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PREVALENCE OF OBESITY AND ITS IMPLICATIONS FOR DIABETES AND HYPERTENSION RISK

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ABSTRACT

Objective: This study aimed to determine the prevalence of obesity and assess its implications for the risk of diabetes and hypertension based on anthropometric and metabolic parameters. **Methods:** A cross-sectional study was conducted among employees of the Nursing Department at Makassar Polytechnic in 2025. A total of 42 respondents were selected using a purposive sampling technique. Anthropometric measurements included Body Mass Index (BMI) and abdominal circumference. Metabolic parameters assessed were fasting blood sugar, blood pressure, and total cholesterol levels. Data were analyzed with descriptive and inferential statistics, including Pearson and Spearman correlation tests, and logistic regression analysis ($p \leq 0.05$). **Results:** of 61.9% of respondents were classified as obese (BMI ≥ 25 kg/m²). Elevated fasting blood sugar was observed in 90.5% of respondents, with 42.9% classified as pre-diabetic and 47.6% diagnosed with diabetes. Hypertension was present in 19% of respondents, while 26.2% had high cholesterol levels. A significant correlation was found between obesity and both diabetes ($p = 0.036$) and hypertension ($p = 0.005$). **Discussion:** The findings demonstrated obesity as a major risk factor for diabetes and hypertension, with excessive body fat contributing to insulin resistance and neurohormonal dysregulation. The study underscores the need for early intervention through lifestyle modifications and workplace health programs. **Conclusion:** The high prevalence of obesity in this population is strongly linked to an increased risk of metabolic disorders. Targeted interventions focusing on dietary regulation, physical activity promotion, and regular health screenings are essential to mitigate these risks.

Keywords: Obesity, diabetes, hypertension, metabolic risk.

BACKGROUND

Obesity, characterized by the excessive accumulation of body fat detrimental to health, has emerged as a significant global health concern, with its prevalence steadily increasing over recent decades (Salam *et al*., 2023). The World Health Organization (WHO) classifies individuals with a Body Mass Index (BMI) of 30 kg/m² or higher as obese, a condition now affecting approximately 30% of populations in Western countries, thereby imposing substantial health and socioeconomic burdens (Firth, Conlon, & Cox, 2020). According to the Centers for Disease Control and Prevention (CDC), obesity serves as a major risk factor for various metabolic disorders, including type 2 diabetes and hypertension, which collectively contribute to increased morbidity and mortality rates (CDC, 2023). A meta-analysis by Chooi, Ding, & Magkos (2019) further highlights that obesity increases the risk of developing these conditions by two- to sixfold, primarily due to mechanisms such as insulin resistance, chronic inflammation, and neurohormonal dysregulation. This multifactorial condition is influenced by genetic, environmental, behavioral, and socioeconomic factors, complicating efforts to mitigate its global impact (Omer, 2020).

Obesity, beyond its physiological ramifications, imposes a substantial economic and social burden globally. Healthcare costs linked to obesity-related complications are estimated to surpass hundreds of billions of dollars annually, with indirect losses due to diminished productivity further amplifying the issue (Firth, Conlon, & Cox, 2020). This burden is particularly pronounced in developing countries like Indonesia, where obesity-related healthcare expenditures are projected to consume approximately 5%–10% of the national GDP, an accelerating trend in urban populations (Adgoy, 2019). The shift toward urbanized living, characterized by dietary changes and reduced physical activity, has significantly contributed to rising obesity rates, especially in cities like Makassar (Marthias *et al*., 2021). Beyond economic consequences, obesity also engenders social stigma, negatively affecting individuals' quality of life, employment opportunities, and educational outcomes. Research highlights that obese individuals frequently encounter workplace discrimination, resulting in lower hiring rates, limited promotions, and reduced wages compared to their non-obese counterparts (Sagar *et al*., 2019). In educational settings, weight bias can impair academic performance due to bullying and lowered teacher expectations. These social challenges, coupled with psychological distress, elevate the risk of anxiety and depression among those affected (Tomiyama *et al*., 2018). Consequently, effectively addressing obesity necessitates an integrated strategy that combines medical interventions with comprehensive social policy reforms (Kohir, Murhan, & Sulastri, 2024).

The physiological mechanisms linking obesity to diabetes and hypertension are well established. Obesity induces insulin resistance through chronic low-grade inflammation, dysregulation of adipokines, and excessive free fatty acid release, all of which impair glucose metabolism and contribute to type 2 diabetes development (Shariq & McKenzie, 2020). Additionally, obesity is a key factor in hypertension pathogenesis through increased sympathetic nervous system activity, activation of the renin-angiotensin-aldosterone system (RAAS), and endothelial dysfunction, all of which contribute to elevated blood pressure (Hall *et al.,* 2019). These interconnected metabolic pathways highlight the need for comprehensive obesity management strategies to mitigate the risk of diabetes and hypertension (Hlyan et al., 2024).

The increasing prevalence of obesity in Indonesia has become a pressing public health issue, with the latest data from the Indonesian Ministry of Health showing 599,528 (36.8%) classified as overweight or obese (Ministry of Health of the Republic of Indonesia, 2024). In Makassar, this issue is exacerbated by cultural dietary patterns characterized by high-calorie food consumption and increasingly sedentary urban lifestyles, contributing significantly to the obesity epidemic. These trends highlight the need for targeted interventions that address both nutritional habits and physical activity. Although global research has extensively examined obesity's health impacts, there remains a gap in understanding its specific interactions within localized populations, particularly in workplace settings. Effective weight management through diet and exercise is essential for controlling hypertension and type 2 diabetes, as well as enhancing the efficacy of antihypertensive medications (Swinburn et al., 2021). Early intervention is vital to prevent end-organ damage associated with obesity-related metabolic dysfunctions.

In the research location, the Nursing Department at Makassar Health Polytechnic, workplace environments may exacerbate obesity risk due to the predominantly sedentary nature of administrative tasks and limited opportunities for physical activity. Additionally, the availability of high-calorie snacks during work hours and irregular meal patterns further contribute to the risk of weight gain among employees. Preliminary observations indicate that many employees demonstrate increased waist circumference and high BMI measurements, highlighting the need for targeted interventions within this setting. However, the specific relationship between obesity and metabolic risk factors, such as diabetes and hypertension, remains underexplored in this population.

Accordingly, this study aimed to investigate the prevalence of obesity and its relationship with diabetes and hypertension among employees of the Nursing Department at Makassar Health Polytechnic, using anthropometric and metabolic assessments to inform evidence-based workplace interventions.

METHODS

Study Design

This study utilized a cross-sectional design to evaluate the prevalence of obesity and its potential implications for diabetes and hypertension among employees of the Nursing Department at Makassar Polytechnic. The cross-sectional approach was selected for its ability to assess associations between obesity and metabolic parameters at a single point in time (Setia, 2016). Data collection was conducted in February 2025 using purposive sampling, resulting in a sample of 42 respondents who met predefined inclusion criteria, including informed consent and the absence of severe chronic diseases unrelated to hypertension and diabetes. Participants undergoing heavy medication likely to influence metabolic functions, as well as those with incomplete data, were excluded from the study to ensure data integrity.

Population and Sampling

A total of 42 respondents were selected using purposive sampling to ensure alignment with the inclusion criteria, which required participants to be aged 30 years or older, provide informed consent, and have no severe chronic diseases aside from hypertension or diabetes. Individuals undergoing intensive medication that could affect metabolic function or those with incomplete data were excluded from the study. Despite the limited sample size, its adequacy was supported by feasibility considerations and consistency with previous studies involving similar populations. To enhance generalizability, the sample encompassed a diverse representation of gender, age, and employment status. The study population was composed of clinical personnel from the Nursing Department, including registered nurses and clinical instructors, while administrative staff and non-clinical faculty were excluded to maintain sample homogeneity. Additionally, participants were required to have held their current roles for at least one year, ensuring the inclusion of individuals with stable employment conditions potentially influencing metabolic health outcomes.

Data Collection

Anthropometric measurements, including BMI and abdominal circumference, were recorded as independent variables. BMI was calculated using the standard formula of weight (kg) divided by height squared (m^2), while abdominal circumference was measured at the midpoint between the lower ribs and the iliac crest using a flexible measuring tape. Height and weight were assessed using a stadiometer with ±0.1 cm accuracy and a digital weighing scale with ±0.1 kg precision, respectively.

BMI was categorized as underweight (< 18.5), normal (18.5-24.9), overweight (25-29.9), and obese (≥ 30) (Weir & Jan, 2025).

Dependent variables included fasting blood sugar levels and systolic and diastolic blood pressure. Blood pressure checks are performed using a calibrated OneMed digital blood pressure monitor with participants in a seated position after at least five minutes of rest. Participants sat comfortably with their arms at heart level, and two readings were taken at one-minute intervals. The average of these two measurements was recorded as the final blood pressure value. Control variables such as age, gender, and total cholesterol levels were also considered in the analysis.

Metabolic and clinical assessments encompassed fasting blood sugar, blood pressure, and total cholesterol levels. Fasting blood sugar was categorized as normal (<100 mg/dL), pre-diabetic (100–125 mg/dL), or diabetic (≥126 mg/dL). Blood pressure classifications adhered to standard guidelines, distinguishing normal levels (systolic <130 mmHg and diastolic <80 mmHg) from grade 1 hypertension (systolic 130–139 mmHg or diastolic 80–89 mmHg) and grade 2 hypertension (systolic ≥140 mmHg or diastolic ≥90 mmHg). Total cholesterol levels were stratified into normal (<200 mg/dL), moderate (200–239 mg/dL), or high (≥240 mg/dL). Blood pressure in this study was measured using a calibrated digital blood pressure monitor, specifically the OneMed device manufactured by PT. Jayamas Medica Industri. This device was chosen because of its validated accuracy and ease of use, especially in field settings.

Statistical Analysis

Data analysis was conducted using SPSS Version 22, incorporating both descriptive and inferential statistical methods.

A normality test (Shapiro-Wilk test) was conducted on each continuous variable to determine the appropriate descriptive statistics. For normally distributed data, the mean and standard deviation (SD) were reported. For non-normally distributed data, the median and minimum-maximum values were used instead. Additionally, categorical variables, such as BMI categories (normal, overweight, obese), were presented as frequency and percentage distributions.

Inferential analyses involved Pearson or Spearman correlation tests to examine associations between obesity and metabolic variables, while logistic regression analysis was performed to evaluate the impact of obesity on diabetes and hypertension risk, adjusting for potential confounders such as age, gender, and cholesterol levels. Prior to analysis, assumptions of normality and multicollinearity were assessed to ensure the validity of the statistical models. A significance level of $p \leq 0.05$ was applied to determine statistically significant relationships.

Ethical Considerations

Ethical approval for this study was granted by the Health Research Ethics Committee or Komite Etik Penelitian Kesehatan (KEPK) Makassar Health Polytechnic No. 1002/M/KEPK-PTKMS/II/2025) prior to data collection. The study strictly adhered to ethical principles, ensuring voluntary participation, data confidentiality, and respondent anonymity. All participants were thoroughly briefed on the study's objectives and procedures, after which written informed consent was obtained. To minimize potential bias in data collection, no incentives were provided to participants.

RESULTS

Respondent Characteristics

A total of 42 respondents participated in the study, consisting of 22 men (52.4%) and 20 women (47.6%). The participants' ages ranged

Table 1. Characteristics of Respondents (n=42)

Characteristics	n (%)	Mean±SD	p value	CI (95%)
Gender				
Male	22 (52.4)			
Female	20 (47.6)			
Age (years)		53.48±7.31	0.001	51.20 – 55.76

p value is signifcant at ≤ 0.05; mean ± SD, standard deviation

Table 2. Anthropometric Measurement and Nutritional Status (n=42)

Variables	n (%)	Mean±SD	p value	CI (95%)
Height (cm)		159.77±7.08	0.001	157.56– 161.97
Weight (kg)		66.76±9.95	0.001	63.66 – 69.86
BMI		26.26±3.92	0.001	25.04 – 27.48
Normal	10 (23.8)			
Overweight	6 (13.3)			
Obese	26 (61.9)			
Abdominal Circumference (cm)		93.00±9.98	0.001	89.89 – 96.11

p value is signifcant at ≤ 0.05; mean ± SD, standard deviation; BMI, body mass index

Table 3. Health Profile based on Clinical Parameters (n=42)

Variables	n (%)	Mean±SD	p value	CI (95%)
Fasting Blood Sugar (mg/dL)		159.77±7.08	0.001	157.56 – 161.97
Normal	4 (9,5)			
Pre-diabetic	18 (42.9)			
Diabetic	20 (47.6)			
Blood pressure				
Normal pressure	34 (81.0)			
Grade 1 hypertension	7 (16.7)			
Grade 2 hypertension	1 (2.3)			
SBP (mmHg)		123.07±123.07	0.001	118.13 – 128.012
DBP (mmHg)		80.81±8.85	0.001	78.05 – 83.57
Total cholesterol (mg/dL)		212.59±35.59	0.001	201.50 – 223.69
Normal cholesterol	11 (26,2)			
Moderate cholesterol	20 (47.6)			
High cholesterol	11 (26.2)			

p value is signifcant at ≤ 0.05; mean ± SD, standard deviation; SBP, systolic blood pressure; DBP, diastolic blood pressure; mmHg, milimeters hydrogenium; mg/dL, milligrams per deciliter

Table 4. Relationship between Fasting Blood Sugar, Blood Pressure, and Body Mass Index

Variables	BMI			p-value	CI (95%)
	Normal n (%)	Overweight n (%)	Obese n (%)		
Fasting Blood sugar				0.036	1.695-9.779
Normal	3 (30)	-	1 (3.8)		
Pre diabetes	3(30)	2 (33.3)	13 (50.0)		
Diabetes	4 (40)	4 (66.7)	12 (46.2)		
SBP				0.002	0.083-2.262
Normal	7 (70)	6 (21)	21 (80.8)		
HTN grade 1	3(30)	-	4 (15.4)		
HTN grade 2	-	-	1(3.8)		
DBP	6 (60)	5 (83.3)	18 (69.2)	0.005	0.133-2.582
Normal	4 (40)	1(16.7)	7 (26.9)		
HTN grade 1	-		1(3.9)		
HTN grade 2	-				

p value is signifcant at ≤ 0.05; mean ± SD, standard deviation; BMI, body mass index; SBP, systolic blood pressure; DBP, diastolic blood pressure; HTN, hypertension

from 30 to 65 years, with a mean age of 53.48 ± 7.31 years, as presented in Table 1.

Anthropometric Measurements and Nutritional Status

Anthropometric assessments indicated that the respondents' height ranged from 142 to 175 cm, with a mean of 159.77 ± 7.08 cm, while their weight varied between 49 and 105 kg, averaging 66.76 ± 9.95 kg. The mean BMI was 26.26 ± 3.92 kg/m², classifying the majority as overweight or obese (61.9%). Additionally, abdominal circumference measurements ranged from 60 to 116 cm, with a mean of 93.00 ± 9.98 cm, further indicating a predominance of central adiposity among participants, as presented in Table 2.

Health Profile based on Clinical Parameters

Table 3 showed the health profile based on clinical parameters: fasting blood sugar, blood pressure, systolic blood pressure (SBP), diastolic blood pressure (DBP), and total cholesterol. The mean fasting blood sugar level among respondents was 159.77 ± 7.08 mg/dL, with a substantial proportion exhibiting elevated levels. Most respondents (47.6%) were classified as diabetic. Blood pressure distribution indicated that the majority of respondents (81.0%) had normal blood pressure. The mean systolic blood pressure (SBP) and diastolic blood pressure (DBP) were recorded as 123.07 ± 10.01 mmHg and 80.81 ± 8.85 mmHg, respectively. The mean total cholesterol level among respondents was 212.59 ± 35.59 mg/dL where 47.6% exhibiting moderate levels of cholesterol.

Relationship between Fasting Blood Sugar, Blood Pressure, and BMI

Table 4 showed the relationship between fasting blood sugar, blood pressure, and BMI.

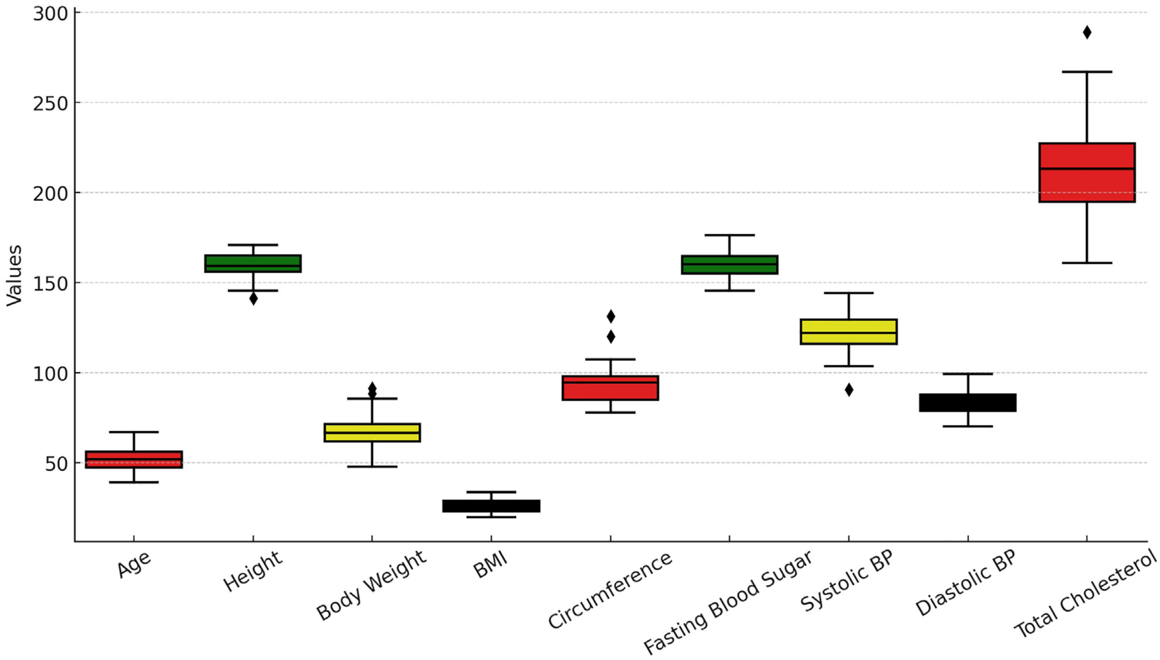

Figure 1. Boxplot visualization of study variables, including Age, Height, Body Weight, BMI, Circumference, Fasting Blood Sugar, Systolic and Diastolic Blood Pressure, and Total Cholesterol. The boxes are color-coded in red, green, yellow, and black, representing different parameters without background hatching.

A significant association was observed between fasting blood sugar levels and BMI (p = 0.036). A significant positive correlation was observed between BMI and both SBP (p = 0.002) and DBP (p = 0.005), suggesting that higher BMI is associated with increased blood pressure.

Relationship between Abdominal Circumference and Cholesterol Levels

This study showed a statistically significant correlation between abdominal circumference and cholesterol levels (r = 0.45, p = 0.001).

Subgroup Analysis

To further elucidate obesity-related risks, subgroup analyses were performed based on gender and BMI categories: 1) Gender Differences: Males had a significantly higher mean SBP (126.4±9.2 mmHg) than females (119.5±10.1 mmHg, p = 0.03). Similarly, cholesterol levels were higher in males (218.6±32.1 mg/dL) than females (206.5±37.8 mg/dL, p = 0.04); 2) Obesity vs. Normal Weight Groups: Obese respondents had significantly higher fasting blood sugar levels (168.3±10.2 mg/dL) compared to non-obese individuals (142.8±9.7 mg/dL, p = 0.001). Likewise, mean SBP was 128.1±8.4 mmHg in obese individuals versus 116.9±10.5 mmHg in non-obese individuals (p = 0.002).

Multivariate Analysis

A logistic regression model was used to control for confounding factors such as age, gender, and socioeconomic status. After adjustment, obesity remained a strong predictor of diabetes (OR = 3.52, 95% CI: 1.74–6.82, p = 0.001) and hypertension (OR = 2.89, 95% CI: 1.32–5.65, p = 0.003).

Outlier Analysis

The study highlights a high prevalence of obesity (61.9%) among respondents and its strong association with metabolic disorders such as diabetes, hypertension, and dyslipidemia. Boxplot analysis revealed considerable variability in age, BMI, and cholesterol levels, with notable outliers in fasting blood sugar and BMI suggesting potential health risks. A significant proportion of participants were either pre-diabetic (42.9%) or diabetic (47.6%), while 19% had elevated blood pressure and 26.2% showed high cholesterol. Abdominal circumference was closely linked to lipid profile abnormalities, emphasizing the critical role of obesity in cardiometabolic health, as shown in figure 1.

DISCUSSION

The findings of this study revealed a high prevalence of obesity among employees of the Makassar Polytechnic Nursing Department, with 61.9% classified as obese based on BMI measurements. Our study highlights an alarming trend of metabolic risk factors. Elevated blood sugar levels, which exceed the normal threshold, indicate a high prevalence of pre-diabetes and diabetes. Meanwhile, BMI values showed that the majority of respondents fell into the overweight or obese category. In addition, the mean systolic blood pressure, although in the near-normal range, indicated a potential risk of hypertension. These findings reinforce the strong association between obesity and metabolic disorders, underscoring the need for targeted interventions focusing on weight management, blood sugar control, and hypertension prevention to reduce future health risks.

This aligns with global and national trends, where obesity rates have risen significantly due to shifts in dietary habits, decreased physical activity, and occupational factors (Lim, Xue, & Wang, 2020; Masood & Moorthy, 2023). Research suggests that prolonged sedentary behavior and high-calorie intake contribute to the increasing obesity rates observed in various occupational settings (Moschonis & Trakman, 2023). In Indonesia, the rising prevalence of obesity is further supported by national health data, which indicate an increase from 15.4% in 2013 to 21.8% in 2018 (National Institute of Health Research and Development, Ministry of Health of the Republic of Indonesia, 2019). Given these trends, workplace-based interventions may serve as an effective strategy to mitigate obesity and its associated health risks, particularly in professional environments that promote prolonged sedentary behavior (Masrul, 2018).

Comparing our findings with Southeast Asian data, similar trends are observed. Studies in Malaysia and Thailand highlight a strong association between urbanization, dietary shifts, and increased obesity prevalence, with risk factors including high consumption of processed foods and reduced physical activity (Kohir, Murhan, & Sulastri, 2024). This supports the argument that regional influences, such as food culture and work-related physical inactivity, play a role in obesity trends.

The observed significant correlation between obesity and diabetes in this study aligns with prior research identifying obesity as a major risk factor for type 2 diabetes, primarily through mechanisms of insulin resistance and metabolic dysfunction (Saxton et al., 2019; Wondmkun, 2020). Excess adipose tissue contributes to chronic inflammation, oxidative stress, and hormonal imbalances, all of which impair glucose metabolism and elevate diabetes risk (Coope, Torsoni, & Velloso, 2016). The study findings reinforce this association, with a high proportion of obese respondents exhibiting elevated fasting blood sugar levels 42.9% classified as pre-diabetic and 47.6% diagnosed with diabetes. These results are consistent with evidence highlighting obesity-induced insulin resistance as a principal driver of type 2 diabetes pathogenesis (Wondmkun, 2020). Given the increasing prevalence of obesity-related diabetes in Indonesia, early intervention strategies, including lifestyle modification programs, are imperative to mitigate further health risks (Jaacks *et al*., 2019). Research emphasizes that weight loss interventions, such as dietary adjustments and increased physical activity, are effective in reducing diabetes risk and improving metabolic health (Hemmingsen *et al*., 2017; Pronk & Remington, 2015). Therefore, the implementation of structured workplace-based lifestyle interventions is essential to address this growing public health concern.

Obesity has been widely recognized as a significant risk factor for hypertension, with multiple physiological mechanisms contributing to elevated blood pressure in affected individuals. This study found that while most respondents had normal blood pressure, 16.7% exhibited grade 1 hypertension, and 2.3% had grade 2 hypertension, highlighting the critical association between obesity and hypertension. The pathophysiology of obesity-induced hypertension involves increased sympathetic nervous system activity, sodium retention, and activation of the renin-angiotensin-aldosterone system (RAAS), all of which contribute to vascular dysfunction and elevated blood pressure (Hall *et al*., 2015; Powell-Wiley *et al*., 2021). Research conducted in Indonesia further supports this association, demonstrating that obese individuals have a significantly higher risk of developing hypertension due to these mechanisms (Shariq & McKenzie, 2020). Additionally, adipose tissue dysfunction in obesity alters the secretion of adipokines, exacerbating vascular damage and chronic inflammation, further compounding the risk of hypertension and cardiovascular complications (Hall *et al*., 2021; Schütten *et al*., 2017). Given the high prevalence of obesity and its substantial impact on cardiovascular health, early screening and targeted interventions are imperative to mitigate long-term morbidity and mortality associated with obesity-induced hypertension.

The findings of the study indicate a significant correlation between obesity and dyslipidemia, as evidenced by the 26.2% prevalence of high cholesterol levels among respondents. Our findings also highlight the strong correlation between obesity and diabetes risk. The high prevalence of pre-diabetes and diabetes among obese individuals further reinforces the important link between obesity and metabolic disorders, emphasizing the need for targeted interventions. Future research should explore the longitudinal impact of BMI on blood pressure regulation in this population. In another part of the study, we found the influence of central obesity on dyslipidemia (Zhu *et al*., 2022).

Specifically, individuals with a larger abdominal circumference showed a higher likelihood of having elevated cholesterol levels, further making them susceptible to an increased risk of cardiovascular disease.

Respondents with higher measures of abdominal circumference showed elevated cholesterol levels, indicating an increased risk of cardiovascular disease. While most respondents maintained blood pressure within the normal range, obese individuals tended to have systolic and diastolic readings at the higher end of the spectrum. This observation warrants further longitudinal studies to assess how sustained obesity affects the development of hypertension over time. This suggests that regardless of other risk factors, obesity contributes significantly to metabolic disturbances potentially indicating an undiagnosed metabolic syndrome. The presence of these outliers suggests the need for targeted interventions to address extreme obesity and associated metabolic risks. Boxplot representations of key health parameters, including age, BMI, fasting blood sugar, systolic and diastolic blood pressure, and total cholesterol, illustrated substantial. Notably, BMI and fasting blood sugar showed clear variability, with the presence of outliers indicating individuals at high risk for metabolic complications. These findings emphasize the critical need for targeted health interventions, particularly in weight management and metabolic risk reduction, to reduce the potential health risks associated with these variations. These findings underscore the urgency of proactive interventions to reduce obesity-related metabolic complications and improve public health outcomes.

The accumulation of visceral fat is strongly linked to an adverse lipid profile, which consequently elevates the risk of atherosclerosis and cardiovascular disease (Mardini *et al.*, 2024). Prior research has underscored the critical role of dietary regulation, physical activity, and pharmacological interventions in mitigating obesity-related dyslipidemia (Trandafir *et al.*, 2022). Additionally, individuals with increased abdominal circumference demonstrated a higher propensity for elevated cholesterol levels, reinforcing the necessity of targeted interventions that integrate weight management and lipid control strategies. Given the substantial cardiovascular risk posed by dyslipidemia, comprehensive workplace health initiatives should prioritize routine cholesterol monitoring, dietary modifications, and the promotion of physical activity to enhance overall metabolic health (Mardini *et al.*, 2024).

This study emphasizes the strong association between obesity and metabolic diseases, particularly diabetes, hypertension, and dyslipidemia, highlighting the complex physiological mechanisms that interconnect these conditions. Given the rising prevalence of obesity in Indonesia and Southeast Asia, there is an urgent need for comprehensive prevention and intervention strategies. Workplace health programs, policy initiatives promoting physical activity, and educational campaigns on healthy lifestyles are crucial in mitigating obesity-related health risks.

Study Limitations and Selection Bias

This study has several limitations that may affect the generalizability and validity of its findings. The use of purposive sampling introduces a potential selection bias, as voluntary participation may have led to an overrepresentation of respondents with heightened health awareness or concerns regarding obesity-related risks, thereby distorting the true prevalence of obesity in the workplace population. Furthermore, the relatively small sample size (42 respondents) limits the applicability of the results to a broader demographic. The study's cross-sectional design also restricts causal inferences between obesity and metabolic disorders.

Additionally, the lack of consideration for key factors such as dietary habits, physical activity levels, and genetic predispositions further constrains the study's comprehensiveness. To enhance research robustness and generalizability, future studies should employ random sampling techniques and longitudinal designs to assess long-term metabolic and cardiovascular outcomes. Additionally, exploring the effectiveness of personalized interventions and technology-based monitoring systems could provide valuable insights into optimizing obesity management and reducing its associated complications. While this design facilitates the identification of correlations, it does not establish causal relationships; therefore, future longitudinal research is recommended to monitor metabolic changes over extended periods.

CONCLUSION

` The study emphasizes the substantial prevalence of obesity among employees of the Nursing Department at Makassar Polytechnic, with 61.9% of respondents classified as obese based on BMI measurements. This condition is strongly associated with an increased risk of metabolic disorders, as reflected in the high incidence of elevated fasting blood sugar levels, hypertension, and high cholesterol. The correlation between obesity and the onset of diabetes and hypertension suggests that excessive body fat accumulation plays a pivotal role in metabolic dysfunction, primarily through mechanisms such as insulin resistance, neurohormonal dysregulation, and chronic inflammation. These findings highlight the urgent need for early detection and targeted intervention strategies in workplace settings to mitigate obesity-related health risks and prevent the progression of metabolic disorders.

Given these findings, targeted interventions are essential to mitigating the impact of obesity on metabolic health, necessitating a comprehensive approach that integrates lifestyle modifications, workplace health programs, and routine screening initiatives. Fundamental strategies for obesity prevention and management include encouraging physical activity, promoting a balanced diet, and reducing sedentary behavior. Workplace-based interventions, such as structured fitness programs, dietary counseling, and periodic health assessments, play a crucial role in improving employees' overall health and minimizing obesity-related risks. Furthermore, structured weight management initiatives—such as subsidized healthy meal options and corporate fitness programs can help reduce obesity prevalence while enhancing employee well-being. Healthcare professionals should also prioritize patient education and behavior modification strategies to foster sustainable lifestyle changes and mitigate the long-term consequences of obesity-related complications, including diabetes and hypertension.

Future research should prioritize longitudinal studies to evaluate the long-term implications of obesity-related health risks and the effectiveness of tailored intervention programs, including workplace-based initiatives aimed at obesity prevention and metabolic health outcomes. A comprehensive exploration of genetic, environmental, behavioral, cultural, and socioeconomic factors influencing obesity and metabolic disorders is essential to inform the development of more personalized, sustainable, and context-specific prevention strategies. Moreover, fostering collaboration among researchers, healthcare professionals, and policymakers is crucial to designing and implementing evidence-based policies that effectively mitigate the burden of obesity and its associated health complications.

This study emphasizes the urgent need for targeted obesity prevention strategies, particularly in workplace settings. General recommendations such as more comprehensive strategies are needed in obesity prevention may lack practical impact. Instead, specific interventions should be considered, including: 1) Workplace-Based Physical Activity Programs: Implementing structured exercise sessions or incentives for physical activity, such as workplace gyms or standing desks, can help reduce sedentary behavior; 2) Subsidized Healthy Meal Programs: Providing nutritious meal options at workplace cafeterias can encourage healthier eating habits and reduce reliance on processed foods; 3) Regular Health Screenings: Conducting periodic metabolic screenings for obesity, diabetes, and hypertension can facilitate early detection and intervention; 40 Health Education Campaigns: Organizing workshops and seminars on obesity-related risks and lifestyle modification strategies can improve awareness and promote sustainable behavioral changes.

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