



**PROFILE OF HEALTH BASED ON BODY MASS INDEX, BLOOD PRESSURE,
AND BLOOD SUGAR LEVELS IN THE ELDERLY**

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ABSTRACT

Diabetes mellitus (DM) is an escalating global health issue, characterised by its increasing prevalence and the significant complications it entails. Effective management of blood glucose levels is a critical component in preventing DM-related complications. This study aims to analyse the health profiles of elderly individuals based on Body Mass Index (BMI), blood pressure, and blood glucose levels. An observational cross-sectional design was employed, involving data collection at a single point in time to identify relationships between variables. The sample consisted of 120 respondents aged 60 and above residing in the Puskesmas Kagok area. Purposive sampling was utilised to select respondents based on inclusion criteria, specifically targeting elderly individuals willing to participate and without any medical conditions necessitating specialised care. The data revealed that the average BMI of respondents was 25.3, with 25% classified as normal weight, 50% as overweight, and 25% as obese. In terms of blood pressure, 58.33% of respondents were found to be hypertensive, while 41.67% were within the normal range. Additionally, the average random blood glucose level was 205 mg/dL, with 33.33% of respondents exhibiting glucose levels ≥ 200 mg/dL, indicating a high risk of diabetes. Demographic characteristics indicated that 66.7% of respondents were female, and 75% had been diagnosed with diabetes for over five years. Educational attainment varied, with 51.6% having completed secondary education and 31.7% possessing higher education qualifications. Notably, 46.6% of respondents were not engaged in employment. These findings highlight a high prevalence of overweight, hypertension, and elevated blood glucose levels among the elderly population in the Puskesmas Kagok area, underscoring the necessity for preventative measures and management of non-communicable diseases within this age group. It is anticipated that this research will provide valuable insights for the development of health programmes tailored to the needs of the elderly.

Keywords: body mass index; blood glucose levels; elderly; hypertension; non communicable diseases

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INTRODUCTION

The global ageing population presents significant challenges for healthcare systems, particularly concerning health conditions commonly experienced by the elderly. A crucial aspect of understanding geriatric health involves analysing health indicators such as Body Mass Index (BMI), blood pressure, and blood sugar levels. BMI is a measure used to assess an individual's weight in relation to their height and can provide insights into their nutritional status (World Health Organization, 2021). Research indicates that abnormal BMI, whether overweight or underweight, is significantly associated with various chronic diseases, including diabetes mellitus and hypertension among the elderly (Ali et al., 2020; Sari, 2022). High blood pressure is a significant risk factor for various cardiovascular conditions, including heart disease and stroke. According to the latest data from the World Health Organization (2021), hypertension is one of the leading causes of death globally, with its

prevalence increasing with age. In Indonesia, the prevalence of hypertension among the elderly is also on the rise, highlighting the need for greater attention to blood pressure management in this population (Smith & Lee, 2022).

Blood glucose levels serve as another crucial indicator to monitor within the health profile of the elderly. Diabetes mellitus, which is often undiagnosed in its early stages, can lead to a range of serious complications, including neuropathy, retinopathy, and cardiovascular disease (Dewi et al., 2021). Reports indicate that the prevalence of type 2 diabetes mellitus among the elderly is on the rise, largely attributed to lifestyle changes and unhealthy dietary patterns (Herlina, 2023). Integrating the three indicators Body Mass Index (BMI), blood pressure, and blood glucose levels provides a comprehensive overview of the health status of the elderly and aids in the development of more effective disease prevention and management strategies. This research aims to analyse the health profiles of older adults based on these three criteria, with the expectation of contributing to a better understanding of elderly health in Indonesia and supporting improved decision-making in public health policy.

As individuals age, metabolic and hormonal changes can significantly impact body composition and fat distribution, often contributing to an increase in obesity rates among the elderly. Research indicates that the accumulation of visceral fat, which is influenced not only by unhealthy dietary habits but also by genetic factors and a sedentary lifestyle, may be a primary contributor to elevated health risks in this age group (Pramuka et al., 2022). A decline in physical activity levels and alterations in dietary patterns associated with ageing not only affect body mass index (BMI) but can also have implications for cardiovascular health and blood glucose metabolism (Berna et al., 2021). Consequently, rigorous monitoring of BMI and appropriate interventions in diet and physical activity are essential for maintaining the health of older adults.

Furthermore, the significance of health education for elderly individuals and their caregivers cannot be overlooked in the efforts to prevent disease. Awareness of the health risks associated with body mass index (BMI), hypertension, and uncontrolled blood sugar levels can empower elderly individuals to take proactive steps in managing their health. Research conducted by Sari and Budiman (2023) indicates that health education programmes involving elderly individuals and their families yield positive outcomes in enhancing understanding and preventive actions regarding chronic illnesses. By educating the elderly on the importance of a balanced diet, regular physical activity, and routine health check-ups, we can encourage healthy behaviours that contribute to improved quality of life and longevity. This study aims to analyze the health profile of the elderly based on Body Mass Index (BMI), blood pressure, and blood sugar levels, with the hope of contributing to a better understanding of the health of the elderly in Indonesia and supporting better decision-making in public health policies.

METHOD

This study employs an observational research design with a cross-sectional approach. The primary objective is to analyse the health profile of elderly individuals based on Body Mass Index (BMI), blood pressure, and blood glucose levels. Data collection is conducted at a specific point in time to provide a clear overview of the relationships between these variables. The population for this research consists of elderly individuals aged 60 and above residing in the Kagok Health Centre area. The sampling technique utilised is purposive sampling, whereby respondents are selected based on predetermined inclusion and exclusion criteria. Inclusion criteria encompass elderly individuals who are willing to participate and do not have medical conditions requiring specialised care. Conversely, exclusion criteria pertain

to elderly individuals suffering from acute illnesses or those undergoing treatment that may affect measurement outcomes. The sample for this study consisted of 120 respondents. Data collection was carried out through physical examinations and interviews. The data gathered included: the measurement of Body Mass Index (BMI), calculated using the formula weight (in kilograms) divided by the square of height (in metres); blood pressure assessments, where blood pressure was measured using a digital sphygmomanometer. Measurements were taken twice with a 5-minute interval, and the average of the two readings was utilised for analysis; and blood glucose levels, which were measured using a glucometer, with data collected from fasting blood glucose tests.

The collected data was analysed using statistical methods, with descriptive analysis performed to illustrate the characteristics of the sample, including the distribution of Body Mass Index (BMI), blood pressure, and blood glucose levels. This analysis aimed to provide an overview of the health conditions of the elderly participants within the study sample. In this study, data was collected using a record sheet containing the results of measuring Body Mass Index (BMI), checking blood sugar levels, and blood pressure of respondents. Because the measuring tool used is in the form of objective examination results with the standard medical method, its validity and reliability refer to the standard measuring tool used in the health examination procedure, not the validity and reliability test of conventional questionnaires

RESULT

Table 1.
Frequency Distribution of Respondent Characteristics (n = 120)

Category	Number of Respondents	Percentage (%)
Gender		
Male	40	33,3
Female	80	66,7
Duration of Diabetes		
Less than 1 year	5	4,2
Less than 5 year	25	20,8
More than 5 year	90	75
Education Level		
Primary School	5	4,2
Junior High School	15	12,5
Senior High School	62	51,6
University	38	31,7
Employment Status		
Unemployed	56	46,6
Private Sector Employee	28	23,4
Entrepreneur	5	4,2
Civil Servant	8	6,6
Other	23	19,2
Total	120	100%

Table 1 presents the characteristics of 120 respondents based on gender, with a majority being female, accounting for 80 respondents (66.7%). In terms of diabetes duration, the majority have been diagnosed for more than 5 years, comprising 90 respondents (75%). Furthermore, the predominant educational background is high school, represented by 62 respondents (51.6%). Regarding employment status, the majority are unemployed, totalling 56 respondents (46.6%).

Table 2.
Health Profile (n = 120)

Category	Number of Respondents	Percentage (%)	Mean
Body Mass Index (BMI)			25,3
Normal (18,5 - 24,9)	30	25%	
Overweight (25 - 29,9)	60	50%	
Obesity (≥ 30)	30	25%	
Blood Pressure			140/85 mmHg
Normal (systolic < 120 and diastolic < 80)	50	41,67%	
Hypertension ($\geq 140 / \geq 90$)	70	58,33%	
Random Blood Glucose (RBG)			205 mg/dL
Normal (< 200 mg/dL)	80	66,67%	
RBG ≥ 200 mg/dL	40	33,33%	
Total	120	100%	

Body Mass Index (BMI): Among the respondents, 50% (60 individuals) were classified as overweight, with a BMI ranging from 25 to 29.9. Meanwhile, 25% (30 individuals) fell into the obesity category, while the remaining 25% had a normal BMI. This indicates that half of the respondents are in a high-risk category for health complications related to diabetes mellitus, as both overweight and obesity are closely associated with the development of this disease. Blood Pressure: A significant 58.33% of respondents were found to have hypertension (with blood pressure readings of $\geq 140/90$ mmHg), while 41.67% maintained blood pressure within the normal range. The high prevalence of hypertension among respondents underscores the necessity for regular monitoring and management of blood pressure, as hypertension can elevate the risk of cardiovascular diseases in individuals with diabetes. Blood Glucose Levels (GDS): Approximately 33.33% of respondents exhibited elevated blood glucose levels (≥ 200 mg/dL), while 66.67% remained within the normal range (< 200 mg/dL). Although the majority of respondents are within normal limits, this significant proportion warrants particular attention, as elevated blood glucose levels can lead to serious long-term complications if not effectively managed.

DISCUSSION

The findings of this study reveal the demographic characteristics of 120 respondents, the majority of whom are female, with 80 respondents (66.7%) identifying as such. This outcome aligns with previous research indicating that the prevalence of diabetes mellitus is higher in women than in men, likely due to hormonal factors and an increased risk of obesity among women (Gonzalez et al., 2020). Consequently, preventive and management strategies for diabetes should consider gender as a significant factor in their approach. The duration of diabetes among the majority of respondents indicates that over 5 years of diagnosis is common, with 90 respondents (75%) falling into this category. This suggests that many individuals in this study are at risk of long-term complications, particularly concerning metabolic control and cardiovascular disease (Yadav et al., 2021). Additional research has also indicated that a longer duration of diabetes is associated with a heightened risk of serious complications such as neuropathy and retinopathy (Fisher et al., 2022). In terms of education, the majority of respondents have a secondary education background (SMA), comprising 62 individuals (51.6%). The low level of education may impact patients' understanding and acceptance of health information, as well as their adherence to diabetes treatment (Sherwood et al., 2019). Previous research indicates that individuals with lower educational attainment tend to possess inadequate knowledge regarding diabetes management and are more likely to disregard medical advice, potentially exacerbating the health burden within the community (Wang & Chattopadhyay, 2020). Regarding employment, a significant proportion of respondents are unemployed (56 individuals, 46.6%). This situation may adversely affect their

quality of life and diabetes management, as economic factors influence access to healthcare, healthy diets, and physical activity (Lee et al., 2020). Studies have shown that economic instability can worsen health conditions, including diabetes management, thereby potentially increasing the financial strain on the healthcare system (Cohen et al., 2021).

The findings of this research indicate that out of 120 respondents surveyed, the majority fall into the overweight category, with 60 respondents (50%) classified as overweight and 30 respondents (25%) categorised as obese. Consequently, a total of 75% of respondents have a weight above the normal range, with a mean Body Mass Index (BMI) of 25.3. These results align with several studies conducted in Indonesia, which have reported a rising prevalence of obesity and overweight, primarily attributed to unhealthy dietary patterns and insufficient physical activity (Kemenkes RI, 2020; Istiyowati et al., 2021). Overweight and obesity are significant risk factors for various health issues, including hypertension and diabetes. Research by Prasetyo et al. (2021) reinforces the significant correlation between BMI and hypertension risk, indicating that individuals with obesity are more susceptible to developing hypertension. This is consistent with the current study's findings, where 58.33% of respondents experienced hypertension, with a mean blood pressure of 140/85 mmHg. Elevated blood pressure can serve as an early indicator of more severe complications, including heart disease.

In terms of blood glucose levels, the results indicate that 33.33% of respondents exhibit elevated blood glucose levels (≥ 200 mg/dL), with a mean blood glucose level of 205 mg/dL. These findings highlight a significant prevalence of diabetes and underscore the necessity for early intervention to prevent further complications. A study conducted by Ruliana et al. (2022) demonstrates that individuals with a high body mass index (BMI) are more likely to experience impaired glucose tolerance, which may progress to type 2 diabetes if not properly managed. Furthermore, the data obtained from this research suggest that effective weight management and improved dietary practices can significantly reduce the risk of diabetes and hypertension. A study by Hidayati et al. (2021) emphasises the importance of education regarding healthy eating and physical activity in managing obesity and the need for regular health monitoring. From a global perspective, a report by the World Health Organization (2021) indicates that the prevalence of obesity worldwide continues to rise, contributing to 900,000 deaths each year. This underscores the necessity for interventions across various sectors, including government policy, healthcare systems, and community engagement, to foster an environment that promotes healthy lifestyles. Overall, the findings of this study emphasise the critical need to strengthen programmes aimed at the prevention and control of non-communicable diseases, such as diabetes and hypertension, within communities. A focus on education-based interventions and the enhancement of health awareness is essential in addressing this health epidemic.

Discussion on the Relationship Between Body Mass Index (BMI), Hypertension, and Blood Sugar Level

Body Mass Index (BMI) is a crucial indicator frequently utilised to assess weight categories, providing insight into the health risks associated with obesity and overweight. Recent research indicates a significant correlation between BMI, hypertension, and blood sugar levels, which are closely linked to diabetes mellitus. The interconnection between BMI, hypertension, and blood sugar levels is becoming increasingly pertinent in light of the rising prevalence of non-communicable diseases, including diabetes mellitus and hypertension. Both conditions represent comorbidities that can influence one another and potentially exacerbate overall health.

The Relationship Between BMI and Hypertension

Body Mass Index (BMI) serves as a straightforward indicator for classifying an individual's weight status. The BMI categories, such as normal weight, overweight, and obesity, provide insight into an individual's health risks. Research conducted by Suri and Rani (2022) indicates that individuals with a BMI exceeding the normal range face an elevated risk of developing hypertension. This is attributed to the accumulation of visceral fat in the abdominal region, which can lead to increased insulin resistance and elevated blood pressure. Biologically, visceral fat plays a significant role in blood pressure regulation by producing pro-inflammatory cytokines that heighten systemic inflammation and influence hormone circulation involved in blood pressure control (Liu et al., 2021).

Several studies indicate that an increase in Body Mass Index (BMI) is directly associated with the risk of hypertension. According to Suri and Rani (2022), each unit increase in BMI correlates with a 15% rise in hypertension risk. This is attributed to the excessive accumulation of visceral fat in individuals with a high BMI, which can trigger insulin resistance and adversely affect endothelial function in blood vessels, thereby elevating blood pressure (Zhou et al., 2021). However, it is important to note that not all individuals with a high BMI develop hypertension, as genetic and environmental factors also play a significant role. Further research by Niranjana et al. (2023) emphasises that lifestyle modifications, including a balanced diet and adequate physical activity, can significantly contribute to managing BMI and preventing hypertension. A weight loss of 5-10% in obese individuals can markedly reduce blood pressure levels and enhance overall cardiovascular health.

The Relationship Between Hypertension and Blood Sugar Levels

Hypertension is frequently associated with metabolic disorders, including diabetes mellitus. Research conducted by Adhianto et al. (2021) indicates that individuals with hypertension have a higher risk of developing type 2 diabetes compared to those with normal blood pressure. The underlying mechanisms involve inflammation and metabolic changes triggered by elevated lipid levels and insulin resistance, which contribute to increased blood sugar levels (Martínez-Cordero et al., 2022).

Both hypertension and diabetes mellitus are often components of what is referred to as "metabolic syndrome." The study by Adhianto et al. (2021) illustrates that individuals suffering from hypertension are at an elevated risk of developing type 2 diabetes. Hypertension can cause damage to the vascular endothelium and disrupt the mechanisms necessary for glucose processing within the body, potentially exacerbating insulin sensitivity (Martínez-Cordero et al., 2022). Recent studies by Wang et al. (2022) have revealed that high blood pressure contributes to insulin resistance and hyperglycaemia, which may lead to the onset of diabetes. This underscores the importance of effective blood pressure management, not only for reducing the risk of cardiovascular diseases but also for controlling blood sugar levels.

The Relationship between BMI and Blood Sugar Levels

A high Body Mass Index (BMI) is a significant risk factor for elevated blood sugar levels or diabetes mellitus. Research indicates that individuals with a BMI of 25 or above exhibit a higher prevalence of diabetes mellitus compared to those with a normal BMI (Sari et al., 2022). This correlation is largely attributed to the accumulation of fat, which is associated with increased insulin resistance, ultimately leading to dysfunction in pancreatic beta cells responsible for insulin production (Singh et al., 2022). Elevated blood sugar levels are often a consequence of the interplay between obesity, insulin, and unhealthy dietary patterns.

High BMI serves as a strong predictor of diabetes mellitus. Singh et al. (2022) emphasise that individuals with a BMI exceeding 25 demonstrate a significant rise in blood glucose levels, primarily due to fat accumulation linked to insulin resistance. Furthermore, the researchers observed that a diet rich in calories and trans fats contributes to excessive BMI, thereby facilitating the onset of diabetes. Another study by Fitriah et al. (2023) highlights that the adoption of a healthy diet and regular physical activity can effectively reduce BMI, which in turn helps in regulating blood sugar levels. Health education regarding nutrition and the negative impacts of a sedentary lifestyle can significantly influence the management of diabetes and hypertension among high-risk populations.

CONCLUSION

The relationship between Body Mass Index (BMI), hypertension, and blood sugar levels is intricate and highlights the necessity for a holistic approach in managing health risks. Therefore, it is essential to develop comprehensive, community-based intervention programmes aimed at promoting healthy lifestyles. Weight loss through diet and physical activity can serve as a primary strategy for reducing BMI, enhancing insulin sensitivity, and controlling blood pressure. By implementing appropriate preventive measures and educational initiatives, we can mitigate the burden of non-communicable diseases within the community.

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