Blood Type Profile in Relation to the Prevalence of Metabolic Diseases and Diabetes Mellitus at Kraton Regional General Hospital, Pekalongan Regency

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ABSTRACT

Background & Objective: Diabetes mellitus is one of the chronic metabolic diseases whose prevalence continues to increase in Indonesia and is the third leading cause of death in the country. The main disorder in diabetes is carbohydrate metabolism, which causes chronic hyperglycemia and poses a risk of complications in various organs of the body, such as the eyes, kidneys, nerves, heart, and blood vessels. In addition to genetic factors and lifestyle, several studies have shown an association between ABO blood type and the tendency to develop type 2 diabetes mellitus. This study aims to determine the distribution of blood types in relation to the tendency for metabolic diabetes mellitus at Kraton District General Hospital in Pekalongan. **Method:** This study used a descriptive design with 35 samples collected through total sampling among diabetes mellitus patients at Kraton District General Hospital in Pekalongan. Blood type testing was conducted using the slide method. **Result:** The results showed that blood type B had the highest percentage (40%), followed by blood type A (28.57%), blood type O (20%), and blood type AB (11.43%). **Conclusion:** It can be concluded that blood type B has a high percentage (40%) compared to other blood types. This indicates that blood type B is more dominant among diabetes mellitus patients in the sample at Kraton District General Hospital, Pekalongan.

Introduction

The *International Diabetes Federation* states that diabetes mellitus is a chronic condition that occurs when the pancreas is unable to produce enough insulin, or the

body cannot utilize insulin efficiently. Insulin is a hormone produced by the pancreas that acts as a key to transport glucose from the food we consume into the body's cells to produce energy (Federation, 2019).

According to the *American Diabetes Association*, diabetes is a metabolic condition characterized by hyperglycemia resulting from impaired insulin secretion, insulin action, or a combination of both. Chronic hyperglycemia in diabetes can lead to long-term damage and dysfunction in various organs, such as the eyes, kidneys, nerves, heart, and blood vessels (Association, 2020).

Diabetes mellitus is a general term for metabolic disorders of the pancreas and is characterized by elevated blood sugar levels, or hyperglycemia, caused by a decrease in insulin and pancreatic function (Lestari et al., 2021). Chronic hyperglycemia in diabetes is associated with damage and dysfunction of several organs, particularly the eyes, kidneys, nerves, heart, and blood vessels (Widodo, 2017).

Metabolism in diabetes is impaired, but the most significant metabolic disturbance is carbohydrate metabolism. Therefore, the diagnosis of diabetes is always based on elevated glucose concentrations in the blood plasma (Ummah, 2019). Diabetes can affect various organ systems over a long period of time, and this is referred to as complications. Diabetes complications can be divided into microvascular complications and macrovascular complications. Microvascular complications include nerve damage (neuropathy), kidney damage (nephropathy), and eye damage (retinopathy). Macrovascular complications include heart disease, stroke, and peripheral vascular disease (Rosyada & Trihandini, 2013).

Diabetes is one of the deadliest chronic diseases in Indonesia. According to the Institute for Health Metrics and Evaluation, diabetes was the third leading cause of death in Indonesia in 2019, with approximately 57.42 deaths per 100,000 people (Raranta et al., 2023). According to data from the *International Diabetes Federation* (IDF), the number of diabetes patients in Indonesia in 2021 has increased rapidly over the past 10 years. This number is projected to reach 28.57 million people by 2045, an increase of 47% from 19.47 million people in 2021 (Lubis, 2023).

Diabetes is related to blood. Blood is a fluid in the body that transports oxygen to all tissues. Blood is generally classified into different types (Dian Fita Lestari et al., 2020). Blood type is a classification system based on the type of antigen present in the blood. These antigens can be carbohydrates or proteins. The factor determining human blood type is the antigen present on the surface of red blood cells, known as agglutinin. The substance that is anti-antigenic is called an antibody (agglutinin), which is a natural antibody found in serum, and when it reacts, it agglutinates the related antigen (Jafriati, 2022).

Blood type is a blood classification system based on the presence or absence of antigens and antibodies on red blood cells. Blood type is determined by parents and passed on to their children. The most commonly known blood type classification system is the ABO blood type system, which is divided into four blood types: A, B, O, and AB (Anggraeni, 2022).

A total of 29 blood group systems have been identified to date, including the ABO, Rhesus, P, MNS, Lutheran, Kell, Kidd, Duffy, I, and other systems. Blood types are named based on the antigens found on the surface or membrane of red blood cells. Among all these systems, the ABO and Rhesus blood types are the most important in blood transfusions (Joseph, 2006).

Research related to blood type and the risk of diabetes mellitus conducted by Zahara Nurfatihah Z, Nur Vaizi, and Maya Yuni showed that 17% of respondents were at risk of type 2 diabetes mellitus, with most respondents with blood types A and B having a higher risk than those with other blood types (Z et al., 2021).

Objective

The objective of this study was to determine the relationship between blood type and the tendency for metabolic diseases such as diabetes mellitus at the Kraton Regional General Hospital in Pekalongan Regency.

Method

The type of research used is descriptive research. The population in this study is diabetes mellitus outpatients at Kraton District Hospital in Pekalongan, with a total of 35 people. The sample was taken using total sampling. This research was conducted from October 2024 to March 2025 at Kraton District Hospital in Pekalongan. The sample was examined using the slide method. The data in this study came from primary and secondary data. Primary data was obtained by the researcher from direct examinations of outpatient diabetes mellitus patients at Kraton District General Hospital in Pekalongan. Secondary data was obtained from existing and available data sources used as supporting data by the researcher, such as data from literature such as research journals. The data obtained was then processed, presented in tabular form, and narrated.

Results

The results of the study on the relationship between blood type and the tendency to develop metabolic diseases such as diabetes mellitus at the Kraton Regional General Hospital in Pekalongan Regency, with a sample size of 35 samples obtained in February 2025, are as follows:

TABLE 1. Research Results

Sample Number	Blood Type
S1	B
S2	B
S3	A
S4	A
S5	O
S6	B
S7	A
S8	O
S9	A
S10	AB
S11	A
S12	A
S13	A
S14	O
S15	B
S16	AB
S17	A
S18	O
S19	B
S20	O

S21	B
S22	A
S23	B
S24	B
S25	O
S26	AB
S27	B
S28	O
S29	B
S30	B
S31	AB
S32	B
S33	A
S34	B
S35	B

TABLE 2. Frequency distribution of blood types among all respondents

Blood Type	Total	Percentage
A	10	28,57%
B	14	40%
O	7	20%
AB	4	11,43%

The distribution of respondents in this study shows that blood type B has the highest number (40%), followed by blood type A (28.57%), blood type O (20%), and blood type AB (11.43%).

Discussion

Blood type B in this study had a high percentage (40%) compared to other blood types. This is consistent with a study published in the International Journal of Hematology and Blood Disorders in 2017 in Pakistan, which found that individuals with blood type B had a higher tendency to develop diabetes compared to other blood types (Khalil et al., 2023). This is believed to be related to non-von Willebrand factors, which are proteins in the blood that play a role in increasing blood sugar levels, with higher levels of these proteins found in blood type B. Individuals with blood types other than O have a higher risk of type 2 diabetes mellitus due to higher levels of non-von Willebrand factors.

Based on the results of this study, blood type AB shows a lower risk compared to blood type O. This is likely due to the small sample size, making the results less representative. Meanwhile, the study by Zahara Nurfatihah Z, Nur Vaizi, and Maya Yuni (2021) on the relationship between blood type and the risk of type 2 diabetes mellitus revealed that blood type O has a lower risk of type 2 diabetes, while blood type AB tends to have a slightly higher risk.

This study has limitations in terms of sample representativeness, as it only involved outpatients at Kraton Regional General Hospital as the only service unit studied. Meanwhile, there are still several other health service units such as inpatient care and special diabetes clinics. In addition, the researchers did not conduct surveys or collect data on the type of diabetes suffered by respondents.

Conclusion

Based on the results of blood type examinations in patients with diabetes mellitus, it can be concluded that out of 35 research samples, blood type B had the highest percentage (40%), followed by blood type A (28.57%), blood type O (20%), and blood type AB (11.42%). This indicates that blood type B is more prevalent among diabetes mellitus patients in the sample.

Recommendations for future researchers include conducting studies on blood type trends in Type I and Type II diabetes mellitus.

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