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THE RELATIONSHIP BETWEEN BLOOD SUGAR LEVELS AND BLOOD PRESSURE IN PATIENTS WITH TYPE II DIABETES MELLITUS IN THE WORKING AREA OF THE HEALTH CENTER

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ABSTRACT

Prolonged treatment therapy is necessary to decrease the occurrence of complications in diabetes mellitus, a chronic illness. The goal of this research is to identify the factors—such as age, weight, family history, lifestyle, and nutrition—that raise the likelihood of diabetes mellitus and to find out whether people with type II diabetes mellitus are more likely to have hypertension as a result of their diabetes. Correlation using a cross-sectional technique is used, with an emphasis on data measurement or observation on the independent and dependent variables occurring simultaneously. This study's population consists of all 94 individuals employed at the Ciracap Health Center who have a history of type 2 diabetes mellitus. In this research, 55 participants will be surveyed using the slovin formula. For this study, researchers utilized a non-probability sampling strategy based on a purposive sampling method. Asymptotic significance (two-sided) was determined to have a P value of 0.002 in the chi-square test. This result indicates that Ha is accepted and H0 is rejected, since p < 0.05. It follows that in the Ciracap workplace, people with type 2 diabetes have a strong correlation between their blood sugar and blood pressure readings.

Introduction

Hyperglycemia due to insulin resistance and beta cell dysfunction is the hallmark of Type II Diabetes Mellitus, a chronic metabolic disorder. Hypertension is also reported by most patients with Type II Diabetes Mellitus, which increases the risk of morbidity and the onset of complications such as diabetic foot ulcers, diabetic retinopathy, and kidney disease. Uncontrolled increases in blood sugar levels are correlated. However, the relationship between the two has become a major topic of academic discussion due to mediating factors and their repercussions.

Long-term treatment of diabetes mellitus to reduce the incidence of complications, which is a chronic disease. One of the factors affecting the final turn of the turn signal is the tapping of the turn signal. One of the risk factors for hypertension is hyperglycemia. According to Tanto and Hustrini (2014) and Anggi Amalia Cinta Lestari (2024), hyperglycemia is often accompanied by metabolic syndrome, which includes hypertension, dyslipidemia, obesity, endothelial dysfunction, and thrombotic factors. All of these will contribute to and exacerbate renal complications. Changes in blood sugar, with high blood sugar appearing on the walls of blood vessels, can lead to diabetic macroangiopathy, one of the complications of this disease. After that, the process of oxidation occurs, causing AGEs to be produced when gallbladder proteins react with gallstone minerals. The end products of glucose and protein hydrolysis are called Advanced Glycosylated Endproducts (AGEs), which destroy the basement membrane of blood vessels and add cholesterol to the basement membrane, which prevents the reaction from occurring. White blood cells (lekocytes) and blood clotting cells (platelets), come together from other materials, along with the plaque clumps (clots). In a kaleidoscope of events, the walls of the blood vessels become hard, stiff, and eventually clogged resulting in changes in blood pressure, otherwise

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known as hypertension. According to the American Diabetes Association (ADA) (2017), out of four people diagnosed with diabetes, two of them have high blood sugar levels. (Anggi Amalia Cinta Lestari, 2024) .

In 2012, 1.5 million deaths worldwide were caused by diabetes mellitus. The risk of cardiovascular and other diseases increased by 2.2 million cases per 100,000 people due to high blood sugar levels above the normal range. Of the 3.7 million cases, 43% occur before the age of 70. Compared to high-income countries, low-income countries have a higher prevalence of diabetes mellitus in adults younger than 70 years of age (WHO, 2016). In 2017, the prevalence of diabetes mellitus in Southeast Asia was 8.5%, according to the International Diabetes Federation (IDF). By 2045, when Indonesia ranks 6th behind China, India, the United States, Brazil and Mexico with a total of 11.3 million new cases of diabetes mellitus, the prevalence is expected to increase to 11.1%, according to the International Diabetes Federation (2017).

The prevalence of diabetes mellitus has increased in 2018, according to statistical data from the Central Statistics Agency (RISKESDAS). Based on the RISKESDAS results, the prevalence of diabetes mellitus was 6.9% in 2013 and increased to 8.5% in 2018. According to the latest statistics collected from the International Diabetes Federation (IDF) in 2018, Indonesia has the highest prevalence of type 2 diabetes worldwide, with a total of 10.3 million cases. By 2030, if left untreated, the incidence of type 2 diabetes in Indonesia is projected to reach 21.3 million people (Indonesian Ministry of Health, 2018). (Imalambasi et al., 2022)

Diabetes mellitus is among the top 10 most prevalent non-communicable diseases over the past decade, according to the Sukabumi District Health Office's Non-Communicable Disease Control Program in 2019. Two of these ten complications are caused by diabetes mellitus. Based on data on the number of cases of Diabetes Mellitus per region in Sukabumi District in 2017, out of a total of 9014 cases, 3 regions (Region I, Region IV, and Region VI) had the highest prevalence of Diabetes Mellitus. There were 1235 cases out of a total of 496,856 participants in Region I, Sukabumi District. (Mulyadi & Basri, 2021) .

The prevalence of type 2 diabetes in Sukabumi district, particularly in Ciracap sub-district, is one of the highest in the district, according to data collected by the Central Bureau of Statistics.

A health problem characterized by the accumulation of glucose in the blood, diabetes mellitus (DM) is a set of symptoms caused by elevated blood sugar (glucose). The main energy in living organisms is glucose. The stain that covers the level of glucose in the blood is called blood sugar or simply blood. is a precursor for the synthesis of all other carbohydrates in the body, including glycogen, ribose, deoxyribose in nucleic acids, galactose in sucrose, glycolipids, glycoproteins, and proteoglycans (Murray et al, 2003; Fahmi et al, 2020). The normal glucose concentration in blood or serum is about 90 mg/dl, the amount possessed by a person who has not eaten in the last three or four hours. This glucose is known as blood glucose. When you don't have to urinate or look at the food you have just eaten, you do an intermittent blood glucose test, which is a measurement of blood glucose. The cut-off is 110 mg/dl or less. Unhealthy glucose metabolism can damage your organs. According to Smeltzer et al. (2003) and Fahmi et al. (2020), hyperglycemia and type 2 diabetes can be caused by high blood sugar. According to Contreas et al. (2022), patients with diabetes have delayed formation of non-enzymatic glycosylation products on the collagen surface of the skin, which can lead to decreased skin elastin and even hypertension. (Pramono & Luzida Azmi Aurelia, 2024) .

In terms of DM, hypertension is a major risk factor. The very complex combination of hypertension and type 2 diabetes can make insulin-sensitive gels become insulin-resistant. Insulin is useful because it increases glucose uptake by many cells and alters carbohydrate metabolism in this way; therefore, blood sugar levels can also be compromised if insulin is resistant by such cells. (Pratama Putra et al., 2019) .

Research carried out by Anggi Amalia Cinta Lestari in 2024 This study found that 17.8% of the participants had hyperglycemia, 66.7% had high blood pressure at the 1st century mark, and

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33.3% had high blood pressure at the 2nd century mark. On patients with type 2 diabetes, there is a correlation between high blood pressure and erectile dysfunction.

Arifin et al. (2020) analyzed the relationship between HbA1c and blood pressure in Type 2 DM patients at the Puskesmas. They found that systolic blood pressure was positively correlated with HbA1c levels, when the patients were grouped by age. Also, to find out how effective blood sugar regulation is for diabetic patients, Sari and Putri (2019) used fasting blood sugar (GDP) levels as an indication. This study aims to identify the factors that raise the likelihood of developing diabetes mellitus, including age, weight, family history, lifestyle, and diet, and to find out if individuals with type II diabetes mellitus are more likely to have high blood pressure if their blood sugar levels are consistently high.

Method

This study design serves as a framework for addressing research topics, validating hypotheses, and foreseeing potential challenges. Using a cross-sectional design, the technique is correlational and places an emphasis on the timing of data collection for both the independent and dependent variables. This study's population consists of all 94 individuals employed at the Ciracap Health Center who have a history of type 2 diabetes mellitus. In this research, 55 participants will be surveyed using the slovin formula. Using the following criteria, this research employs a non-probability sampling strategy based on a purposive sampling approach: Inclusion Criteria: Respondents who are willing to be sampled, Respondents aged 20-70 years, Respondents with a history of type II diabetes mellitus. Exclusion Criteria: Respondents refused the Intervention. Respondents with no history of type II diabetes mellitus

A questionnaire that has been tailored to the study goals, research variables, and theory-informed design will be used as the data collecting instrument. X1 stands for blood sugar level, and Y for blood pressure; these two variables are used to calibrate the device. Questionnaires and in-person interviews were the means of data gathering used in this investigation. A validated and reliable questionnaire serves as the research tool. The data was analyzed using SPSS software for Windows 20, specifically univariate and bivariate analysis. When the R-count is higher than the r-table value (0.444), the validity test yields valid findings. Because X1 (0.809) > (0.444) and X2 (0.844) > (0.444), the R-count is greater than the r-table. With an r-alpha of 0.656> r-table of 0.444, the findings of the reliability test were deemed trustworthy. Univariate and bivariate analysis are the methods used for the analysis. Univariate analysis seeks to explain or define the properties of each study variable, according to Notoatmodjo (2015) in Firdaus et al. (2021). Many factors were used to determine the respondents' characteristics, including their gender, level of education, profession, length of time from DM diagnosis, and family history. In order to estimate or assess the frequency being researched or to analyze observations to see whether there is a significant connection or difference in the study, bivariate analysis employing the chi-square test is used (Notoatmodjo, 2015; Firdaus et al., 2021).

Results

Univariate Analysis

a. Gender

The researcher identifies the respondents according to their gender before presenting the findings of this thesis study.

Table 1. Distribution of Respondent Characteristics by Gender (n=55)

Gender	Frequency (people)	Percentage (%)
Male	23	45,3%
Female	32	54,7 %

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Gender	Frequency (people)	Percentage (%)
Total	55	**100%**

Table 1 reveals that there were 32 females (58.2% of the total) and 23 men (41.8%). Of the total responders, 32 were female, making up 58.2% of the total.

b. Age

Prior to presenting the results of this thesis study, the researcher sorts the respondents by age.

Table 2. Distribution of Respondent Characteristics by age (n=55)

Age	Frequency (people)	Percentage (%)
20-30 years	1	1,8%
31-40 years old	4	7,3%
41-50 years old	5	9,1 %
51-60 years old	44	80,0 %
61-70 years	1	1,8%
Total	**55**	**100%**

Based on the data in table 2, there is a representation of the following age groups: those between 20 and 30 years old (1.8% of the total), those between 31 and 40 years old (7.3% of the total), those between 41 and 50 years old (9.1% of the total), those between 51 and 60 years old (80.0%), and those between 61 and 70 years old (1.8% of the total). Of the total number of responders, forty-four (or 80.0%) fell within the 51-60 age bracket.

c. Education

The researcher identifies the respondents according to their degree of education before presenting the findings of this thesis study.

Table 3. Distribution of Respondent Characteristics by age (n=55)

Education	Frequency (people)	Percentage (%)
Not in School	0	0,0 %
SD	5	9,1 %
SMP	39	70,9 %
HIGH SCHOOL	7	12,7 %
Diploma	1	1,8 %
Bachelor	3	5,5%
Total	**55**	**100%**

Figure 3 illustrates that out of the total population, 0% have never attended school, 9.1% have completed elementary school, 70.9% have completed junior high, 12.7% have completed high school, 1.8% have a bachelor's degree, and 5.5% have a master's degree. The number of participants with a junior high school diploma increased to 39 (70.9%).

d. Jobs

The researcher introduces the work-based respondents before delving into the outcomes of this thesis study.

Table 4. Distribution of Respondent Characteristics by Occupation (n=55)

Jobs	Frequency (people)	Percentage (%)
Labor	9	16,4 %
Trader/ Self-employed	3	5,5 %
Farmers	8	14,5 %
PNS	2	3,6 %
IRT	33	60,0 %
Total	55	100%

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Table 4 reveals that among the respondents, there are a total of 33 (60.0%) who are either housewives or work as farmers. Among the traders/self-employed, there are 9 (16.4%), 8 (14.5%), 2 (3.6%), and 8 (14.5%). More work variables were working as housewives (IRT), with 33 persons (60.0%) falling into this category, according to the findings of this survey.

e. Overview of Blood Sugar Levels in Diabetes Mellitus 2 Patients

An Overview of Blood Sugar Levels in Patients with Diabetes Mellitus Type 2 is provided before the researcher explains the outcomes of this thesis study.

Table 5. Overview of Blood Sugar Levels in Type 2 Diabetes Mellitus Patients (n=55)

Blood Sugar Levels	Frequency (people)	Percentage (%)
Hyperglycemia	37	67,3 %
Normal	18	32,7%
Hypoglycemi	0	0,0%
Total	**55**	**100%**

Blood sugar levels in patients with type 2 diabetes mellitus were found to be hyperglycemia in 37 cases (67.3%), normal in 18 cases (32.7%), and hypoglycemia in 0 cases (0.0%), as shown in Table 5. Hyperglycemia was the most common blood sugar level among 37 participants (67.3% of the total) with type 2 diabetes mellitus, according to this research.

f. Hypertension in patients with type 2 diabetes mellitus

The researcher begins by outlining the prevalence of hypertension in T2DM patients before moving on to discuss the findings of this thesis.

Table 6. Hypertension in patients with type 2 diabetes mellitus (n=55)

Hypertension	Frequency (people)	Percentage (%)
Hypertension	32	58,2%
Normal	23	41,8%
Hypotension	0	0,0 %
Total	**55**	**100%**

According to Table 6, 58.2% of individuals with type 2 diabetes mellitus have hypertension, 41.8% have normal blood pressure, and 0.0% have hypotension. Hypertension was most common in 32 individuals (58.2% of the total) with type 2 diabetes mellitus, according to this research.

***Bivariate* Analysis**

This research used bivariate analysis to look for a correlation between blood pressure and blood sugar levels in people with type 2 diabetes mellitus who were working at the Ciracap Health Center. The research used the Chi Square test to examine the hypotheses.

Table 7. Relationship between blood sugar levels and blood pressure in patients with diabetes mellitus II in Ciracap working area.

Glucose	Blood Pressure				Total		*P-Value*
	Hypertension		Normal				
	F	%	F	%	F	%	
Hyperglycemia	28	50.9%	4	7.3%	32	58.2%	**0,002**
Normal	9	16.4%	14	25.5 %	23	41.8%	

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Total	**37**	**58.2%**	**18**	**41.8 %**	**55**	**100,0 %**

Table 7's tabulated data shows that up to 28 persons, or 50.9% of the total, with type 2 diabetes mellitus had hyperglycemia glucose levels together with hypertension. hyperglycemia glucose levels in up to four individuals (7.3%) with normal blood pressure. elevated blood pressure (hypertension) and normal glucose levels in up to nine individuals (16.4%). inside the normal range for blood pressure and glucose levels as many as fourteen individuals (25.5%).

A two-sided chi-square test for asymptotic significance yielded a p-value of 0.002. This result indicates that Ha is accepted and H0 is rejected, since $p < 0.05$. It follows that in the Ciracap workplace, people with type 2 diabetes have a strong correlation between their blood sugar and blood pressure readings.

Discussion

Overview of Blood Sugar Levels

Consistent with previous research, high blood sugar levels are considered a major risk factor for and contributor to the development of problems in type 2 diabetes. According to research, regulating blood sugar levels has two goals: reducing symptoms and preventing harm to certain organs that might develop as a result of diabetes.

Table 7's tabulated data shows that up to 28 persons, or 50.9% of the total, with type 2 diabetes mellitus had hyperglycemia glucose levels together with hypertension. hyperglycemia glucose levels in up to four individuals (7.3%) with normal blood pressure. elevated blood pressure (hypertension) and normal glucose levels in up to nine individuals (16.4%). inside the normal range for blood pressure and glucose levels as many as fourteen individuals (25.5%).

High blood pressure is a common symptom of diabetes, according to research by Gemini and Natalia (2023). Parts of the walls of blood vessels become dysfunctional or degraded in function in patients with uncontrolled blood sugar levels, making them less effective at their intended role as a barrier to other substances moving through the circulation. Given the correlation between the two, it is imperative that patients closely monitor and maintain appropriate blood sugar and blood pressure levels.

However, in the RW.IX Sendangmulyo Village senior community, researchers KAHAR (2022) found no correlation between blood sugar and hypertension.

Blood Pressure Overview

Comorbidities with type II diabetes mellitus include hypertension, or high blood pressure, which is a leading cause of diabetic complications. A large body of evidence suggests that the risk of vascular problems might be enhanced when hyperglycemia and hypertension are present together.

Anggi Amalia Cinta Lestari (2024) states that patients should monitor and maintain their blood sugar and blood pressure levels to ensure they remain within normal ranges, due to the correlation between the two. Advantages of BP management for hypertensive individuals co-morbid with type 2 diabetes

A person's hypertension develops as a result of the interplay of several risk factors, as stated by Reanita et al. (2021). The buildup of collagen components in the muscle layer leads the artery wall to thicken as a result of aging, which causes blood vessels to constrict and become stiff beginning around the age of 45. Along with these issues, sympathetic activity and peripheral resistance rise, baroreceptor sensitivity (blood pressure control) is absent, and renal blood flow and glomerular filtration rate play less of a role.

Conclusion

Hypoglycemia is characterized by elevated blood sugar levels in type 2 diabetic individuals, according to the data shown in Table 7. amounts of glucose in conjunction with hypertension in

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as many as twenty-eight individuals (50.9%). hyperglycemia glucose levels in up to four individuals (7.3%) with normal blood pressure. elevated blood pressure (hypertension) and normal glucose levels in up to nine individuals (16.4%). inside the normal range for blood pressure and glucose levels as many as fourteen individuals (25.5%). A two-sided chi-square test for asymptotic significance yielded a p-value of 0.002. The outcome of p <0.05 is shown by this number, which implies that Ha is accepted and H0 is rejected. It follows that in the Ciracap workplace, people with type 2 diabetes have a strong correlation between their blood sugar and blood pressure readings.

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