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The Effectiveness of Moringa Leaves in Controlling Blood Sugar Levels in Patients With Type 2 Diabetes Mellitus in Prolanis, Sampang District, Madura

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ABSTRACT Diabetes mellitus (DM) is a disease that leads to an increase in blood glucose levels, which in turn can lead to chronic diseases. The potential group to be socialized is the Prolanis group at Sreseh Health Centre, Sampang Madura. *Moringa* is a tree that grows very commonly in the Madura region, including in Sreseh sub-district. *Moringa* contains active ingredients that can lower blood glucose levels. People do not avail of the benefits of Moringa leaves (*Moringa aleivera*), which are widely available in the region. The purpose of this community service activity is so that the community can be more optimal in controlling blood sugar levels, especially the use of Moringa leaf extract in lowering blood sugar levels. The method of conducting the activities is a group-based method that is carried out comprehensively, namely conducting regular and continuous counselling and consultations for Prolanis members. The activities of the community service teams are carried out in a measurable way and a monitoring and evaluation process is carried out to measure the achievement of the objectives and results. The results of the PKM activities have been identified: Community service activities (PKM) that have been well implemented, starting with survey and coordination activities, initial assessment activities, PKM implementation activities, and evaluation of the results achieved. The community, in this case, the Prolanis members with DM type 2, participated with great enthusiasm in each meeting/phase of the activities. The evaluation of the results of the activities showed good results: The number of subjects with type 2 diabetes whose blood glucose levels were uncontrolled decreased by 61.54%.

INDEX TERMS: blood glucose, type 2 DM prolanis, *moringa* leaves

I. INTRODUCTION

Type 2 Diabetes Mellitus, one of the most notable non-communicable and chronic diseases (NCDs), is a growing global problem affecting 463 million people in the world. Western Pacific region, including Indonesia, is listed as the leading region of Type 2 Diabetes Mellitus global prevalence in the world. In Indonesia, the national prevalence of Type 2 Diabetes Mellitus is steadily increasing from 6.9% in 2013 to 10.9% in 2018.[1]

In Indonesia, the national prevalence of Type 2 Diabetes Mellitus is steadily increasing from 6.9% in 2013 to 10.9% in 2018. As Type 2 Diabetes Mellitus is responsible for many deaths and burdens, the World Health Organization recommends every country to establish national policies and plans for the prevention and control of many NCDs including Type 2 Diabetes Mellitus[2],[3]

The Chronic Disease Management Program or Program Pengelolaan Penyakit Kronis (Prolanis) is a program initiated by the Social Insurance Administration Organization or Badan Penyelenggara Jaminan Social (BPJS) in Indonesia [4].

PROLANIS activities at Sreseh Health Centre are conducted regularly once a month, with a focus on Bangsah

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village. Routine laboratory tests include blood glucose results with more than 35% above 200 mg/dl or uncontrolled.

Maintaining glycemic control in diabetes and prediabetes is necessary to prevent many health complications and mortality. Although different hypoglycemic drugs are used for this purpose, there is still a growing interest in the use of medicinal plants due to their low price, easy availability, and fewer or no side effects. Moringa (Moringa oleifera Lam.) is a medicinal plant that has been traditionally used in the management of diabetes[5]

Moringa oleifera (MO) is a multipurpose plant consumed as food and known for its medicinal uses, among others. Leaves, seeds and pods are the main parts used as food or food supplements[6]

Moringa is a tree that grows very commonly in the Madura region[7] including in Sreseh sub-district. Moringa leaves are usually used as a vegetable that is directly consumed as an additional side dish. Moringa trees have generally not been of concern to the Indonesian population[8]

The results of the phytochemical study of Moringa leaves (Moringa oleivera) show the presence of alkaloid and steroid/triterpenoid compounds that play an active role in lowering blood glucose levels by stimulating the cells of the pancreas to secrete insulin[9][10]

There are 5 pillars of type 2 diabetes treatment: diet, exercise, blood glucose autoanalysis, drugs, and control of vascular risk factors[11]. The poor knowledge of the Prolanis members with DM about the 5 pillars of DM control and the less optimal use of Moringa leaves to control blood glucose levels in type 2 DM patients were the reason to conduct this Puskesmas activity.

The purpose of this community service activity is so that the community can be more optimal in controlling blood sugar levels, especially the use of Moringa leaf extract in lowering blood sugar levels

II. METHODS

The method used to implement the activities is a group-based method that is carried out comprehensively. The activities of the community service team are carried out in a measurable manner and the monitoring and evaluation process is carried out to measure the achievement of the objectives and results. The PKM activities in the Sreseh Community Health Centre (Puskesmas) work area will focus on Bangsah village in August-September 2021. The PKM activities consist of several phases: Coordinating with partners, conducting initial assessments, implementing PKM activities and evaluating the results of PKM activities. The PKM activities are implemented through counselling and testing of fasting blood glucose and HbA1C in patients with type 2 diabetes mellitus. The evaluation of the activities will be done by measuring fasting blood glucose and HbA1C level after consuming Moringa leaves tea for one month.

III. RESULTS AND DISCUSSION

Survey activities and coordination of partner health centres. In this activity, the implementation of the activities in collaboration with the partner Community Health Centre (Puskesmas), namely Sreseh Sampang Madura Health Centre, is guided by the activities to be implemented so that they are consistent with both the Puskesmas work programme and technical implementation, as well as the timing and location of the activities.

In the first phase of the assessment, information was collected from 40 Prolanis members on the understanding of Prolanis members with type 2 DM of the five pillars of control of type 2 DM and the complications of disease caused by type 2 DM.

Community service activities FIGURE 1. This activity is divided into four phases: Controlling blood glucose levels, conducting diabetic foot exercises, educating pronalists on the five pillars of controlling DM and the complications of diabetes mellitus, and counselling on the use of *Moringa* leaves to control blood glucose levels in type-2 DM patients.

FIGURE 1. PKM activities in the working area of the Sreseh Health Centre in the centre of Bangsah village in August - September 2021

The PKM activities were well conducted and the community enthusiastically followed each phase of the activities conducted. The results of the initial blood glucose screening of 36 Prolanis members with type 2 diabetes revealed that 23 people (63.89%) had controlled blood glucose levels and 13 people (36.11%) had uncontrolled blood glucose levels.

Evaluation measures are conducted after the implementation of PKM activities to assess the success of each programme. Evaluation measures were conducted by checking fasting blood and HbA1C levels.

TABLE 1.
The results of testing fasting blood glucose levels of Prolanis in the work area of Sreseh Sampang Madura Health Centre before and after consumption of *Moringa* leaves tea.

Fasting blood glucose values	Before		After	
	F	%	F	Percentage
Controlled	23	63,89%	31	86,11%
Uncontrolled	13	36,11%	5	13,89%
Jumlah	36	100%	36	100%

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From the TABLE 1, out of 36 Prolanis members with type 2 DM, blood glucose levels were controlled before consumption of *Moringa* leaves tea in 23 (63.89%) and after consumption of *Moringa* leaves tea in 31 (86.11%). Uncontrolled blood glucose levels before consumption of *Moringa* leaves tea were in 13 pe rsons (36.11%) and after consumption of *Moringa* leaves tea in 5 persons (13.89%)(FIGURE 2).

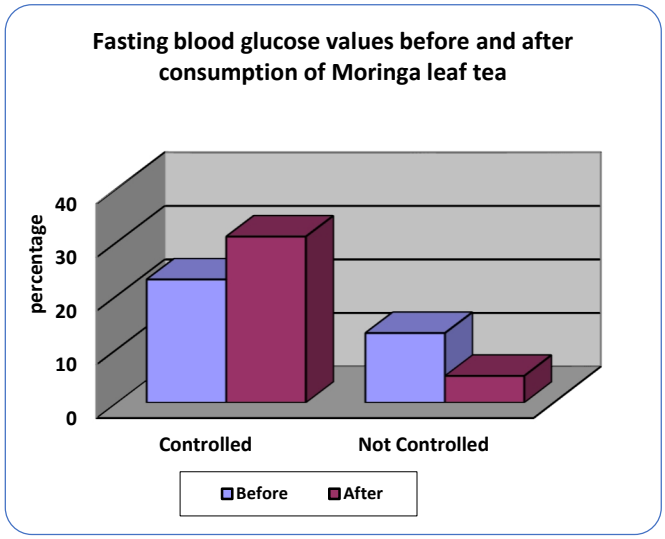

FIGURE 2. Graphical representation of the results of the examination of fasting blood glucose levels of Prolanis at Sreseh Sampang Madura Health Centre before and after consumption of Moringa leaves tea.

TABLE 2.

Results of the examination of HbA1C levels of uncontrolled patients before and after PKM activities

HbA1C value	Frequency	Percentage
Before	13	100
After	5	38,46
Difference	8	61,54

The TABLE 2 HbA1C levels of the patients were not controlled before consuming *Moringa* leaves tea as they decreased from 13 individuals (100%) to 5 individuals (38.46%) after consuming *Moringa* leaves tea and decreased in 8 individuals (61.54%) after consuming *Moringa* leaves tea respectively.

The results of the evaluation of PKM activities showed that the number of Prolanis members with type 2 diabetes who had uncontrolled blood glucose levels decreased by 61.54%.

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder that makes up for approximately 90% of DM cases. T2DM is characterized by high blood glucose levels, insulin resistance in the muscle, liver, and adipose tissues, and relative deficiency of insulin secretion from the pancreas. Moreover, patients with DM often develop serious complications including dyslipidemia and cardiovascular diseases, which are the major causes of their increased morbidity and mortality. Therefore, it remains critical to explore new preventative and therapeutic strategies against DM [12][13]. This community service activity is carried out through the use of Moringa leaves to reduce blood sugar levels in patients with type 2 diabetes mellitus and the application of the 5 pillars of controlling type 2 diabetes mellitus.

The results of this community service activity indicate that Moringa leaf extract can reduce blood sugar levels of patients with type 2 diabetes mellitus in the working area of the Sreseh Public Health Center.

The advantage of Moringa leaves compared to other plants is that Moringa leaves (Moringa oleivera) show the presence of alkaloid and steroid/triterpenoid compounds that play an active role in lowering blood glucose levels by stimulating pancreatic cells to secrete insulin. [9][14][15]

The limitation of this study is that there is no control group so that the effect of lowering blood sugar levels is due to Moringa leaf extract or other causes such as lifestyle modification. Lifestyle modification effectively prevents or delays the development of type 2 diabetes, at times with more enduring results than drug therapies [16] [17] [18].

Despite the limitations of this activity. The results of this community service activity are expected to be able to increase awareness and ask the public to use Moringa leaves to reduce blood sugar levels in type 2 diabetes mellitus patients.

IV. CONCLUSION

The results of the PKM activities can be summarized as follows: The community service activities (PKM) were well implemented, starting with the survey and coordination activities, the initial evaluation activities, the PKM implementation activities and the evaluation of the results achieved. The community, in this case, the members of Prolines with DM type 2, participate with great enthusiasm in each meeting/phase of the activity. The evaluation of the results of the activity showed good results: The number of Prolines members with type 2 diabetes who had uncontrolled blood glucose levels decreased by 61.54%.

Suggestions in the future are that the use of natural ingredients such as Moringa leaf extract should be increased to reduce blood sugar levels in patients with type 2 diabetes mellitus, as well as implement the 5 pillars of blood sugar control.

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