



Original Article

The Relationship Between Lifestyle and Dietary Patterns and the Incidence of Degenerative Diseases

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ABSTRACT

Degenerative diseases, particularly diabetes mellitus and hypertension, contribute substantially to morbidity in Indonesia, including rural areas undergoing lifestyle transitions. Kalukku Subdistrict in Mamuju Regency is one such region, yet no comprehensive studies have examined the relationship between lifestyle, diet, and nutritional status with these diseases. This study aimed to analyze associations between lifestyle, dietary patterns, and nutritional status with the incidence of diabetes mellitus and hypertension in Kalukku Subdistrict. A cross-sectional design was applied to 150 purposively selected patients with diabetes mellitus and hypertension recorded at Tampapadang Health Center. Data were collected using lifestyle questionnaires, 24-hour dietary recalls, semi-quantitative food frequency questionnaires (SQ-FFQ), and anthropometric measurements. Associations were analyzed using chi-square tests with odds ratios (ORs) and 95% confidence intervals (CIs). Unhealthy lifestyle was strongly associated with diabetes mellitus ($p < 0.001$, $OR = 12.17$) and hypertension ($p < 0.001$, $OR = 0.016$, indicating 98.4% lower risk in individuals with healthy lifestyles). Unhealthy dietary patterns were associated with diabetes mellitus ($p = 0.040$, $OR = 3.51$) but not with hypertension ($p = 1.00$). Nutritional status showed no significant relationship with either condition ($p > 0.05$). Lifestyle is a key determinant of both diabetes mellitus and hypertension, while dietary patterns are associated only with diabetes mellitus. Nutritional status was not significantly linked to either disease. These findings highlight the importance of community-based health promotion and prevention, including daily physical activity through group exercise, dietary modification using local foods (corn, cassava, sweet potatoes) as alternatives to white rice, and salt-reduction campaigns via cooking demonstrations.



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INTRODUCTION

Non-communicable diseases (NCDs) pose a significant global health challenge, constituting over 80% of mortality and morbidity.¹ In Indonesia, this reflects an ongoing epidemiological transition marked by a rising prevalence of NCDs, particularly degenerative diseases, among both the productive age group and the elderly.^{2,3} The increasing burden of degenerative diseases is closely

related to individual risk factors such as unhealthy diets, sedentary lifestyles, and poor nutritional status. A modern lifestyle characterized by high consumption of fat, sugar, and salt combined with low physical activity has accelerated metabolic degeneration, which underlies various degenerative diseases, notably diabetes mellitus and hypertension.^{4,5}

Hypertension and diabetes are two degenerative diseases that not only have high prevalence but also represent major risk factors for cardiovascular disease. Hypertension is not only a disease in itself but also serves as a “gateway” to serious complications such as stroke, heart failure, and chronic kidney disease.⁶ Meanwhile, the rising incidence of diabetes among adolescents is concerning, as it indicates a shift in the onset of degenerative diseases to younger age groups.⁷

Globally, the prevalence of diabetes among adults was recorded at 14% in 2022, affecting more than 800 million people. In the same year, nearly 450 million adults aged ≥ 30 years, representing about 59% of all people with diabetes, remained untreated.⁸ Hypertension is likewise a global health problem, affecting an estimated 1.28 billion adults worldwide.⁹ This has prompted the establishment of global NCD targets, including a 25% reduction in hypertension prevalence by 2025.¹⁰ At the national level, the prevalence of hypertension among Indonesians aged ≥ 18 years reached 30.8%.¹¹ The prevalence of diabetes mellitus among those aged ≥ 15 years also rose from 2.0% to 2.2%.¹² Locally, the prevalence of diabetes mellitus in West Sulawesi Province is reported at 0.9%, while hypertension reaches 34.77%.¹³

Kalukku Subdistrict in Mamuju Regency, West Sulawesi, is an area undergoing demographic and economic growth. These changes have influenced local lifestyles, including dietary habits and daily activities. However, research in rural Indonesia, especially in West Sulawesi, remains scarce. Previous studies often focused on urban populations or examined single risk factors, while no comprehensive study has yet evaluated the combined role of lifestyle, diet, and nutritional status in relation to diabetes mellitus and hypertension in this area.

The growing burden of degenerative diseases in Indonesia presents a major public health challenge, particularly in rural areas with limited access to health education.¹⁴ Mortality from degenerative diseases tends to be higher in rural than urban areas, partly due to inadequate health facilities and uneven distribution of healthcare workers.¹⁵ Thus, mapping the distribution and trends of diseases at the local level is crucial to support effective health promotion and prevention strategies. Therefore, this study aims to analyze the association between dietary patterns, lifestyle, and nutritional status with the incidence of degenerative diseases (diabetes and hypertension) in Kalukku. The findings are expected to provide evidence for developing context-specific community-based health interventions, supporting local health policy planning, and strengthening monitoring systems for NCD risk factors.

METHODS

This study employed a quantitative cross-sectional approach to analyze the relationship between individual risk factors and degenerative diseases (diabetes mellitus and hypertension). The study population consisted of all patients with confirmed diagnoses of diabetes mellitus or hypertension recorded in Tampapadang Health Center medical records. The final sample size was 150 respondents. Purposive sampling was used with the following inclusion criteria: (1) patients with a confirmed medical diagnosis of diabetes mellitus or hypertension verified through medical records; (2) aged ≥ 20 years; (3) residing in the Tampapadang Health Center service area for at least one year; and (4) willingness to participate indicated by signing informed consent, and Exclusion criteria: (1) patients with severe complications (e.g., stroke, kidney failure, or terminal cardiovascular disease); (2) patients with cognitive or physical limitations that hindered questionnaire completion; and (3) pregnant women.

The sample size of 150 was determined using the Lemeshow formula for hypothesis testing of proportions, assuming a 95% confidence level, 80% power, and a national hypertension prevalence

of 30.8%. The minimum required sample was 138, which was then increased by 10% to anticipate dropouts, resulting in 150 respondents. The lifestyle questionnaire assessed physical activity, smoking, alcohol consumption, and sleep. Content validity was confirmed through expert judgment (public health and nutrition experts from Poltekkes Kemenkes Mamuju), and reliability testing produced a Cronbach's alpha of 0.81. The SQ-FFQ evaluated dietary patterns over the previous six months and was adapted to local food items (85 food items commonly consumed in the community). Construct validity testing showed item-total correlations >0.30 , with a Cronbach's alpha of 0.79. Dietary quality scores above the median were categorized as "healthy," while scores below the median (86) were categorized as "unhealthy." Anthropometric measurements included height (stadiometer) and weight (calibrated digital scale). Nutritional status was classified as normal if BMI was 18.5–24.9 kg/m². Data analysis: Chi-Square tests were used with a significance level of $p < 0.05$. Risk estimates were expressed as odds ratios (ORs) with 95% confidence intervals (CIs). Analyses were performed using SPSS.

Bias control: Self-report bias was minimized by providing respondents with clear explanations and assistance during questionnaire completion; Recall bias in the SQ-FFQ was minimized through the use of specific frequency questions and a food photo booklet to help estimate portion sizes; and Selection bias was minimized by applying strict inclusion–exclusion criteria and using verified medical records. This study did not require formal approval from an institutional ethics committee, as it involved minimal risk and no clinical intervention. However, all procedures were conducted in accordance with the ethical principles of the Declaration of Helsinki. Prior to data collection, the researchers provided clear information to all participants regarding the purpose, procedures, potential risks, and benefits of the study. Written informed consent was obtained from all participants to ensure voluntary participation and confidentiality of data. Participants were also informed of their right to withdraw from the study at any time without consequence.

RESULTS

The findings are presented in the following tables.

Table 1. Frequency Distribution of Respondent Characteristics

Variables	n	%
Gender		
Male	53	35.3
Female	97	64.7
Respondent Age		
20 - 39 Years	24	16
40 - 59 Years	88	58.7
≥ 60 Years	38	25.3
Respondent Occupation		
Unemployed	4	2.7
Housewife	86	57.3
Laborer / Farmer / Fisherman	35	23.3
Trader / Self-employed	12	8
Contract Worker	3	2
Civil Servant	10	6.7
Lifestyle		
Good	83	55.3
Poor	67	44.7
Dietary Pattern		
Good	94	62.7
Poor	56	37.3

Variables	n	%
Diabetes Mellitus		
Yes	24	16
No	126	84
Hypertension		
Yes	65	43.3
No	85	56.7
Nutritional Status		
Normal	63	42
Abnormal / Not Normal	87	58

Table 1 shows the general characteristics of respondents. Most respondents were female (64.7%), aged 40–59 years (58.7%), and housewives (57.3%). A majority reported healthy lifestyles (55.3%) and healthy dietary patterns (62.7%). Hypertension was found in 65 respondents (43.3%), while 58% were classified as having abnormal nutritional status.

Table 2. Association between Lifestyle, Dietary Patterns, and Nutritional Status with Diabetes Mellitus

Individual Risk Factors	Individual Risk Factor Categories	Deabetes Mellitus				OR (95% CI)	P Value*
		Yes		Not			
		n	%	n	%		
Lifestyle	Unhealthy	21	31.3	46	68.7	12.2 (3.4 – 43)	<0.001
	Healthy	3	3.6	80	96.4		
Dietary Pattern	Unhealthy	20	21.3	74	78.7	3.5 (1.1 – 10.9)	0.04
	Healthy	4	7.1	52	92.9		
Nutritional Status	Abnormal	13	14.9	74	85.1	0.8 (0.3 – 2)	0.850
	Normal	11	17.5	52	82.5		

Remarks: OR = Odds Ratio; *significant statistic $p < 0,05$

Table 2 shows that unhealthy lifestyle was significantly associated with diabetes mellitus ($p < 0.001$). Respondents with unhealthy lifestyles were 12.17 times more likely to develop diabetes mellitus compared to those with healthy lifestyles. Unhealthy dietary patterns were also significantly associated with diabetes mellitus ($p = 0.04$), with respondents 3.51 times more likely to develop diabetes mellitus compared to those with healthy diets. Nutritional status was not significantly associated with diabetes mellitus ($p = 0.85$).

Table 3 shows that lifestyle was significantly associated with hypertension ($p < 0.001$). Respondents with healthy lifestyles had a 98.4% lower risk of hypertension compared to those with unhealthy lifestyles (OR=0.016). Neither dietary patterns nor nutritional status were associated with hypertension ($p = 1.0$).

Table 3. Association between Lifestyle, Dietary Patterns, and Nutritional Status with Hypertension

Individual Risk Factors	Individual Risk Factor Categories	Hypertension				OR (95% CI)	P Value*
		Yes		Not			
		n	%	n	%		
Lifestyle	Unhealthy	62	74.7	21	25.3	0.016 (0.005 – 0.06)	<0.001
	Healthy	3	4.5	64	95.5		
Dietary Pattern	Unhealthy	41	43.6	53	56.4	1 (0.5 – 2.0)	1.000
	Healthy	24	42.9	32	57.1		
Nutritional Status	Abnormal	38	43.7	49	56.3	1 (0.5 – 2.0)	1.000
	Normal	27	42.9	36	57.1		

Remarks: OR = Odds Ratio; *significant statistic $p < 0,05$

DISCUSSION

Lifestyle and Degenerative Diseases (Diabetes Mellitus and Hypertension)

This study revealed a significant association between lifestyle and the occurrence of degenerative diseases, namely diabetes mellitus (DM) and hypertension. Respondents with unhealthy lifestyles were 12.17 times more likely to develop DM compared to those with healthy lifestyles. This finding is consistent with previous studies reporting that lifestyle is a major trigger of degenerative diseases.^{16–18} Prior research has shown that regular physical activity can reduce the risk of DM by up to 92%, and that aerobic exercise significantly lowers blood glucose levels when performed consistently.¹⁹

The majority of respondents were aged 40–59 years (58.7%) and ≥60 years (25.3%). With increasing age, metabolism declines and insulin production decreases, particularly among those with low levels of physical activity.^{20,21} Women are also more vulnerable to DM due to a sedentary lifestyle, obesity, and lower levels of physical activity.²²

For hypertension, respondents with a healthy lifestyle had a 98.4% lower risk compared to those with an unhealthy lifestyle, consistent with studies that found a significant relationship between lifestyle and hypertension.²³ Age ≥36 years and obesity are also known to be important risk factors for hypertension.²⁴ These results emphasize that lifestyle particularly physical activity is a key determinant of degenerative diseases.

Dietary Patterns and Degenerative Diseases (Diabetes Mellitus and Hypertension)

The study showed a significant association between dietary patterns and DM. Unhealthy dietary patterns increased the risk of DM by 3.51 times. This finding is supported by studies indicating that high consumption of fat- and sugar-rich foods significantly increases DM risk.^{11,25,26} Diets low in fiber and high in refined carbohydrates (white rice, processed fatty foods, and sugary drinks) can induce insulin resistance.^{5,27–29} Low fruit and vegetable intake may be related to economic factors, food availability, and limited awareness of fiber's role in controlling blood glucose.²² Healthy dietary interventions—such as replacing sugary drinks with low-calorie beverages, consuming unsweetened tea, and increasing fruit and vegetable intake—have been shown to reduce the risk of type 2 DM.^{30–32}

Conversely, dietary patterns were not significantly associated with hypertension in this study. This may be due to the homogeneity of high sodium consumption in the study area. The frequent intake of salted fish, instant noodles, and flavor enhancers contributed to high salt consumption.^{33,34} Excess sodium intake is a well-established risk factor for hypertension.^{33,34,36} However, other studies indicate that fruit, vegetable, and plant-based diets have protective effects against hypertension.^{29–31,33,34,36–38} It is important to note that the relationship between dietary habits and hypertension is complex and may be influenced by other factors such as age, sex, and lifestyle characteristics. Thus, these factors must be considered when interpreting the association between diet and hypertension.³⁹

Nutritional Status and Degenerative Diseases (Diabetes Mellitus and Hypertension)

Nutritional status was not significantly associated with either DM or hypertension. This result aligns with studies reporting no significant association between nutritional status and these diseases.⁴⁰ However, it contradicts other literature suggesting a strong link between obesity and the occurrence of both DM and hypertension.^{14,26,41} Poor nutritional status such as obesity increases cardiac output and triggers activation of the sympathetic nervous system and the Renin–Angiotensin–Aldosterone System (RAAS), thereby elevating blood pressure.²⁴

The discrepancy may be due to the use of BMI as the sole indicator of nutritional status, which does not reflect fat distribution. Parameters such as waist circumference or waist-to-hip ratio may provide a more accurate assessment of metabolic risk.⁴² Therefore, future research is recommended to incorporate more comprehensive anthropometric measures. In addition, other factors such as physical activity and dietary patterns may have stronger effects.

Public Health Implications

The prevalence of hypertension in Kalukku (43.3%) was higher than the national prevalence (30.8%), while the prevalence of DM was lower (16%).¹¹ The majority of respondents were housewives with low levels of physical activity, consistent with findings from the Ministry of Health's Basic Health Research in West Sulawesi. Lifestyle, diet, and physical activity play crucial roles in chronic disease control.³⁹ Community-based interventions are needed, such as the "Healthy Living Movement" promoting regular physical activity, dietary education based on local foods, and salt reduction campaigns.⁴³ Socio-cultural factors also influence eating behaviors, including low fruit and vegetable intake due to perceived costs and traditions.⁴⁴ Strengthening community-based non-communicable disease posts (Posbindu PTM) with local adaptations, as well as integrating routine health screening into village development programs, should be considered to reduce the prevalence of NCDs.

Study Limitations

This study has several limitations: (1) the cross-sectional design does not establish causal relationships; (2) purposive sampling limits the generalizability of results; (3) uncontrolled confounders such as family history and genetic factors; (4) lack of direct measurement of daily salt and sugar intake; and (5) the use of median values as cut-offs for dietary patterns, which may not represent clinically meaningful differences. Future research should consider longitudinal designs, more comprehensive measurements (e.g., waist circumference, lipid profile), and mixed-methods approaches to explore deeper socio-cultural determinants.

CONCLUSION

This study concludes that lifestyle is significantly associated with the occurrence of both diabetes mellitus and hypertension, while dietary patterns are significantly associated only with diabetes mellitus. Conversely, nutritional status showed no significant association with either diabetes mellitus or hypertension. These findings highlight the importance of community-based promotive and preventive interventions focusing on lifestyle behavior change, particularly through strengthening local health programs such as Posbindu PTM, in a more contextual and collaborative manner. Such interventions should involve cross-sector collaboration with community health workers, village officials, and local leaders. Activities may include promoting at least 30 minutes of daily physical activity (e.g., group exercise sessions), community-based dietary education through posyandu cadres on the use of local foods (corn, cassava, or sweet potatoes) as alternatives to white rice, and salt-reduction campaigns through cooking demonstrations. Future research should employ longitudinal designs with more detailed measurements such as waist circumference and lipid profiles. Mixed-methods approaches are recommended to better capture socio-cultural determinants. Comparative studies with other rural areas in West Sulawesi are also needed to enrich the evidence base.

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