, therefore, aims to analyze the characteristics of WHR in relation to physical activity levels among medical students of the Faculty of Medicine, Universitas Muslim Indonesia, Class of 2022.

Although this research makes an important contribution, there are still some unanswered research gaps:

1. Limitations of Longitudinal Design. Gap: The study used a cross-sectional design, thus: Unable to explain cause-and-effect relationships; Not knowing WHR changes over time. Research Needs: Longitudinal or cohort studies to monitor the progression of central obesity during the study period.
2. Not Including Nutritional Factors. Gap: Variables of diet, calorie intake, and diet quality were not analyzed. Research Needs: Multivariate studies that integrate: Physical activity; Diet; Nutritional status; Sleep habits
3. Lack of Psychosocial Analysis. Gap: Academic stressors, burnout, and mental health have not been measured. Research Needs: Interdisciplinary research that links: Stress; cortisol; Visceral obesity; Physical activity
4. Limitations of Generalization. Gap: Sample only from one university and one batch. Research Needs: National or regional multi-center studies to enhance external validity.
5. No Intervention Evaluation. Gap: The research is observational; solutions have not yet been tested. Research Needs: Experiment or quasi-experiment on: Campus sports program; Lifestyle interventions; Health-based curriculum
6. Not Measuring Clinical Metabolic Indicators. Gap: No measurement of biomarkers such as Blood sugar, Lipid profile, and Blood pressure. Research Needs: Integrative study of anthropometrics–biochemistry.

Further research needs to develop longitudinal, multivariate, multi-site, and intervention-based designs that incorporate nutritional, psychological, and metabolic biomarker factors.

Summary in Table Form

Aspects	Description
State of the Art	Physical activity was shown to be significantly associated with WHR using standard instruments
Novelty	Local evidence of Indonesian medical students with global standards and an early risk focus
Research Gap	Not yet longitudinal, not multivariate, not yet interventional, and not yet biochemical

METHOD

Study Design

This study employed a quantitative analytical approach with a cross-sectional design to examine the relationship between Waist–Hip Ratio (WHR) and physical activity levels

among medical students of the Faculty of Medicine, Universitas Muslim Indonesia, Class of 2022. The design enabled simultaneous measurement of WHR and physical activity at a single point in time without intervention.

Population and Sample

The study population comprised 383 active medical students from the Class of 2022. Simple random sampling was used to ensure that each member of the population had an equal probability of selection as a respondent. The minimum sample size was calculated using the Slovin formula, with a 10% margin of error, yielding 80 respondents. Data collection was conducted until the required sample size was achieved.

Inclusion and Exclusion Criteria

Inclusion criteria were active students of the Faculty of Medicine, UMI Class of 2022, who were willing to participate, provided informed consent, completed the questionnaire, and underwent waist and hip circumference measurements. Exclusion criteria were students who refused to follow the entire research procedure, were pregnant or breastfeeding, or were undergoing a specific diet program that could affect body composition.

Operational Definition of Variables

The independent variable in this study was physical activity level measured using the Global Physical Activity Questionnaire (GPAQ) and categorized into low (<600 MET-minutes/week), moderate (600–3000 MET-minutes/week), and high (>3000 MET-minutes/week) on an ordinal scale. The dependent variable was Waist–Hip Ratio (WHR), calculated by dividing waist circumference by hip circumference, and classified as normal or central obesity based on WHO criteria (men: ≤0.90 normal, >0.90 central obesity; women: ≤0.85 normal, >0.85 central obesity), using an ordinal scale.

Research Instruments and Data Collection Procedures

Physical activity data were obtained using the GPAQ questionnaire. Waist and hip circumferences were measured directly using a standardized measuring tape (metlin) with an accuracy of 0.10 cm. After obtaining informed consent, respondents completed the GPAQ questionnaire, followed by anthropometric measurements conducted by trained researchers. All collected data were reviewed for completeness and accuracy prior to analysis.

Data Analysis

Data were analyzed using SPSS software. Univariate analysis was performed to describe the distribution of WHR and physical activity levels, expressed as frequencies and

percentages. Bivariate analysis was conducted using the Chi-square test to determine the relationship between physical activity level and WHR, with a significance level of $p < 0.05$.

RESULT AND DISCUSSION

Univariate Analysis

Table 1. Characteristics of Respondents Based on Gender, Age, Waist–Hip Ratio, and Physical Activity Level

Characteristic	Frequency (n)	Percentage (%)
Gender		
Male	20	25.0
Female	60	75.0
Age (years)		
20	7	8.8
21	60	75.0
22	12	15.0
23	1	1.3
Waist–Hip Ratio (WHR)		
Normal	50	62.5
Central Obesity	30	37.5
Physical Activity Level		
Low	16	20.0
Moderate	49	61.3
High	15	18.8
Total	**80**	**100.0**

Source: ***Primary Data***

Based on Table 1, the majority of respondents were female (60; 75%), whereas male respondents accounted for 20 (25%). Most respondents were 21 years old (60; 75.0%), followed by 22 years (15; 18.8%), 20 years (8; 8.8%), and 23 years (1; 1.3%).

Regarding waist–hip ratio, most respondents were classified as normal (50; 62.5%), whereas 30 (37.5%) were categorized as having central obesity. Regarding physical activity, the largest proportion of respondents reported a moderate level of activity (49; 61.3%), followed by low activity (16; 20.0%) and high activity (15; 18.8%).

Characteristics of Body Mass Index According to Physical Activity Level

Table 2. Distribution of Body Mass Index According to Physical Activity Level

WHR Category	Low Activity	Moderate Activity	High Activity	Total	p-value
	n (%)	n (%)	n (%)	n (%)	
Normal	4 (25.0)	33 (67.3)	13 (86.7)	50 (62.5)	**0.001**
Central Obesity	12 (75.0)	16 (32.7)	2 (13.3)	30 (37.5)	
Total	**16 (100)**	**49 (100)**	**15 (100)**	**80 (100)**	

Source: Chi-Square Test

Among respondents with a normal waist–hip ratio, most (33; 67.3%) were in the moderate activity group. The next highest proportion was in the high activity group, with 13 respondents (86.7%), whereas the lowest proportion was in the low activity group, with 4 respondents (25.0%). In the central obesity category, the largest proportion was observed in the low-activity group, comprising 12 respondents (75.0%). Furthermore, the moderate activity group comprised 16 respondents (32.7%), whereas the lowest proportion was in the high activity group, with 2 respondents (13.3%). The Chi-square test yielded a p-value < 0.001, indicating a statistically significant association between waist–hip ratio and physical activity level among respondents.

DISCUSSION

General Characteristics of Respondents

The respondents in this study were predominantly female (75%) and only a small proportion were male (25%). This composition is important because the prevalence and pattern of body fat distribution often differ between males and females, which directly affects the Waist–Hip Ratio (WHR). A study by Gornale demonstrated that the cut-off value for central obesity differs by gender >0.85 for females and >0.90 for males, indicating that women are more likely to be classified as having central obesity even with relatively small increases in waist circumference. These findings are relevant to the characteristics of this study, in which the dominance of female respondents may influence the distribution of WHR categories observed in the study population.

The age distribution of respondents, which was concentrated at 21 years (75%), also provides an interesting overview regarding metabolic conditions and the risk of central obesity in young adults. Based on the literature on aging, young adulthood represents a physiological transition during which physical activity patterns, dietary habits, and lifestyle changes begin to shape long-term visceral fat accumulation. The study emphasized that a decline in physical activity often begins in early adulthood and may increase the risk of inflammation and abdominal fat accumulation, which directly contributes to an increase in WHR. Therefore, the age composition in this study is highly relevant for assessing the relationship between WHR and physical activity.

Furthermore, the relatively homogeneous composition by gender and age provides important context for interpreting the relationship between physical activity and central obesity. Gutierrez reported that a high WHR is closely associated with reduced physical

function in older adults; however, they also emphasized that early changes in visceral fat can begin at a young age and tend to be progressive. These findings underscore the importance of examining WHR in young adult populations, such as those in this study, as this phase is a critical period for preventing sustained increases in abdominal fat.

Demographically, most respondents were within the productive age group with varying levels of daily physical activity. This condition is consistent with research by Kelly, which found that variations in physical activity significantly influence central adiposity in adult African American men. Although Kelly's study focused on a different population, the physiological principles remain similar: physical activity is a major determinant of body fat distribution, including in young adults. Thus, the characteristics of respondents in this study provide a strong foundation for understanding how variations in physical activity may influence WHR.

In this study, gender and age characteristics help explain the patterns observed in WHR categories and physical activity levels in subsequent analyses. The predominance of female respondents and the young-adult age range may have influenced the observed distribution of central obesity. Previous studies have shown that these two factors are significant biological and behavioral determinants related to increased visceral fat. Therefore, the general description of respondent characteristics provides an important foundation for understanding the relationship identified between WHR and physical activity level in this study.

Distribution of Waist–Hip Ratio (WHR)

The distribution of WHR in this study showed that most respondents were in the normal WHR category (50 individuals, 62.5%), whereas the remaining 30 individuals (37.5%) were classified as having central obesity. The predominance of normal WHR in this sample indicates that most respondents were still within anthropometric ranges that do not indicate significant abdominal adiposity. However, the central obesity rate of 37.5% remains a proportion that requires attention, considering that central obesity has greater health consequences than general obesity, particularly in relation to cardiometabolic risk. This is consistent with findings by Yang Zhu, who reported that WHR is a sensitive indicator of body fat distribution and metabolic disease risk in adolescents and young adults.

When stratified by gender, the WHR distribution showed an interesting pattern. Among female respondents, 37 were categorized as having normal WHR, while 23 were classified as having central obesity. Meanwhile, among male respondents, 13 had normal

WHR and 7 were categorized as centrally obese. In percentage terms, females had a higher proportion of central obesity than males. This is consistent with findings by Aristo, who reported that body fat distribution differs by gender, with women tending to accumulate fat in the pelvic and waist regions, which may increase the risk of high WHR, along with hormonal and metabolic changes. Although the population in Gutierrez's study consisted of older adults, this biological distribution pattern may emerge earlier in young adulthood, as suggested by other studies on early adult physiological transition.

The proportion of central obesity of 37.5% in this study is also consistent with biological mechanisms described by Banerjee, who reported that visceral fat accumulation in young adults may increase due to lifestyle changes, reduced physical activity, and increased sedentary behavior. Persistent low-grade inflammation is a mechanism that contributes to abdominal fat accumulation, as reflected by increased WHR. Therefore, the prevalence of central obesity among respondents in this study indicates a potential long-term metabolic risk if not balanced with adequate physical activity.

This finding is also relevant to research by Lockie, which reported that participants with lower levels of physical activity tended to experience increased WHR. Lockie explained that although physical activity interventions did not significantly reduce WHR across all age groups, the overall pattern indicated that increased physical activity reduced central fat accumulation, particularly in individuals under 50 years of age. This mechanism strengthens the interpretation that the proportion of central obesity found in this study may be influenced by physical activity levels.

The WHR distribution in this study can also be analyzed in the context of young adult health, where central obesity is not only related to cardiometabolic risk but also serves as an early indicator of impaired physical function. Gutierrez found that increased WHR was associated with reduced physical performance in adults, including reduced muscle strength and mobility. Although respondents in this study were younger, increased WHR in this group may serve as an indicator of long-term risk requiring early intervention, particularly through increased physical activity.

Overall, the WHR distribution in this study indicates that although most respondents had normal WHR, the proportion with central obesity remains relatively high and warrants special attention. Imbalance in body fat distribution, as reflected by high WHR values, is an important factor in assessing its relationship with physical activity level, as biological pathways linking the two have been supported by numerous previous studies. These findings

emphasize the importance of understanding WHR patterns in the context of metabolic health and as a basis for interpreting the relationship between WHR and physical activity.

Distribution of Physical Activity Levels

The distribution of physical activity levels showed that most respondents were in the moderate activity category, totaling 49 individuals (61.3%). The high-activity group comprised 15 individuals (18.8%), whereas the low-activity group comprised 16 individuals (20%). This proportion indicates that most respondents had an adequate level of activity, although they did not reach the high intensity required for optimal physiological benefits on body composition. This distribution is consistent with characteristics of young adult populations, who generally have moderate physical activity due to academic or work routines but do not always engage in regular high-intensity exercise. This pattern aligns with findings by Syahputri, who reported that many adults have moderate but unstable physical activity levels, resulting in suboptimal protective effects against central adiposity.

The presence of low activity levels in some respondents (20%) supports findings from various studies that sedentary lifestyles are increasingly common in young adulthood. Research by Gornale emphasized that modern lifestyle changes, such as increased use of digital devices and reduced spontaneous physical activity, influence daily activity patterns and increase the risk of visceral fat accumulation. This mechanism may explain why the low activity group in this study showed a higher proportion of central obesity in the WHR–physical activity analysis. Metabolic changes resulting from insufficient physical activity contribute to increased inflammation and decreased fat metabolism efficiency, ultimately promoting increased WHR.

The dominance of the moderate activity group suggests potential metabolic protection, although the effect is less pronounced than in the high activity group. This is in line with findings by Bellocco, who showed that both moderate and high-intensity physical activity are associated with reduced mortality risk, particularly in individuals with abdominal obesity. The study reported that moderate–to–high physical activity can reduce metabolic risk by improving insulin sensitivity, reducing inflammation, and enhancing lipid metabolism. These findings are relevant to the distribution of physical activity in this study, as most respondents were at an activity level that provides some benefit, although a significant proportion of respondents had central obesity.

Relationship Between WHR and Physical Activity Level

Statistical analysis showed a significant relationship between WHR and physical activity level ($p < 0.001$). The pattern was consistent: respondents with normal WHR were predominantly in the moderate (67.3%) and high activity (86.7%) groups, whereas central obesity was predominantly observed in the low activity group (75%). This distribution indicates that physical activity plays a strong role in preventing central fat accumulation, reflected by increased WHR.

These findings are consistent with studies from Medip Academy, which reported that adolescents with high physical activity levels tended to have normal WHR, whereas those with low activity levels were at higher risk of central obesity. Similar evidence from *Aging* emphasized that low physical activity is strongly associated with increased abdominal fat, a pattern clearly observed in this study.

From a physiological perspective, the relationship between physical activity and WHR can be explained through mechanisms involving visceral fat metabolism, insulin sensitivity, and systemic inflammation. Low physical activity is associated with increased inflammation, reduced fat oxidation, and faster visceral fat accumulation, which directly elevates WHR.

However, central obesity may still occur even among individuals with high physical activity levels due to complex interactions among energy balance, dietary patterns, and psychological stress. Excess caloric intake and chronic stress can activate the hypothalamic–pituitary–adrenal axis, increasing cortisol secretion, which promotes visceral fat storage. Visceral adipose tissue also functions as an endocrine organ producing proinflammatory cytokines such as IL-6 and TNF-α, which contribute to insulin resistance and persistent abdominal fat accumulation. Therefore, central obesity in individuals with high physical activity cannot be explained solely by activity level but results from interactions among behavioral, psychological, hormonal, and metabolic factors.

The main novelty of this research lies in the following aspects:

1. Specific Local Context. This study specifically examines: Students of the Faculty of Medicine, Muslim University of Indonesia; Class of 2022; South Sulawesi Region. This provides evidence based on the local context of Eastern Indonesia, which remains relatively underrepresented in the literature.
2. GPAQ and Cut-Off Asia integration. The study combined: GPAQ based on MET-min/week; cut-off WHR (Asia, WHO). This combination is rarely used consistently in student studies in Indonesia.

3. Focus on Early Metabolic Risk. Different from many studies that focused on adult or elderly populations, this study highlighted the risk of central obesity at a very young age (±21 years); Shows that metabolic risks have arisen since the time of medical education
4. Empirical Evidence on Prospective Health Workers. The research subjects are prospective doctors, so that: Provide a new perspective on the health of future health actors; Linking personal behavior to future professional roles
5. Prevalence Data Contribution. This study provides central obesity prevalence data (37.5%). The distribution of physical activity among medical students remains rarely systematically reported in Indonesia.

The novelty of the research lies in providing local empirical evidence on the relationship between physical activity and WHR among Indonesian medical students, using global instruments and Asian standards, with a focus on the prevention of early metabolic risks.

CONCLUSION

This study confirms a significant association between waist–to–hip ratio (WHR) and physical activity levels among medical students. Most respondents demonstrated normal WHR; however, central obesity was still observed, particularly among those with low physical activity. Moderate physical activity was associated with healthier WHR, indicating its protective role against central fat accumulation. These findings highlight the importance of regular physical activity in maintaining optimal body fat distribution. Integrating structured physical activity programs within the medical school environment is recommended to prevent central obesity and support long-term metabolic health among students.

Implication

Medical schools should integrate structured physical activity promotion into the academic environment through scheduled exercise programs, active learning breaks, and accessible sports facilities. Routine monitoring of WHR alongside physical activity assessment is recommended for early detection of metabolic risk. Strengthening lifestyle-based preventive strategies during medical training may not only improve student health but also foster future physicians who can effectively advocate for healthy behaviors in the community.

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