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## The Correlation of Early Detection Results using Self Detection Application for Diabetes (SEDAB) with Haemoglobin A1C (HbA1C) Levels



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### Abstract

The increasing cases of diabetes mellitus significantly from year to year increase the burden on society and the government, because it requires time, cost and technology in handling. This disease can be controlled if the symptoms are detected early. The purpose of this research was to determine the correlation between the results of early detection using self-detection application for diabetes (SEDAB) with hemoglobin A1C (HbA1C) levels. The research was carried out on June 2022. The research was a correlative research with a cross sectional approach. The population was the people of the Mojoroto Kediri village. The samples were taken with consideration of a minimum sample of 30 respondents with simple random sampling technique. The instrument used to assess the level of symptoms of diabetes mellitus was the SEDAB application. Diabetes Mellitus category was assessed through the observation sheet of laboratory examination results Hemoglobin A1C (HbA1C). The data analysis used the Spearman Rank test. The test results with the Spearman rank test showed a p-value of = 0.000. This meant that there was a correlation between the level of diabetes mellitus symptoms results detection with Self Detection Application for Diabetic (SEDAB) with diabetes mellitus level based on HbA1c examination results. It is important for health workers to expand the scope of early detection of diabetes mellitus by promoting independent early detection using an effective and efficient diabetes mellitus early detection instrument, namely the SEDAB application which easy to access and use.

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## INTRODUCTION

Globalization and technological advances offer effectiveness and efficiency in various aspects of life. This has an impact on a sedentary life style, overeating and unhealthy (lack of vegetables and fruit, high in sugar, salt and fat and fast food) (Sulistiyowati, 2017). Excessive food intake increases the risk of non-communicable diseases (PTM) including diabetes mellitus. Eighty percent of PTM is caused by unhealthy behavior, including: 33.5% of the population lacks physical activity, 95.5% of the population aged over 10 years does not consume fruits and vegetables, 33.8% (Riskasdas, 2018). This unhealthy behavior will cause symptoms that can be predicted as symptoms of diabetes mellitus

Diabetes mellitus is a global health problem. The rate of diabetes mellitus tends to increase in low- and middle-income countries. Indonesia is ranked 7th in the world with 10.7 million sufferers and ranked 3rd in Southeast Asia with a prevalence of 11.3% in 2015 (Kemenkes RI, 2020). The prevalence of DM at age 15 years increased from 6.9% to 10.9%. Diabetes mellitus is the 3rd highest cause of death in Indonesia after hypertension and stroke (Riskasdas, 2018).

The increase in cases of non-communicable diseases is a big challenge in health development and will significantly increase the burden on the community and the government, because handling it requires time, high costs and high technology. The high cost of care is a burden for individuals and the state related to the economy and the health care system, one of which is the financing of the National Health Insurance (JKN) (Soewondo, Ferrario and Levenus Tahapary, 2013; Agustina et al., 2019).

The high number of people with Diabetes Mellitus is caused by the fact that patients are not aware of the early symptoms that appear, including frequent urination (polyuria), frequent thirst (polydipsia) and a lot of eating / easy hunger (polyphagia). In addition, symptoms of blurred vision often appear, tingling in the hands or feet, itching that is often very annoying (pruritus), and weight loss for no apparent reason. For further detection, laboratory tests are needed for blood sugar levels, fasting blood sugar levels and plasma glucose content after 2 hours (Directorate of Pharmacy Bina, 2005 in (Sofiana, 2016). Examination of HbA1C levels is more accurate

because it describes the bond of glucose with blood during last 3 months

Early detection is necessary to prevent chronic complications and can provide prompt and appropriate treatment (Kudarti and Caturiningsih, 2017). The low knowledge of the community related to attitudes and behavior towards early detection of diabetes. The public's healthy perception of health can inhibit the behavior to check health regularly to health services. Early detection of non-communicable diseases (PTM), one of which is DM is one of the health programs of the Puskesmas, one of which is Posbindu PTM, but the achievements are not optimal. Several risk factors that cause DM already exist in the community, without realizing that he has entered the category of Pre-diabetes mellitus or has been exposed to diabetes mellitus.

The demand for the use of smartphone and internet technology in society continues to increase. With government policies related to preventing the transmission of Covid 19, the use of technology in the health sector makes health care workers more effective and efficient. The SEDAB application is very relevant to use, easy and can detect diabetes, so that health workers can follow up based on the results of detection carried out independently by the community.

The purpose of this research was to determine the correlation between the results of early detection using self-detection application for diabetes (SEDAB) with hemoglobin A1C (HbA1C) levels. The existence of a correlation indicates that the application of SEDAB is effective in predicting the signs and symptoms of diabetes. Benefits for the community, the existence of this SEDAB application can be used as a reference to carry out further examinations to health services.

## METHODS

This research was correlative research with a cross sectional approach. The population in this research was the people of Mojoroto Village, Kediri City. The sample was taken by simple random sampling technique with the total sample of 30 people. The research was conducted on June 2022.

The instrument used to assess the level of symptoms of diabetes mellitus is the SEDAB (Self Detection Application of Diabetes Mellitus) application, an application that can be used for the independent detection of diabetes symptoms by individuals. Diabetes Mellitus category was

assessed through the observation sheet of laboratory examination results for Hemoglobin A1C (HbA1C) levels.

The analysis of the data used the Spearman Rank test. This test was to determine the correlation between the score of the assessment of the level of symptoms of diabetes mellitus using the SEDAB application and the level of diabetes mellitus as a

result of the observation of Hemoglobin A1C (HbA1c) levels. The correlation was shown by the higher the score from the SEDAB application, the higher the HbA1c value or vice versa.

This research protocol has passed ethics with Number:06/PHB/KEPK/74/06.22 the Ethics Committee of STIKes Patria Husada Blitar.

## RESULT

Characteristics of respondents include age, gender, occupation, income, education, family history of Diabetes Mellitus, people living in the same household as the respondent, sports activities and information about DM.

### Characteristics of Research Respondents

**Table 1: Characteristics of Research Respondents**

Characteristics	Frequency	%
<b>Age</b>		
25-34 th	1	3,3
35-49 th	10	33,3
50-64 th	13	43,3
>65 th	6	20
<b>Gender</b>		
Man	21	70
Woman	9	30
<b>Work</b>		
government employees	1	3,3
Self-employed	8	26,7
Farmer	4	13,3
Retired	3	10
Housewife	8	26,7
Etc	6	20
<b>Income</b>		
<1 million	5	16,7
1-2 million	12	40
2-4 million	7	23,3
>=4 million	6	20
<b>Level of Education</b>		
primary school	7	23,3
junior high school	5	16,7
senior high school	11	36,7
diploma	1	3,3
bachelor	6	20
<b>DM Family History</b>		
No family history	20	66,7
there is a family history	10	33,3
<b>People Living Together</b>		
Husband/wife and children	10	33,3
Husband/wife, children, parents	6	20
Husband and wife	3	10
Child	2	6,7
Parents/brothers	4	13,3
Own	5	16,7

<b>Sports (Within 1 Day)</b>		
Not exercising	10	33,3
15-30 minutes	8	26,7
30-60 minutes	11	36,7
>60 minutes	1	3,3
<b>DM Information</b>		
Yes	15	50
Not	15	50

Data on the characteristics of respondents aged 50-64 years are 13 people (43.3%), the sex is mostly male, namely 21 people (70%), self-employed and household workers each are 8 people (26.7%), the most income is 1-2 million, namely 12 people (40%), the most education is high school, namely 11 people (36.7%), a family history of DM as many as 20 people (66.7%) do not have a family with DM, people who live in the same house partially with husband/wife and children, namely 10 people (33.3%), sports as many as 11 people (36.7) in a day exercising 30-60 minutes, information about DM each 50% has received information.

### Results of Early Detection Using Self Detection Application for Diabetes (SEDAB)

**Table 2: Results of early detection using SEDAB**

Early Detection Results	Frequency	%
Mild symptoms	13	43,3
Moderate symptoms	16	53,3
Severe symptoms	1	3,3

The results of early detection using the SEDAB application showed that the majority with moderate symptoms experienced were 16 people (53.3%).

### Hemoglobin A1C (HbA1C) Levels

**Table 3: Levels of Hemoglobin A1C (HbA1C)**

HbA1C level	Frequency	%
Normal	16	53,3
Pre-Diabetes	5	16,7
Diabetes	9	30

The highest HbA1c levels were in the normal category, namely 16 people (53.3%).

### Spearman Rank statistic test results

**Table 4: Spearman Rank Statistic Test**

		HbA1c			Total
		Normal <5,7%	prediabetes 5,7-6,4%	Diabetes ≥ 6,5%	
SE DAB	19-27 Severe symptoms	8	0	1	9
	10-18 Moderate symptoms	0	1	4	5
	1-9 Mild symptoms	0	0	16	16
Amount		8	1	21	30
Spearman Rank		Sig. (2-tailed) = 0,000		Correlation coefficient = 0,825**	

The results of the statistical test with Spearman Rank show that there is a correlation between the results of early detection and SEDAB with the HbA1C value with p-value = 0.000 and the correlation coefficient = 0.825\*\* which means the correlation is very strong.

### DISCUSSION

Statistical test results with Spearman Rank showed p-value = 0.000 and correlation coefficient = 0.825\*\*. These results indicate a very strong correlation between the results of early detection and SEDAB with HbA1C values. This means that the more symptoms felt by the respondent detected

through the SEDAB application, the higher the patient's HbA1c value.

In this research, the diagnosis of diabetes was confirmed by conducting an HbA1c examination because the results of the HbA1c examination showed an average blood sugar level for 3 months. The use of HbA1C as a reference for diagnosing

diabetes mellitus is considered more accurate when compared to regular blood sugar tests. Blood laboratory examination for diagnosis of diabetes and prediabetes with HbA1C examination is diabetes if the value: 6.5%, prediabetes 5.7-6.4%, normal < 5.7%. In general, the HbA1c test and the blood sugar test have the same function and purpose. Both are intended for diabetics and people at risk of developing diabetes. Both tests can assess blood sugar levels. The results of the examination are in line, if the HbA1c level is high, the blood sugar level will be high. However, there is a slight difference between these two tests. HbA1c examination is not affected by changes in blood sugar levels that only occur temporarily, such as after eating sweet foods (Bella, 2022).

Another similar study based on android. An early detection system for Diabetes Mellitus designed using an Android-based forward chaining expert system method also shows that the method is suitable for detecting DM (Simanjuntak, Irawan and Prasasti, 2019). The SEDAB application can have a positive and beneficial impact on the community because it does not have to incur expensive costs and spend a lot of time detecting DM based on perceived complaints.

Another study that is not in line is that there is no significant correlation between the results of measurements using KGDA examination and DM personal screening (p value = 0.277). The measurement results show the correlation between random blood sugar levels and the results of personal screening DM measurement is p value = 0.277 (Gyatri, Wardani and Katmawanti, 2019). So that the results of this research are more accurate than the research.

This detection is a temporary detection that can be used to increase alertness and immediately contact a doctor to obtain a definite diagnosis and medication/therapy early on (Inayati and Qoriani, 2016).

Pre-diabetes is a condition in which a person's blood sugar levels are between normal and diabetic levels, higher than normal but not high enough to be classified as type 2 diabetes. Pre-diabetes is a risk factor for diabetes, heart attack and stroke. If not controlled properly, pre-diabetes can progress to type 2 diabetes within 5-10 years. However, good diet and exercise settings can prevent or delay the onset of diabetes (Inayati and Qoriani, 2016).

## CONCLUSION

The results of early detection using the "Sedab" application showed that most of the respondents had moderate symptoms of diabetes mellitus as many as 16 respondents or 53.33%. Based on the examination of Hemoglobin A1C (HbA1-C) levels, it showed that most respondents had normal examination results, such as 16 respondents or 53.33% showing symptoms of diabetes mellitus as many as 9 people or 30% and pre-diabetes mellitus as many as 5 respondents or 16.66%. The results of the Spearman rank test showed that there was a correlation between the level of diabetes mellitus symptoms detected by Self Detection Application for Diabetic (SEDAB) and the level of diabetes mellitus based on the results of the HbA1c examination with a p-value of = 0.000.

## SUGGESTION

### For Patients and Families

Increase self-awareness of the importance of early detection of non-communicable diseases, especially diabetes mellitus by using early detection independently and reporting the results of detection to health workers so that intervention can be carried out as early as possible as a step to return to normal conditions or prevent complications. Benefits for the community, the existence of this SEDAB application can be used as a reference to carry out further examinations to health services.

The author hopes that in the future this application can be used as best as possible by health workers as an effective and efficient early detection of diabetes mellitus. For further researchers, they can develop research on diabetes mellitus in the direction of detecting the risk of complications of diabetes mellitus.

### For Health Workers

The results of this research are expected to be utilized by health workers in increasing the effectiveness and efficiency of early detection programs for non-communicable diseases, especially diabetes mellitus.

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## CONFLICTS OF INTEREST

The author declares that there are no conflicts of interest with the topic or any associated objects upon the publication of this study.

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