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CHARACTERISTICS OF BODY FAT PERCENTAGE AND IT'S DISTRIBUTION IN UDAYANA UNIVERSITY MEDICAL STUDENTS IN 2023

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ABSTRACT

The composition of fat in the body can show the balance between intake and use of nutrients in the body. If the body has more nutritional intake than it uses, then the excess nutrients (carbohydrates and protein) will be stored in the form of reserve fat in the body. Continuous accumulation of reserve fat without sufficient physical activity can cause weight gain and obesity. Obesity can trigger cardiovascular disease, metabolic syndrome, diabetes, dyslipidemia, and others. This research was conducted to determine the characteristics of body fat percentage and its distribution in Udayana University medical students in 2023. This research used a cross-sectional observational design. The respondents of this research were medical students in the class of 2020–2022 at Udayana University who met the inclusion and exclusion criteria. The sampling technique uses proportional random sampling with a minimum sample size calculated using the Slovin formula. From 105 research respondents, it was found that 49.5% of them had normal body fat percentage. In male respondents, the proportion of body fat percentage was almost the same in the normal (42.9%) and high (40.5%) groups. In female respondents, the proportion of body fat percentage was quite large in the normal (55.6%) and low (22.2%) groups. Most of the respondents had normal waist circumference (74.3%) and normal waist-to-hip ratio (68.6%).

Keywords: Body Fat Percentage., Body Fat Distribution., Waist Circumference., Waist-To-Hip Ratio., Medical Students.

INTRODUCTIONS

In the era of globalization, modernization, urbanization, and rapid economic movement, nutritional transitions, and obesogenic environments are taking place. This has led to increase in the incidence of obesity or overweight in the undernutrition problem, which is still a health problem.[1] This condition creates the double burden phenomenon, where there are problems of undernutrition and overnutrition at the same time.[2]

Nutritional status can be determined based on the intake of nutrients and the body's ability to use those nutrients.[3] Normal nutritional status is indicated by a balance between energy intake and energy expenditure. If nutrient intake and use are not balanced, the risk of being overweight will increase, which can even lead to obesity.[4] Obesity can be defined as the excessive accumulation of fat that poses a health risk.[5]

The composition of fat in the body can show the balance between the intake that enters the body and the use of those nutrients. If the body has a higher nutrient intake than its use, then the excess nutrients (carbohydrates and proteins) will be stored as reserve fat in the body. Reserve fat is usually distributed in visceral areas in the abdominal and chest cavities as visceral fat and in the subcutaneous tissue as subcutaneous fat. The accumulation of reserve fat continuously without being followed by sufficient physical activity can lead to weight gain.[6]

The college years are a time of crisis, in which there is a transition from adolescence to young adulthood physically, mentally, and socially. During this period, students begin to search for their identity, which is greatly influenced by new cultures, experiences, and changes in lifestyle.[7] One of the problems that can occur in students is the risk of being overweight due to lifestyle changes such as a decrease in the quality of good food choices, unhealthy eating patterns, and decrease in daily physical activity.[8]

Medical students have an important role in developing healthy lifestyles and promoting nutrition education in society. Doctors have two different roles in combating obesity, namely helping patients treat their obesity-related health problems as well as being an example for patients by having a healthy weight and healthy lifestyle habits.[9]

Based on the basic health research report of the Ministry of Health in Indonesia, there has been an increase in the prevalence of overweight in adults over the age of 18, from 11.5% in 2013 to 13.6% in 2018. The prevalence of obesity in Indonesia has also increased, from 14.8% in 2013 to 21.8% in 2018. There has also been an increase in central obesity from 26.6% in 2013 to 31.0% in 2018, with Bali as 4th highest in Indonesia.[10]

Obesity has a major impact on economy, work productivity, and risk of disease. Obesity can disrupt glucose tolerance and lead to diabetes. In recent years, diseases that generally occur at geriatric age can occur earlier in adulthood due to obesity. The prevalence of dyslipidemia also increases with obesity. In adolescent obesity, there is an increase in LDL cholesterol by 40% and triglycerides by 25%. This causes metabolic syndrome and triggers cardiovascular disease to occur earlier.[11]

Body fat composition can be measured by measuring body fat percentage using computed tomography (CT), magnetic resonance imaging (MRI), bioelectrical impedance analysis (BIA), and skinfold thickness. BIA is the fastest, most comfortable, and most accurate method for assessing body composition in field studies. However, this method cannot distinguish the distribution of fat within the body.[12] Simple measurement of body fat distribution can be done by indirect anthropometric measurements such as waist circumference and waist-to-hip ratio.[13]

Body fat distribution can help provide information to classify central obesity (android) and peripheral obesity (gynoid). In central obesity, body fat accumulates in the abdomen (abdominal area). Whereas in peripheral obesity, fat accumulates in the area around the hips and thighs, so people with peripheral obesity have buttocks that look larger and thighs that appear rounded. [14] Central-type obesity is known to have a higher health risk because fat cells in the abdominal area are more easily absorbed into the blood vessels and can lead to the narrowing of the arteries, thereby increasing the risk of diabetes, hypertension, stroke, liver disease, and certain types of cancer.[15]

Body fat composition measurement has not been widely used as a health indicator in Indonesia, especially at Udayana University. There is no data on the percentage of body fat and its distribution in Udayana University medical students. Based on this background, authors are interested in researching the characteristics of body fat percentage and its distribution in Udayana University medical students in 2023.

MATERIALS AND METHODS

This research is a descriptive study to determine the characteristics of body fat percentage and its distribution in Udayana University medical students in 2023. The sampling method used is proportional random sampling with samples that have been adjusted to the inclusion and exclusion criteria. The inclusion criteria for the study are active undergraduate medical students at Udayana University batch 2020–2022, who are willing to be research samples and cooperative during the research. The exclusion criteria for this study are samples that do not complete all the required data. The data taken are primary data including gender, age, batch year, body fat percentage, waist circumference, and waist-to-hip ratio. Respondent characteristic data were obtained through interviews using a questionnaire. Body fat percentage data were measured using the Omron Body Fat Monitor-HBF 306. Waist circumference and waist-to-hip ratio data were measured using a measuring tape. The collected data will be processed with simple univariate descriptive statistical calculations to describe each research variable using SPSS 25 software. Ethical Clearance Information No: 614/UN14.2.2.VII.14/LT/2023, dated March 10, 2023.

RESULTS

Table 1. Respondents Characteristics

Characteristics	Frequency (n)	Percentage (%)
Gender		
Men	42	40%
Women	63	60%
Total	105	100%
Age		
18 years	13	12.4%
19 years	38	36.2%
20 years	29	27.6%
21 years	23	21.9%
22 years	2	1.9%
Total	105	100%
Batch Year		
2020	35	33.3%
2021	35	33.3%
2022	35	33.3%
Total	105	100%

Based on Table 1, the distribution of research respondents based on gender is 42 men (40%) and 63 women (60%). The distribution of research subjects based on age is 18 years old as many as 13 people (12.4%), 19 years old as many as 38 people (36.2%), 20 years old as many as 29 people (27.6%), 21 years old as many as 23 people (21.9%), and 22 years old as many as 2 people (1.9%). The number of research subjects based on the batch year is as follows: batch 2020 as many as 35 people (33.3%), batch 2021 as many as 35 people (33.3%), and batch 2022 as many as 35 people (33.3%).

Table 2. Frequency Distribution of Body Fat Percentage and Its Distribution

Characteristics	Frequency (n)	Percentage (%)
Body Fat Percentage		
Low	5	4.8%
Normal	52	49.5%
High	32	30.5%
Very High	16	15.2%
Total	105	100%
Mean	26,72 ± 6,96	
Waist Circumference		
Normal	78	74.3%
Central Obesity	27	25.7%
Total	105	100%
Mean	79.63 ± 12,52	
Waist-to-Hip Ratio		
Normal	72	68.6%
Central Obesity	33	31.4%
Total	105	100%
Mean	0,83 ± 0,07	

Based on Table 2, the distribution of the respondents' body fat percentage is as follows: low (4.8%), normal (49.5%), high (30.5%), and very high (15.2%). The average body fat percentage of the respondents is 26.72 ± 6.96%.

The distribution of the respondents' waist circumference characteristics is as follows: normal (74.3%) and central obesity (25.7%). The average waist circumference of the respondents is 79.63 ± 12.52 cm.

The distribution of the respondents' waist-to-hip ratio is as follows: normal (68.6%) and central obesity (31.4%). The average waist-to-hip ratio of the male respondents is 0.83 ± 0.07.

Table 3. Specific Frequency Distribution of Body Fat Percentage and Its Distribution by Gender

Characteristics	Men		Women	
	n	%	n	%
Body Fat Percentage				
Low	2	4.8%	14	22.2%
Normal	18	42.9%	35	55.6%
High	17	40.5%	12	19.0%
Very High	5	11.9%	2	3.2%
Total	42	100%	63	100%
Mean (%)	22.49 ± 6.02		29.54 ± 6.09	
Waist Circumference				
Normal	31	73.8%	47	74.6%
Central Obesity	11	26.2%	16	25.4%
Total	42	100%	63	100%
Mean (cm)	84.83 ± 10.93		76.02 ± 12.30	
Waist-to-Hip Ratio				
Normal	27	64.3%	45	71.4%
Central Obesity	15	35.7%	18	28.6%
Total	42	100%	63	100%
Mean	0.87 ± 0.07		0.81 ± 0.07	

Based on Table 3, the characteristics of body fat percentage in male respondents are as follows: low (4.8%), normal (42.9%), high (40.5%), and very high (11.9%). The average body fat percentage of male respondents is 22.49 ± 6.02%, which is classified as the normal group. The characteristics of body fat percentage in female respondents are as follows: low (22.2%), normal (55.6%), high (19%), and very high (3.2%). The average body fat percentage of female respondents is 29.54 ± 6.09%, which is classified as the normal group.

The characteristics of waist circumference in male respondents are as follows: normal (73.8%) and central obesity (26.2%). The average waist circumference of male respondents is 84.83 ± 10.93 cm, which is classified as the normal group. The characteristics of waist circumference in female respondents are as follows: normal (74.6%) and central obesity (25.4%). The average waist circumference of female respondents is 76.02 ± 12.30 cm, which is classified as the normal group.

The characteristics of the waist-to-hip ratio in male respondents are as follows: normal (64.3%) and central obesity (35.7%). The average waist-to-hip ratio of male respondents is 0.87 ± 0.07, which is classified as the normal group. The characteristics of the waist-to-hip ratio in female respondents are as follows: normal (71.4%) and central obesity (28.6%). The average waist-to-hip ratio of female respondents is 0.81 ± 0.07, which is classified as the normal group.

DISCUSSIONS

Based on Table 1, the characteristics of the respondents in this study showed that most of the respondents were female, with 63 female respondents (60%) and 42 male respondents (40%). This situation is often found in the population of students in the health field. This situation also occurred in the Santoso (2017) study, with 164 female respondents (70.4%) of the total number of respondents.[16]

All of the respondents in this study were in the age range of 18–22 years, which is classified as the young adult group. According to Winpenny et al., students who are classified as young adults (18–25 years old) experience changes in many things, including diet and daily activity patterns.[17]

Based on Table 2, most of the respondents in this study had body fat percentages classified as the normal group, with 49.5% of the total number of respondents. The results of this study are in line with the research conducted by Santosa et al. in Jakarta, which stated that most of the respondents (36.1%) had normal body fat percentages. These results may be because the respondents in this study were students in the health sector who pay attention to and maintain their health.[18]

The average body fat percentage measurement for the respondents in this study was 26.72%. This value is higher than the results of a study conducted by Nugraha et al. in Bandung, which found an average body fat percentage of 25.04%.[19] However, this average value is lower than the results of a study conducted by Lisnawati et al. in Semarang, which found an average body fat percentage of 28.14%.[20]

Body fat percentage is one of the most common measurements used to assess body composition. The body still needs fat within normal limits as a source of energy.[21] Body fat is associated with several health risks, including hypertension, dyslipidemia, type 2 diabetes mellitus, and coronary heart disease. Excessive body fat percentage can impact the body's endurance and lead to fatigue.[22] However, a decrease in body fat percentage is also not good because it can lead to weight loss, muscle loss, and greater tissue damage in people with a low body fat percentage than in people with a high body fat percentage.[23]

In Table 3, the specific distribution based on gender, it was found that most male respondents had normal body fat percentage, with 42.9% of the total male respondents. The results of this study are in line with the study conducted by Sholiha et al. in Samarinda, which found a normal body fat percentage in most male respondents (59.3%).[24] In this study, the average body fat percentage measurement for male respondents was 22.49%. This value is similar to the results of a study conducted by Lisnawati et al. in Semarang, which found an average body fat percentage of 22.03% for male respondents.[20]

However, this study also found a relatively large proportion of respondents with a high body fat percentage, which was 40.5% of the total male respondents. This may be due to factors such as diet, physical activity, and socioeconomic status.[25] High body fat percentage can increase the risk of diseases related to type 2 diabetes mellitus, hypertension, coronary heart disease, dyslipidemia, reproductive function disorders, etc.[26]

In female respondents, most respondents had normal body fat percentage, which was 55.6% of the total female respondents. The results of this study are in line with the study conducted by Sholiha et al. in Samarinda, which found that 74.7% of female respondents had normal body fat percentage.[24] In this study, the average body fat percentage measurement for female respondents was 29.54%. This value is similar to the results of a study conducted by Lisnawati et al. in Semarang, which found an average body fat percentage of 29.88% for female respondents.[20]

However, this study also found a relatively large proportion of respondents with a low body fat percentage, which was 22.2% of the total female respondents. This may be due to the female perception of body image, where women tend to be dissatisfied if there is an increase in fat in their bodies.[27] Body fat itself has an important role related to reproductive function. Women with low or high body fat will experience changes in steroid hormone levels that can cause menstrual cycle disorders.[28]

Female respondents' average body fat percentage was higher than male respondents, with 29.54% for female respondents and 22.61% for male respondents. Women tend to have a higher body fat percentage than men. Women typically have 10% more body fat than men, even at the same BMI, because women have been shown to have more

subcutaneous fat in the abdomen and gluteofemoral region.[29]

Based on Table 2, most of the study respondents had a waist circumference that was classified as the normal group, with 74.3% of the total respondents, and the other respondents (25.7%) were classified as the central obesity group. The results of this study are in line with the study conducted by Lintin et al. in Palu, which stated that most (72.3%) respondents had a waist circumference that was classified as the normal group, and the other respondents (27.7%) were classified as having central obesity. Central obesity can be affected by a lack of physical activity and can have an impact on health problems such as cardiovascular system disorders.[30]

In this study, the average measurement result of the respondents' waist circumference was 79.63 cm. This value is similar to the results of a study conducted by Mighra and Djaali in Jakarta, with an average respondents' waist circumference of 79.32 cm.[31]

Waist circumference is the most practical anthropometric measurement method for measuring visceral fat. High waist circumference measurement results can be caused by lifestyle factors, diet, age, and physical activity. Waist circumference measurement can be used to predict the risk of diabetes mellitus.[32]

Based on Table 3, the specific distribution of waist circumference of respondents by gender, it was found that most male respondents had normal waist circumference, with 73.8% of the total male respondents. However, this study also found a relatively large proportion of respondents with waist circumference classified as the central obesity group, which was 26.2% of the total male respondents. The results of this study are in line with the study conducted by Santoso et al. in Jakarta, which found normal waist circumference in most male respondents (75.4%), and the other respondents (24.6%) were classified as the central obesity group.[16]

In this study, the average measurement result of the waist circumference of male respondents was 84.83 cm. This value is higher than the results of a study conducted by Ramírez-Vélez in Colombia, with an average waist circumference of male respondents of 78.4 cm.[33]

In female respondents, it was found that most respondents had normal waist circumference, with 74.6% of the total female respondents. However, this study also found a relatively large proportion of waist circumference classified as the central obesity group, which was 25.4% of the total respondents. The results of this study are in line with the study conducted by Santoso et al. in Jakarta, which found waist circumference in 76.8% of female respondents classified in the normal group, and the other respondents (23.2%) were classified in the central obesity group.[16]

In this study, the average measurement result of the waist circumference of female respondents was 76.02 cm. This value is higher than the results of a study conducted by Ramírez-Vélez in Colombia, with an average female respondents' waist circumference of 71.5 cm.[33]

Based on Table 2, most of the study respondents had a waist-to-hip ratio that was classified as the normal group, with 68.6% of the total respondents, and the other respondents (31.4%) were classified as the central obesity group. The results of this study are in line with the study conducted by Dini et al. in Bali, which stated that most (65.71%) respondents had a waist-to-hip ratio that was classified as the normal group and the other respondents (34.29%) were classified as the central obesity group.[34]

In this study, the average measurement result of the waist-to-hip ratio of the respondents was 0.83. This value is smaller than the results of a study conducted by Ilmi & Utari in Tangerang, where the average respondents' waist-to-hip ratio was 0.85.[35]

Waist-to-hip ratio (WHR) is a more accurate anthropometric measurement for assessing visceral fat than waist circumference and body mass index. WHR measurement is accurate, does not require additional costs, and is simple to be performed by healthcare workers as a screening tool for the risk of developing non-communicable diseases in the community. High WHR is a more accurate indicator of central obesity related to cardiovascular disease because it includes hip measurement, which provides information related to gluteofemoral muscle mass, bone structure, and fat accumulation in the hip.[36]

Based on Table 3, the specific distribution of waist-to-hip ratio by gender, it was found that most male respondents had a normal waist-to-hip ratio, with 73.8% of the total male respondents. However, this study also found a relatively large proportion of respondents with waist-to-hip ratio classified as the central obesity group (26.2%). The results of this study are in line with the study conducted by Dini et al. in Bali, which found a normal waist-to-hip ratio in most male respondents (64.93%), and the other respondents (35.07%) were classified as the central obesity group.[14]

In this study, the average measurement result of the waist-to-hip ratio of male respondents was 0.87. This value is higher than the results of a study conducted by Arabmokhtari in Iran, with an average of male respondents waist-to-hip ratio of 0.83.[37]

In female respondents, it was found that most respondents had a normal waist-to-hip ratio, with 71.4% of the total female respondents. However, this study also found a relatively large proportion of waist-to-hip ratio classified as the central obesity group, which was 28.6% of the total respondents. The results of this study are in line with the study conducted by Dini et al. in Bali, which found that the waist-to-hip ratio in 77.86% of female respondents was classified in the normal group and the other respondents (22.14%) were classified in the central obesity group.[14]

In this study, the average measurement result of the waist-to-hip ratio of female respondents was 0.81. This value is higher than the results of a study conducted by Arabmokhtari in Iran, with an average female respondents' waist-to-hip ratio was 0.73.[37]

Based on the research results obtained from both waist circumference and waist-to-hip ratio measurements, the proportion of central obesity measurement results in men tends to be higher than in women. In the waist circumference measurement results, the proportion of central obesity in men was 26.2%, while in women it was

25.4%. In the waist-to-hip ratio measurement results, the proportion of central obesity in men was 35.7%, while in women it was 28.6%.

Central obesity is more common in men and is characterized by the accumulation of fat in the upper body, often described as an apple-shaped body. In women, they tend to experience peripheral obesity, characterized by the accumulation of body fat in the lower abdomen, hips, thighs, and buttocks, often described as a pear-shaped body.[38]

Sex steroid hormones also play an important role in the accumulation, metabolism, and distribution of adipose tissue. Testosterone facilitates the accumulation of fat in the abdominal area, while estrogen facilitates the accumulation of fat in the gluteofemoral area. Estrogen is heavily involved in the increase and distribution of gynoid fat in women. The cessation of gonadal estrogen production during menopause is associated with the appearance of a more android fat distribution.[39,40]

The occurrence of central obesity can be triggered by several factors, such as diet, socioeconomic status, and unhealthy lifestyle.[41] Central obesity can increase the risk of developing various diseases such as dyslipidemia, diabetes mellitus type 2, hypertension, and metabolic syndrome.[42]

CONCLUSIONS AND SUGGESTIONS

Based on the research results, most respondents had a normal body fat percentage with an average measurement result of 26.72%. However, there was a variation in the proportion of the high body fat percentage group in men and the low group in women. Most respondents had a normal waist circumference, with an average measurement result of 79.63 cm. Most respondents had a normal waist-to-hip ratio, with an average measurement result of 0.83.

It is hoped that measurements of body fat percentage, waist circumference, and waist-to-hip ratio can be carried out as an initial screening procedure in healthcare centers to prevent chronic diseases, especially those related to cardiometabolic diseases. Future research is expected to use a larger, more extensive sample and involve other variables such as physical activity, diet, or body image.

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