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Analysis of "GESER JADI MANTUL" in the Efforts to Early Detection of Diabetes Mellitus (DM) Type 2 in Tulungagung 2023

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Abstract **Introduction:** The finding of type 2 Diabetes Mellitus (DM) cases in 2021 in Tulungagung Regency at the age of ≥15 years only reached 0.08% (7182 cases out of a target of 833,529 people), a very small finding when compared to the 10.8% prevalence of Diabetes Mellitus (DM) in East Java. GESER JADI MANTUL program is an innovative breakthrough in Tulungagung for early detection of type 2 Diabetes Mellitus (DM) in ≥15 years old by finding the risk of type 2 Diabetes Mellitus (DM) and prediabetes. **Aims:** This study aimed to analyze the effectiveness of GESER JADI MANTUL implementation in increasing the early detection of type 2 Diabetes Mellitus (DM). **Methods:** Cross-sectional analytic study with data analyzed from GESER JADI MANTUL outcome reports at 32 Puskesmas in Tulungagung through t-test and simple linear regression. **Results:** The t-test results on the achievement of early detection of type 2 Diabetes Mellitus (DM) in 2021 and 2023 obtained a p-value = 0.003, indicating an increase in the achievement of early detection of type 2 Diabetes Mellitus (DM) before and after GESER JADI MANTUL. A simple linear regression test on the accomplishment of early detection of type 2 Diabetes Mellitus (DM) in 2023 against the findings of prediabetes in 2023 and the risk of type 2 Diabetes Mellitus (DM) obtained a value of p = 0.006 and p = 0.000, which means that there is a relationship between the achievement of early detection of Diabetes Mellitus (DM) with the findings of prediabetes and the risk of type 2 Diabetes Mellitus (DM). **Conclusions:** GESER JADI MANTUL effectively increases the achievement of early detection of type 2 Diabetes Mellitus (DM), the finding of type 2 Diabetes Mellitus (DM) risk and prediabetes.

Keywords Diabetes Mellitus (DM), Early Detection, GESER JADI MANTUL, Non-communicable Diseases

1. Introduction

The threats and challenges of public health development in developed and developing countries are influenced by Diabetes Mellitus (DM). Globally, the number of Diabetes Mellitus (DM) cases will continue to increase. In 2017, data from the global burden of disease study showed that half a billion people suffer from Diabetes Mellitus (DM), and cases increase by nearly 22 million people each year [1], [2]. On the other hand, the International Diabetes Association Federation (IDF) estimates that Indonesia is ranked 6th, with around 10.2 million people with diabetes (20-79 years old) in 2017. Even the increase in the number of people with Diabetes Mellitus (DM) by IDF is estimated to reach 783 million people (45.81%) by 2045 [1], [3], [4]. There are four types of Diabetes Mellitus (DM): type 1 diabetes due to genetic disorders, type 2 diabetes due to lifestyle, diabetes due to pregnancy (gestational), and diabetes caused by other factors. Of these four types of diabetes, the most common and fatal is type 2 diabetes [5], [6]. Based on data from the Tulungagung Regency Health Profile, the number of cases of type 2 Diabetes Mellitus (DM) is also the highest compared to other types of Diabetes Mellitus (DM). The number of cases of type 2 diabetes in Tulungagung continues to increase. In 2021, there were 7,182 people; in 2022, there were 9,348 people; and in 2023, there were 14,369 people. The percentage of people with type 2 Diabetes Mellitus (DM) in 2023 compared to other types of Diabetes Mellitus (DM) is 88.29%, with 16,274 people with various types of Diabetes Mellitus (DM) [7].

Hyperglycemia becomes an indication of Diabetes Mellitus (DM) with high sugar levels ≥ 200 mg/dL, permanently or chronically, because the body is impaired in producing or using insulin. There are several types of diabetes, namely type 1 diabetes, type 2 diabetes, gestational diabetes, and others [8]. Type 1 diabetes occurs because there is no insulin production at all. Type 2 diabetes occurs due to insufficient and ineffective insulin in the body. Gestational diabetes is the occurrence of high blood sugar levels experienced by women during their pregnancy, and other types of diabetes are caused by the use of drugs, other diseases, and so on [9]. Diabetes Mellitus (DM) is world-renowned for causing the most deaths and is a major disease that often causes disability and complications. In addition to the work of insulin being disrupted, high glucose levels in the body also cause the work of other organs to be disrupted, which can be called diabetic complications. Diabetes complications can be categorized into macrovascular and microvascular complications. Macrovascular complications occur when arteries are damaged, such as stroke, peripheral arterial disease (PAD), angina, and cerebrovascular. Meanwhile, microvascular complications result in minor blood vessel disorders that result in (neuropathy) damage to the nervous system, (nephropathy) damage to the kidney system, and (retinopathy) damage to the vision system. Type 2 Diabetes Mellitus (DM) often leads to morbidity, mortality, and cardiovascular complications (CVD) [10], [11].

Diabetes Mellitus (DM) is also known as the "*silent killer*" because it often occurs without complaints and causes complications that can affect various organs of the body [12]. Diabetes Mellitus (DM), especially type 2 Diabetes Mellitus (DM), is the biggest contributor to death due to complications, including cardiovascular disease, kidney damage and infections (foot ulcers), rather than the direct cause of death itself and is ranked as the 7th leading cause of death among the top 10 diseases in the world [13]. The term Diabetes Mellitus (DM) as "*mother of disease*" and "*silent killer*" is caused by various factors such as heredity, overweight or high incidence of obesity, poor lifestyle and diet, lack of physical activity, drug consumption triggers blood glucose levels to rise, accelerated aging, and emotional disturbances. This situation is reinforced by research produced [14], which states that diet and physical activity significantly affect the incidence of type 2 Diabetes Mellitus (DM). The better the diet and the more regular physical activity carried out, the patient's blood sugar levels can be maintained in a normal state. The high incidence of Diabetes Mellitus (DM) with its various risk factors is often unknown to the public [6]. Therefore, it is crucial to identify type 2 Diabetes Mellitus (DM) early through checking blood sugar levels to prevent and control this disease. Early detection is generally carried out at Posbindu PTM with a target age of 15 years and over [15]. Early detection of glucose level checking is useful in identifying the presence of risk factors for diabetes in a person so that prevention can be done so that people who are not yet sick do not become ill. People who are already sick do not experience complications. Early detection can be done at the Integrated Development Center for Non-Communicable Diseases better known as Posbindu PTM, First Level Health Facilities (Community Health Centers, Primary Clinics), Hospitals, and Health Laboratories. The community has not realized the importance of early detection of NCD risk factors. This can be seen from the Tulungagung Health Office surveillance data in 2021; the achievement of early detection of NCDs at the age of 15 years and over reached 16.50% (137,553 people), even though the government targets early detection of Diabetes Mellitus (DM) to get 80% [7].

The study's results show that predisposing factors (age, gender, education, occupation, knowledge, attitudes, and perceptions) and enabling factors (health facilities, health workers, and cadres) are associated with the utilization of integrated coaching posts for non-communicable diseases [16]. Another study states a relationship exists between cadres' role and visits to integrated coaching posts (Posbindu) for non-communicable diseases, especially in cases of Diabetes Mellitus (DM). Research on Diabetes Mellitus (DM) also states that there is a relationship between the incidence of type 2 Diabetes Mellitus (DM) and age, body proportions (BMI), movement or physical exercise performed, and one's knowledge and the probability of respondents experiencing type 2 Diabetes Mellitus (DM) by having risk factors, namely advanced age and abnormal *body mass index* (BMI) of 47.2% [17], [18]. The results of early detection of Diabetes Mellitus (DM) by checking blood sugar levels are included in 3 criteria: standard, prediabetes, and Diabetes Mellitus (DM). Random blood glucose (RBG) examination will be included in standard criteria if the results are < 140 mg/dL, prediabetes criteria with results of 140 - 199 mg/dL, and Diabetes Mellitus (DM) criteria ≥ 200 mg/dL. Fasting blood glucose level (FBG) examination will enter standard criteria if the results are < 120 mg/dL, prediabetes criteria with 120 - 139 mg/dL results, and Diabetes Mellitus (DM) criteria ≥ 140 mg/dL. Determination of the diagnosis of Diabetes Mellitus (DM) is continued by examining plasma glucose 2 hours after eating an oral glucose tolerance test (OGTT) with results of 140 - 199 mg/dL and will be more specific if an HbA1c examination is carried out, which shows 5.7 - 6.4% [19], [20].

Diabetes prevention of Diabetes Mellitus (DM) is to maintain an ideal body weight, routine physical activity for 30 minutes every day, get used to doing activities with moderate intensity every day to control body weight, consume 5-6 servings of fruit and vegetables every day, and consumption of fat, salt, sugar (FSS) that is not excessive by the recommended limits; Avoiding tobacco use (smoking, chewing tobacco) and avoiding alcohol consumption [21], [22]; managing stress; and checking blood glucose and HbA1c levels regularly. The best and proven steps in preventing Diabetes Mellitus (DM) can be done by implementing a healthy lifestyle [23], [24]. This includes maintaining an ideal body weight, eating a healthy and nutritionally balanced diet, regularly doing physical activity for 30 minutes daily, avoiding cigarette smoke, and not consuming alcohol. Consuming a healthy and nutritionally balanced diet includes consuming fat, salt, sugar (FSS). According to the Ministry of Health, the consumption limit of fat, salt, sugar (FSS) per person per day is 50 grams or four tablespoons of sugar, 2,000 milligrams of sodium/ or 5 grams or one teaspoon of salt (sodium/sodium), and only 67 grams of fat or five tablespoons of cooking oil. This preventive behavior is also in line with research [17], [18], [25] that implementing a healthy lifestyle is found to contribute to a lower risk of Diabetes Mellitus (DM) in a person.

The policies of the Non-Communicable Disease Prevention and Control (P2PTM) program include accelerating the early detection of non-communicable diseases in all targets by strengthening networks, partnerships, and community empowerment [26]. Community empowerment is carried out through Posbindu PTM activities, and the community applies the CERDIK behavior culture. Controlling Diabetes Mellitus (DM) disease with CERDIK behavior, namely: early detection of health regularly, eliminating cigarette smoke, moving the body actively, consuming balanced nutritional foods, adequate rest time, and managing mental stress and for people who have Diabetes Mellitus (DM), it is recommended to behave PATUH, namely regular health checks, taking drugs according to doctor's instructions, consuming food according to portions and nutritional needs, doing safe physical activity according to body capabilities, avoiding cigarette smoke, not consuming alcohol and carcinogenic foods [27], [28]. Implementing the CERDIK and PATUH behavior culture in the community can occur if the community knows and is aware of the importance of implementing CERDIK and PATUH. This condition will undoubtedly happen if massive education is carried out in the community.

GESER JADI MANTUL (Gerakan Serentak Jaring Diabetes Masyarakat Tulungagung) is an innovative breakthrough as a strategic effort to accelerate the early discovery of type 2 Diabetes Mellitus (DM), people at risk of diabetes and prediabetes [29]. The implementation of GESER JADI MANTUL began with socialization and commitment to the role of all stakeholders and cross-sectors: Sub-district Head, Head of Sub-district TP PKK, Indonesian National Army / Police, Education Office, District Ministry of Religion, community organizations (Muslimat NU, Fatayat, Aisyiyah, Nasyiatul Aisyiyah), Village Community Empowerment Office (DPMD), Communication and Information Office (Kominfo), Industry and Trade Office (Disperindag) and State Islamic University and Bhineka PGRI University on September 4, 2022. GESER JADI MANTUL was launched on October 4, 2022, at Senior High School 1 Tulungagung, with 32 health centers organizing similar activities simultaneously in 48 locations. The targets of the GESER JADI MANTUL program are educational institutions (Junior High School and Islamic Junior High School, Senior High Scholl and Islamic Senior High School, Islamic boarding schools), workplaces (government offices, OPD, private offices, factories), village NCD centers, elderly posyandu, UKK posts, toddler posyandu, youth posyandu, general posyandu, health centers, auxiliary health centers Places (Markets, Terminals, Stations), Health Institutions (Community Health Center, Pustu, Ponkesdes), as well as various activities such as bazaars, routine Muslimat / Fatayat recitation, Car Free Day, Posbini, and so on. The success of implementing GESER JADI MANTUL is assessed by the increase in the number of targets detected early and the number of risk outcome findings in prediabetes and Diabetes Mellitus (DM) categories.

GESER JADI MANTUL activities include: blood glucose testing (GDA), interviewing NCD risk behaviors, identifying family and personal NCD history, early detection of general obesity by measuring BMI through weighing and measuring height, early detection of central obesity by measuring abdominal circumference, follow-up of early detection results and education. Early detection of type 2 Diabetes Mellitus (DM) in the implementation of the GESER JADI MANTUL program to identify early people with type 2 Diabetes Mellitus (DM), possible risk of developing type 2 Diabetes Mellitus (DM) and prediabetes in all people aged $\geq$ 15 years [29]. The results of the discovery of the risk of type 2 Diabetes Mellitus (DM) will be followed up with further examinations to determine whether a person has type 2 Diabetes Mellitus (DM) or not. If diagnosed with type 2 Diabetes Mellitus (DM), of course, treatment will be carried out to control blood sugar levels and education for healthy living behavior as an effort to prevent complications and disability. Meanwhile suppose a person is found in a pre-diabetic condition, in that case education on healthy living behavior changes will be carried out so that a person wants to set a balanced nutritional diet consumption pattern and reduce sugar consumption and physical activity. Through this change in behavior towards a healthy life, it is hoped that people with prediabetes will not become ill, and it is expected that their blood sugar levels can return to normal. Based on the above background, this study aims to analyze the effectiveness of the implementation of the GESER

JADI MANTUL program in increasing the achievement of early detection of patients with type 2 Diabetes Mellitus (DM), the risk of developing type 2 Diabetes Mellitus (DM) by identifying the results of checking glucose levels in the category of type 2 Diabetes Mellitus (DM) and prediabetes.

2. Materials and Methods

A certificate numbered: 070/5581/24.09/2024 was issued by the Research Ethics Committee of Dr. Iskak Hospital to certify that this cross-sectional analytic study was ethically appropriate. Data processing and analysis are by reporting the results of the implementation of GESER JADI MANTUL. The early detection results of type 2 Diabetes Mellitus (DM) were entered by name and address in the My Healthy Indonesia Application and the Non-Communicable Disease Information System by 32 in Tulungagung Regency. Furthermore, the aggregate data for each Community Health Center in the My Healthy Indonesia Application and the Non-Communicable Disease Information System were downloaded, and the results were combined and analyzed.

Data analysis of the achievement of early detection of type 2 Diabetes Mellitus (DM) GESER JADI MANTUL was carried out by comparing the achievement of early detection of type 2 Diabetes Mellitus (DM) before the Geser Jadi Mantul program in 2021 with the achievement of early detection after the GESER JADI MANTUL program in 2022 and 2023 through the t-test statistics. Meanwhile, further findings on the results of early detection of the risk of prediabetes and the risk of type 2 Diabetes Mellitus (DM) were statistically analyzed using a simple linear regression test. The results of this statistical test analysis will be used to evaluate the sustainability of the GESER JADI MANTUL program in the following year and become a database for educating behavior change in the prevention and control of type 2 Diabetes Mellitus (DM) in adolescents aged 15-24 years in Tulungagung Regency.

3. Result

The results of early detection of type 2 Diabetes Mellitus (DM) in the GESER JADI MANTUL program activities through examination of blood sugar levels will be grouped into three criteria: normal blood sugar levels, prediabetes, and diabetes. Early detection of type 2 Diabetes Mellitus (DM) is carried out on targets aged ≥15 years who are considered at risk of developing Diabetes Mellitus (DM). The results of non-communicable disease surveillance data collection at the Tulungagung Regency Health Office, as well as My Healthy Indonesia Application & Non-Communicable Disease Information System reporting for the GESER JADI MANTUL program activities, obtained the following results:

Table 1 shows that the number of targets for early detection of Type 2 Diabetes Mellitus (DM) is enormous, as seen from the total population aged ≥15 years in Tulungagung Regency, which is >79%. Early detection of Diabetes Mellitus (DM) in all targets will not be achieved if only waiting passively for the arrival of targets at Posbindu Non-Communicable Diseases in each village hall. This underlies the need for activities carried out actively and massively in early detection of type 2 Diabetes Mellitus (DM) , follow-up of early detection results, and education of changes in healthy living behavior in preventing and controlling Diabetes Mellitus (DM) through various events that gather target groups aged ≥15 years. Based on this, Tulungagung Regency made a breakthrough in Diabetes Mellitus (DM) early detection activities with the existence of GESER JADI MANTUL.

Table 2 shows an increase in the achievement of type 2 Diabetes Mellitus (DM) detection from 2021- 2022 by 2.5%, while in 2022-2023, there was an increase of 8.35%. There was a 3.34-fold increase in the achievement of early detection of type 2 Diabetes Mellitus (DM) in 2022-2023 compared to 2021-2022. The increase in the achievement of early detection of type 2 Diabetes Mellitus (DM) in 2022-2023 is due to the existence of the GESER JADI MANTUL program, which actively targets all target groups aged 15 years and over, while in 2021-2022 only passively waits for the community to come to Posbindu PTM activities in each village. Early detection of GESER JADI MANTUL is carried out by visiting all target groups and various activities that gather many people including: in junior high schools, high schools, Islamic boarding schools, routine recitation, offices, factory employees, etc.

From Table 3, it can be seen that there is an increase in the number of Prediabetes criteria findings, which is proportional to the number of people who are detected early in type 2 Diabetes Mellitus (DM). If in 2021 the findings of prediabetes before the GESER JADI MANTUL program only reached 7.93%, in 2022, with the sliding so Mantul, which started in October, reached 11.57%, and in 2023 with the GESER JADI MANTUL fully implemented for one year, reached 14,48%. The finding of high prediabetes is helpful as an early warning in preventing type 2 Diabetes Mellitus (DM) by providing education so that people carry out healthy living behaviors by reducing the consumption of sweet food and drinks. In addition, consistency in implementing healthy living behaviors must be maintained so that the body's blood sugar can be controlled and regular.

Table 4 shows an increase in the findings of type 2 Diabetes Mellitus (DM) criteria, proportional to the number of people detected early in type 2 Diabetes Mellitus (DM). The findings of Type 2 Diabetes Mellitus (DM) in 2021 before the GESER JADI MANTUL program only reached 2.78%, while in 2022, after sliding GESER JADI MANTUL started running in October, it reached 5.54%, and in 2023, with GESER JADI MANTUL, which had been implemented for one year, it reached 6.22%. The higher findings of blood sugar levels in type 2 Diabetes

Mellitus (DM) criteria will affect the increase in the findings of type 2 Diabetes Mellitus (DM) patients, which are utilized for rapid handling and treatment of patients in controlling blood sugar levels so as not to have an impact on disability and complications caused.

From Table 5, there was an increase in the number of type 2 Diabetes Mellitus (DM) cases from 2021-2022, of 2,256 people. In 2022-2023, there was an increase in the number of cases of type 2 Diabetes Mellitus (DM) of 4,931 people. The occurrence of a 2- fold increase in the findings of type 2 Diabetes Mellitus (DM) cases in 2022-2023 when compared to 2021-2022 is due to the massive early detection of type 2 Diabetes Mellitus (DM) through GESER JADI MANTUL in all target groups aged 15 years and over in the sense that the more people who are detected early, the more netted with the results of type 2 Diabetes Mellitus (DM) criteria for further examination at the Community Health Center so that more cases of type 2 Diabetes Mellitus (DM) are found.

Table 6 shows that the t-test analysis of the variable of early detection achievement of type 2 Diabetes Mellitus (DM) in 2021, when compared to 2023, resulted in a value of p=0.003, which means that it proves that there is a significant increase in the achievement of early detection of type 2 Diabetes Mellitus (DM) before and after GESER JADI MANTUL. Meanwhile, the analysis of the variable of the accomplishment of early detection of Diabetes Mellitus (DM) in 2023 with the variable prediabetes criteria with a simple linear regression test obtained a value of p=0.006. This value indicates a significant effect of increasing the achievement of early detection of type 2 Diabetes Mellitus (DM) on the number of findings of prediabetes risk results. On the other hand, the simple linear regression test on the variable of increasing the achievement of early detection in 2023 with the variable of the number of findings of type 2 Diabetes Mellitus (DM) risk resulted in a value of p=0.000 so that it can be stated that there is also a significant influence between increasing the early detection of type 2 Diabetes Mellitus (DM) and the risk of type 2 Diabetes Mellitus (DM).

Table 1. Population and target of Diabetes Mellitus (DM) early detection in Tulungagung

Year	Total Population (person)	Target of Early Detection of Age-Related ≥15 (person)	Percentage of Population (%)
2021	1,047,645	833,529	79.56
2022	1,051,302	838,563	79.76
2023	1,054,696	843,192	79.94

Source: P2PTM report, Tulungagung District Health Department, 2021-2023

Table 2. Percentage of Diabetes Mellitus (DM) early detection of the population aged ≥15 years in Tulungagung

Year	Target (person)	Screening (person)	Percentage (%)
2021	833,529	137,553	16.50
2022	838,563	150,957	18.00
2023	843,192	222,174	26.36

Source: P2PTM report, Tulungagung District Health Department, 2021-2023

Table 3. Findings of prediabetes criteria from Diabetes Mellitus (DM) early detection in Tulungagung

Year	Screening (person)	GDA 140-199 mg/dL (person)	Percentage (%)
2021	137,553	10,907	7,93
2022	150,957	17,469	11,57
2023	222,174	32,186	14,48

Source: P2PTM report, Tulungagung District Health Department, 2021-2023

Table 4. Result of Diabetes Mellitus (DM) criteria findings from Diabetes Mellitus (DM) early detection in Tulungagung

Year	Screening (person)	Diabetes (≥200 mg/dL) (person)	Percentage (%)
2021	137,553	3,830	2.78
Year	Screening (person)	Diabetes (≥200 mg/dL) (person)	Percentage (%)
2022	150,957	8,362	5.54
2023	222,174	13,814	6.22

Source: P2PTM report, Tulungagung District Health Department, 2021-2023

Table 5. Percentage of Diabetes Mellitus (DM) patients years in Tulungagung

Year	Population (person)	Diabetes (person)	Percentage (%)
2021	1,047,645	7.182	0.686
2022	1,051,302	9.438	0.898
2023	1,054,696	14.369	1.362

Source: P2PTM report, Tulungagung District Health Department, 2021-2023

Table 6. Analytic test results of Diabetes Mellitus (DM) early detection outcomes, pre-Diabetes Mellitus (DM) risk outcomes, and Diabetes Mellitus (DM) risk outcomes

Variable X	Variable Y	Test	P Value
Early Detection Achievement 2021	Early Detection Achievement 2023	t-test	0.003
Early Detection Achievement 2023	Risk result prediabetes	Simple linear regression	0.006
Early Detection Achievement 2023	Risk result of Diabetes Mellitus (DM)	Simple linear regression	0.000

4. Discussion

GESER JADI MANTUL, as a breakthrough effort to accelerate early detection of type 2 Diabetes Mellitus (DM) in Tulungagung Regency, has been implemented in Tulungagung Regency since October 2022. The desired output from the implementation of this program is that if more people are detected early with type 2 Diabetes Mellitus (DM), then the findings of people with type 2 Diabetes Mellitus (DM) will also increase, followed by an increase in findings in people at risk of type 2 Diabetes Mellitus (DM), namely the criteria for blood sugar test results on type 2 Diabetes Mellitus (DM) risk criteria and prediabetes. From the findings of the risk of type 2 diabetes, further examination will be continued to confirm the diagnosis of type 2 Diabetes Mellitus (DM) disease. From there, we can take action as quickly as possible against type 2 Diabetes Mellitus (DM) disease with medication followed by healthy living behavior so that blood sugar is controlled without causing disability and complications. Next, if found in the early detection of Diabetes Mellitus (DM) 2 at the risk of prediabetes, it is necessary to take preventive measures so that someone does not fall ill by providing healthy living education regarding the regulation of food consumption with balanced nutrition, followed by adequate physical activity to reduce incoming calories in someone with prediabetes. The results of this study indicate that with the implementation of the GESER JADI MANTUL program, the number of achievements in the early detection of type 2 Diabetes Mellitus (DM) has increased. The p-value = 0.003 through the t-test on the results of the achievement of early detection of type 2 Diabetes Mellitus (DM) in 2021 compared to 2023 proves that the implementation of GESER JADI MANTUL can significantly increase the achievement of early detection of type 2 Diabetes Mellitus (DM) in Tulungagung Regency.

The condition of the findings of early detection of type 2 Diabetes Mellitus (DM) in 2023 can be achieved, of course, because the GESER JADI MANTUL program has the advantage that this program is implemented actively, targeting all targets. The ball pick-up strategy for early detection is for all target groups aged 15 years and over. On the other hand, implementing this program involves the role of all cross-sectors and policymakers. The involvement of cross-sectors and policymakers in implementing this program has a significant role, especially in mobilizing the target. For example, for targets in schools, the Education Office and schools provide policies so that students can have their blood sugar checked. At the routine Muslim recitation, which is held almost once every 40 days, early detection is also held for members; this is also due to the commitment and policy of the head of Muslimat NU, which requires members to carry out Diabetes Mellitus (DM) early detection. All cross-sectors and policy makers' involvement in mobilizing targets is previous because advocacy and partnership efforts have been made to them. This is in accordance with the policy of the Non-Communicable Disease Prevention and Control (P2PTM) program that accelerates early detection of non-communicable diseases in all targets by strengthening networks, partnerships, and community empowerment [26]. Similar support from research results [30] states that cross-sector cooperation is one of the supporting factors for the success of a program.

GESER JADI MANTUL not only actively targets early detection of Diabetes Mellitus (DM) but also conducts intensive monitoring and follow-up of at-risk outcomes for both type 2 Diabetes Mellitus (DM) and prediabetes. Another advantage of implementing the GESER JADI MANTUL program is that it emphasizes education on the causes, symptoms, prevention, and management of NCDs and healthy lifestyles to prevent and control type 2 Diabetes Mellitus (DM) [31]. The results of the GESER JADI MANTUL program activities are also used as a database to educate people on the importance of healthy living from an early age. This condition is undoubtedly different from the implementation of early detection before GESER JADI MANTUL. Namely, the implementation of early detection of Diabetes Mellitus (DM) remains passive, with patients only waiting for the community to the village PTM Posbindu or to Community Health Center activities. With this condition, the number of people attending Posbindu PTM is limited to 45 years and over, and they tend to be the same people every month. So, the implementation of Posbindu PTM in Tulungagung Regency is considered less than optimal in achieving early detection on targets aged 15 years and over, in line with the results of research conducted previously, which state that the implementation of Posbindu is less than optimal due to budget constraints, human resources, and its implementation, which takes place passively, waiting for the community to attend [32].

Simple linear regression test results p-value = 0.006 on the variable of increasing the achievement of early detection of Diabetes Mellitus (DM) in 2023 on the findings of the number of prediabetes risks in 2023, evidence that strengthens that the implementation of GESER JADI MANTUL can significantly increase the findings of prediabetes risk in Tulungagung Regency. The higher the prediabetes risk findings, if followed by education, it is hoped that someone will want to make behavioral changes towards a healthy life, both balanced nutritional consumption patterns, reduced sugar consumption, and followed by increased physical activity, it is hoped that it can prevent Diabetes Mellitus (DM) and even restore blood sugar levels to normal. Providing education to the community will have an effect on increasing a person's knowledge and ability to behave to prevent diabetes, as shown by [23] research. So that blood sugar control can be carried out independently by the community. Behavioral education on healthy lifestyle consumption patterns given to people at risk of prediabetes is needed, mainly related to the limitation of fat, salt, sugar (FSS). In the identification of fat, salt, sugar (FSS) consumption behavior in GESER JADI MANTUL activities, it turns out that our society does not know the limit of sugar consumption per day is only around four tablespoons (50 grams), salt one spoon (2000 milligrams) and fat five tablespoons (67 salt). People often think that the daily sugar consumption limit of 4 tablespoons is only in the form of granulated sugar, and even though all foods consumed are sources of sugar, they must reduce the consumption of sweet foods and drinks. A 2014 survey of individual food consumption in Indonesia showed that Indonesians consumed an average of 14.2 grams of sugar, 3.6 grams of salt, and 20.6 grams of oil [33] and research conducted [34] makes it clear that the incidence of Diabetes Mellitus (DM) in the working area of Puskesmas Leyengan East Ungaran Semarang Regency is related to sugar consumption habits.

In addition, the linear regression test on the variable of the achievement of early detection of Diabetes Mellitus (DM) in 2023 against the findings of Diabetes Mellitus (DM) risk in 2023 obtained a p-value = 0.000, sharpening the influence of GESER JADI MANTUL in significantly increasing the findings of Diabetes Mellitus (DM) risk. The more people who have early detection of Diabetes Mellitus (DM), the more people are found to be at risk of type 2 Diabetes Mellitus (DM). Finding the risk of Diabetes Mellitus (DM) in someone detected early will then be examined to confirm the diagnosis. If diagnosed with Diabetes Mellitus (DM), treatment and CERDIK healthy lifestyle education will be conducted immediately. The diagnosis of type 2 Diabetes Mellitus (DM) in a person quickly, and then treatment is carried out and followed by the behavior of a balanced nutritional consumption pattern and sufficient physical activity; it is hoped that a person's blood sugar levels can be controlled so that the type 2 Diabetes Mellitus (DM) he suffers from does not cause disability and complications. It can be known from table 5 that the number of people with diabetes has increased in 2021, 2022, and 2023, which is in direct proportion to the number of achievements in early detection of type 2 diabetes. So, if you want to prevent and control Diabetes Mellitus (DM), the primary key is the success of early detection, which can be done thoroughly in the community. In this analysis test, it is also known that the standard deviation value of 4167.458 in early detection of Diabetes Mellitus (DM) in 2023 and a mean of 6942.94 indicate that the achievement of early detection of Diabetes Mellitus (DM) has not been evenly distributed, which means that the GESER JADI MANTUL program has not been implemented evenly in all Community Health Center. This is possible because the target groups of each Community Health Center are different; for example, there are Community Health Centers that have more target groups in schools. The implementation of GESER JADI MANTUL in the coming year can undoubtedly run more optimally by evenly targeting all existing target groups so that the findings on the risk of type 2 Diabetes Mellitus (DM) and prediabetes are increasing.

Based on the results of this study, implementing the GESER JADI MANTUL program can more effectively increase the achievement of early detection of type 2 Diabetes Mellitus (DM) and the discovery of the risk of type 2 Diabetes Mellitus (DM) and prediabetes. Thus, the GESER JADI MANTUL program can continue to be implemented in Tulungagung Regency as an optimization of the Posbindu PTM program in implementing early detection of type 2 Diabetes Mellitus (DM) to prevent and control Diabetes Mellitus (DM).

5. Conclusions

GESER JADI MANTUL is effective in increasing the achievement of early detection of type 2 Diabetes Mellitus (DM) and the discovery of type 2 Diabetes Mellitus (DM) and prediabetes risk. This will lead to efforts to prevent and control type 2 Diabetes Mellitus (DM) to avoid disability and complications for those diagnosed with type 2 Diabetes Mellitus (DM) and prevent type 2 Diabetes Mellitus (DM) for those with prediabetes.

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