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RISK FACTORS FOR OBESITY IN RELATION TO DIABETES MELITUS COMPLICATION AT THE KASSI KASSI COMMUNITY HEALTH CENTER IN MAKASSAR CITY

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ABSTRACT

Obesity is a condition in which there is an imbalance between energy intake and energy expenditure over a long period of time, where the amount of energy consumed from food exceeds the energy used for metabolism and daily activities. Obesity complications of diabetes mellitus are classified under the ICD code E-66. Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces. Insulin is a hormone that regulates blood glucose. The International Diabetes Federation (IDF) globally projects that there will be approximately 537 million adults (aged 20-79) living with diabetes in 2021. Based on 2018 Riskesdas data, South Sulawesi ranks 10th with a diabetes prevalence of 1.8% out of 33 provinces in Indonesia. The purpose of this study was to determine the relationship between stress, sleep quality, and sedentary lifestyle with the incidence of diabetes mellitus complications at the Kassi Kassi Community Health Center. The research method used was analytical observation with a case-control design.The sample size was 100 (50 elderly people with DM complications and 50 elderly people without DM complications). Based on the results of the study, there was a relationship between stress p=0.014 (OR=0.324 95% CI= 0.140-0.752), sleep quality p=0.022 (OR= 0.342 95% CI= 0.146-0.803), sedentary lifestyle p=0.017 (OR=0.017, 95% CI=0.094–0.745) with the occurrence of obesity and diabetes complications. Stress levels, sleep quality, and sedentary lifestyle are risk factors for the occurrence of diabetes complications in the elderly at the Kassi Kassi Community Health Centre.

Keywords: Obesity; Diabetes mellitus complications; Stress; Sleep patterns; Sedentary lifestyle; Dietary patterns

1. INTRODUCTION

Obesity and non-insulin-dependent diabetes mellitus (NIDDM) are closely related. Both often occur together in patients, and body mass index (BMI) is the strongest risk factor for the development of NIDDM. Both obesity and NIDDM are also major causes of morbidity and mortality from atherogenic macrovascular disease, and both are independent risk factors for coronary heart disease. The risk of developing NIDDM and cardiovascular disease is influenced by

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regional body fat distribution. Metabolic and circulatory changes associated with visceral obesity lead to the development of insulin resistance and increased lipoprotein synthesis (Rios). Obesity or excessive weight gain is identified as the most important and significant risk factor in the development and progression of type 2 diabetes mellitus (DM) in all age groups. Obesity can also enlarge adipose tissue, and if this condition persists over a long period, hypoxia will occur and trigger a chain reaction of inflammation (Damayati et al., 2023). Obesity and DM are chronic diseases that are increasing globally, necessitating new approaches to manage and prevent diabetes in individuals with obesity. The importance of understanding the mechanistic relationship between the two and designing a comprehensive approach to increase life expectancy and improve quality of life in patients with type 2 diabetes and obesity (Chandrasekaran P, 2024).

Obesity or excessive weight gain is identified as the most important and significant risk factor in the development and progression of type 2 diabetes mellitus (DM) in all age groups. Obesity and DM are chronic diseases that are increasing globally, requiring new approaches to manage and prevent diabetes in individuals who are obese. It is important to understand the mechanistic relationship between the two and to design comprehensive approaches to improve life expectancy and quality of life in patients with type 2 DM and obesity (Chandrasekaran P, 2024). Obesity is classified as a disease in the ICD-10, and obesity complications are included in the category with code E66 for overweight and obesity.

There are two broad categories of obesity complications: biomechanical complications arising from a general increase in adipose tissue mass, which results in mechanical dysfunction; and cardiometabolic complications arising from abnormalities in the distribution and function of adipose tissue, which cause pathophysiological processes that result in end-stage metabolic and vascular sequelae. The development of cardiometabolic complications begins with insulin resistance, progresses to high-risk metabolic syndrome (MetS) and prediabetes, and culminates in type 2 diabetes (T2D), non-alcoholic fatty liver disease (NAFLD), cardiovascular disease (CVD), or all three in a single individual (W. Timothy Garvey & Jeffrey I. Mechanick, 2020).

Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin or when the body cannot use the insulin it produces effectively. Insulin is a hormone that regulates blood glucose. Being overweight and obese are closely related to blood glucose levels. The accumulation of fatty tissue in overweight and obese individuals can cause insulin resistance, which triggers an increase in blood glucose levels in the body (Lengkong et al., 2020). The International Diabetes Federation (IDF) globally projects that there will be approximately 537 million adults (aged 20-79) living with diabetes in 2021. In addition, the IDF also states that the number and prevalence of people with diabetes aged 20-79 years in Indonesia will continue to increase from year to year. This is the second highest number of all IDF Regions and represents nearly 9% of the regional population in this age group. More than 1 million people died from diabetes in 2019 – the second highest number of deaths in all IDF regions (International Diabetes Federation (IDF), 2021). Based on data from the 2018 Basic Health Research, South Sulawesi ranks 10th with a diabetes prevalence of 1.8% out of 33 provinces in Indonesia (Indonesian Ministry of Health, 2020). The prevalence of diabetes based on SKI 2023 data in Indonesia is 11.7% (based on blood sugar test results) in people aged ≥15 years, an increase from 10.9% in 2018 (Health, 2023). Data from the Makassar City Health Office in 2024 shows that there are 13,769 people with DM. The Kassi Kassi Community Health Centre has the highest prevalence of DM, with 1,553 cases, followed by the Kaluku Bodoa Community Health Centre and the Sudiang Community Health Centre, with 1,210 and 1,200 cases, respectively. Advanced adulthood is a contributing factor to the occurrence of diabetes mellitus due to changes in the body's immune system. At the age of

40, human physiological functions decline due to the ageing process, and after reaching this age, non-communicable diseases such as diabetes often appear (Fandinata & Ernawati, 2020). Physiologically, the function of human organs declines due to the body's reduced ability to control blood glucose, resulting in decreased insulin secretion (Riamah in the book Perilaku Kesehatan Pasien Diabetes Melitus [Health Behaviour of Diabetes Mellitus Patients], (2022) in (Dwi Ambar Wati et al., 2024).

Based on this background, the author was interested in conducting research on the determinants of obesity with complications of diabetes mellitus at the Kassi Kassi Community Health Centre in Makassar City, to find out what factors of obesity can influence the incidence of diabetes mellitus, thereby reducing the incidence of DM complications in obese patients and improving the highest possible level of public health.

2. METHODS

This study is an observational study using a case-control approach. It was conducted at the Kassi Kassi Community Health Centre. The study was conducted from May to July 2025. The population in this study consisted of all obese patients aged 55–75 years at the Kassi Kassi Community Health Centre, comparing the case group (obese patients with diabetes mellitus complications) and the control group (obese patients without complications). The initial population size was 121 people, and then a sample calculation was performed using the Slovin formula, resulting in 100 respondents consisting of 50 case respondents and 50 control respondents. The age range of 55-75 years was chosen for the respondents because at that age, there is a decline in the metabolic system, which can increase the occurrence of complications. The sampling technique used was purposive sampling. Data collection in this study was conducted observationally using primary and secondary data. Primary data was obtained from interviews with respondents regarding their identity and questionnaires that referred to sleep patterns using the Pittsburgh Sleep Quality Index (PSQI) questionnaire, sedentary lifestyle using the Measure of Older Adults Sedentary Time (MOST) questionnaire, and stress using the Depression Anxiety Stress Scales (DASS-21) questionnaire. Meanwhile, secondary data was obtained from the Kassi Kassi Community Health Centre's PTM report.

The questionnaire was completed after patients with obesity complicated by diabetes mellitus were given a consent form to participate as respondents. The Pittsburgh Sleep Quality Index (PSQI) questionnaire was used to assess sleep quality. Respondents were asked to answer 19 questions covering seven components, namely: subjective sleep quality, time taken to fall asleep, sleep duration, sleep efficiency, sleep disturbances, use of sleeping pills, and daytime activity disturbances. The final PSQI score was calculated by adding up the scores from all components, then categorised into two groups, namely good sleep quality (≤ 5) and poor sleep quality (> 5). The MOST questionnaire is an instrument used to assess the level of sedentary lifestyle in the elderly. This questionnaire consists of 7 questions containing the types of sedentary activities performed and the duration of time spent doing them. The final results of this questionnaire are then categorised into two groups, namely low if < 8.5 hours/day and high if ≥ 8.5 hours/day. Meanwhile, the Depression Anxiety Stress Scale (DASS) questionnaire is used to measure a person's stress level. The DASS questionnaire consists of 14 questions, with the following answer options: never = 0, sometimes = 1, fairly often = 2, and very often = 3. The final score of this questionnaire is categorised into two levels: mild stress = 1–18 and severe stress = ≥ 19.

Data processing in this study was conducted using the Statistical Package for the Social Sciences (SPSS) application, and the data was analysed univariately and bivariately. The independent variables in this study included sleep patterns, sedentary lifestyle, and stress levels, while the dependent variable was the incidence of obesity with diabetes complications. Univariate analysis was used to describe and examine the frequency distribution and percentage of each research variable. Meanwhile, bivariate analysis was used to determine and identify the relationship between the independent and dependent variables using the Chi-Square test. With a significance level of 95% ($\alpha < 0.05$), the test results were declared to have a significant relationship if the p-value was less than 0.05. In addition, to determine the magnitude of the association or strength of the relationship between the independent and dependent variables, the Odds Ratio (OR) was calculated as a measure of effect.

3. RESULTS AND DISCUSSION

The working area of the Kassi Kassi Community Health Centre is located in Kassi Kassi Village, Rappocini District, Makassar City, with a working area of approximately 5.2 square kilometres. The Kassi Kassi Community Health Centre was established in 1978/1979. It consists of six villages with 58 neighbourhood associations and 361 community associations.

Table 1. Frequency Distribution Based on Respondent Characteristics at the Kassi Kassi Community Health Centre in 2025

Respondent Characteristics	Group		(n)	(%)
	Case	Control		
Gender				
Male	19	26	45	45
Famale	31	24	55	55
total	50	50	100	100
Age (Year)				
45-55	3	4	7	7
56-65	15	22	37	37
>65	32	24	56	56
total	50	50	100	100

Based on Table 1 it can be seen that the frequency distribution based on gender of the 100 respondents in the case and control groups was mostly female (55% and 45%). Based on the age frequency of the 100 respondents in the case and control groups, most were aged >65 years (56%).

Univariate Analysis

Table 2. Distribution of Respondents Based on Stress Levels at the Kassi Kassi Community Health Centre in 2025

Stres Level	Total (n)	Percentage (%)
Low	39	39
High	61	61
Total	100	100

Based on Table 2 it can be seen that the frequency distribution of respondents based on stress levels from 100 respondents shows that most respondents are in the severe category, namely 61%.

Table 3. Distribution of Respondents Based on Sleep Patterns at the Kassi Kassi Community Health Centre in 2025

Sleep Quality	Total (n)	Percentage (%)
Good sleep quality	36	36
Poor sleep quality	64	64
Total	100	100

Based on Table 3 it can be seen that the frequency distribution of respondents based on sleep quality from 100 respondents shows that most respondents are in the poor category, namely 64%.

Table 4. Distribution of Respondents Based on Sedentary Lifestyle Activities at the Kassi Kassi Community Health Centre in 2025

Sedentary Lifestyle **Activities**	Total (n)	Percentage (%)
Low	23	23
High	77	77
Total	100	100

Based on Table 4 it can be seen that the frequency distribution of respondents based on sedentary lifestyle activities from 100 respondents shows that most respondents are in the high category, namely 77%.

bivariate Analysis

Table 5. The Relationship Between Stress and the Incidence of Diabetes Mellitus Complications in Elderly People at the Kassi Kassi Community Health Centre in 2025

Stres Level	Groups				Total	%	*p*	OR	95%CI
	Obesity DM Complications		Obesity Diabetic Without Complications						
	n	%	n	%					
Low	13	26	26	52	39	39			
Hight	37	74	24	48	61	61	0.014	0.324	0.140-0.752
Total	50		50		100				

Based on Table 5 it can be seen that the percentage of respondents with severe stress levels was 37 respondents (74%) in the case group, which was higher than the control group, where there were 24 respondents (48%). Based on the Chi-Square test that was conducted, a p-value of 0.014 < 0.05 was obtained, which means that there is a relationship between stress levels and the occurrence of DM complications. Furthermore, based on the statistical analysis results, an Odd Ratio value of 0.324 (95% CI: 0.140-0.752) was obtained. Therefore, based on the OR value obtained, respondents with severe stress levels reduce the risk of experiencing DM complications by 0.324 times compared to respondents without complications.

Table 6. The Relationship Between Sleep Quality and the Incidence of Diabetes Mellitus Complications in Elderly People at the Kassi Kassi Community Health Centre in 2025

Sleep Quality	Groups				Total	%	*p*	OR	95%CI
	Obesity DM Complications		Obesity Diabetic Without Complications						
	n	%	n	%					
Good sleep quality	12	24	24	48	36	36			
Poor sleep quality	38	76	26	52	64	64	0.022	0.342	0.146-0.803
Total	50		50		100				

Based on Table 6 it can be seen that the percentage of respondents with poor sleep quality was 38 respondents (76%) in the case group, which was higher than the control group, where there were 26 respondents (52%). Based on the Chi-square test that was conducted, a p-value of 0.022 < 0.05 was obtained, which means that there is a relationship between sleep quality and the occurrence of DM complications. An Odd Ratio of 0.342 (95% CI: 0.146-0.803) was obtained. Therefore, based on the OR value obtained, respondents with poor sleep quality have a 0.342 times lower risk of experiencing DM complications compared to respondents without complications and with good sleep quality.

Table 7. The Relationship Between Sedentary Lifestyles and the Incidence of Diabetes Mellitus Complications in Elderly People at the Kassi Kassi Community Health Centre in 2025

Sedentary Lifestyle Activities	Groups				Total	%	*p*	OR	95%CI
	Obesity DM Complications		Obesity Diabetic Without Complications						
	n	%	n	%					
Low	6	12	17	34	23	23			
High	44	88	33	66	77	77	0.017	0.265	0.094-0.745
Total	50		50		100				

Based on Table 7 the percentage of respondents with a high sedentary lifestyle was found in the case group, with 44 respondents (88%), which was higher than the control group, with only 33 respondents (66%). Based on the Chi-Square test that was conducted, a p-value of 0.017 < 0.05 was obtained, which means that there is a relationship between sedentary lifestyle activities and the occurrence of DM complications. An Odd Ratio of 0.265 (95% CI: 0.094-0.745) was obtained. Thus, respondents with a high sedentary lifestyle reduced their risk of experiencing DM complications by 0.265 times compared to respondents without complications.

4. CONCLUSION

The results of the study show that there is a relationship between stress and the incidence of obesity complications of diabetes mellitus in elderly people at the Kassi Kassi Community Health Centre in Makassar, with a p-value of 0.014. There is a relationship between sleep quality and the incidence of obesity complications of diabetes mellitus in the elderly at the Kassi Kassi

Community Health Centre in Makassar with a p-value of 0.022. There is a relationship between sedentary lifestyle activities and the incidence of obesity complications of diabetes mellitus in the elderly at the Kassi Kassi Community Health Centre in Makassar with a p-value of 0.017. There are limitations to this study in that the time allocated to respondents was not effective for completing the questionnaire, as elderly respondents had to recall activities carried out in the last six months. Therefore, it is hoped that future researchers will pay more attention to the time allocated for completing the questionnaire.

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