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Improvement of Awareness of Diabetes Mellitus Disease Risks and Self-Monitoring Motivation Through Blood Sugar Screening and Counseling for Dian Darat Village Community, Southeast Maluku

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Abstract Diabetes Mellitus (DM) disease is among the world's top 10 causes of death. It is a metabolic disease causing abnormally high blood sugar levels (a fasting blood sugar level above 126 mg/dL) in the body. Fortunately, controlling risk factors (such as unhealthy diet, physical inactivity, stress, and smoking) through early detection can prevent abnormal sugar levels in the body. Dian Darat is among the villages in the Southeast Maluku Regency where DM screening is rarely carried out due to its relatively remote location. This community activity aimed to improve awareness of the importance of self-monitoring blood glucose levels of blood sugar levels as recommended by the Indonesian DM screening policy and to generate awareness about the health risks of DM disease to the community by providing education through blood sugar screening and counseling for the village's community. The DM Screening and diagnosis activity involved professional healthcare workers from Pusat Kesehatan Masyarakat (Puskesmas/Community Health Center). Methods included early detection of DM and counseling based on blood sugar level screening results, and these were supported by poster media. Screening test results showed that 9 out of 26 respondents (35%) had a blood sugar level of 200 mg/dL (post-meal glucose) higher than normal. Based on the results of the pretest and posttest scores before and after the education, there was an increase in participants' knowledge regarding DM disease by 62%. (from average score of 56.15 ± 13.88 to 90.77 ± 9.77, n=26, $p \leq 0.01$). Future community services are recommended on similar and more sustainable community service activities by cooperating with other relevant stakeholders to optimize results.

1. INTRODUCTION

Diabetes Mellitus disease (DM) is responsible for the most significant increase in mortality among the top 10 men, an 80% increase since 2000 (World Health Organization, 2016). The incidence and prevalence of this disease are continuously increasing, especially in developing countries and countries that are entering a culture of industrialization (Misra et al., 2019). The number of people with DM worldwide was recorded in 1990 as only reaching 80 million. Then, by 2010, the number of people with diabetes mellitus reached 239.3 million in the world population and is expected to continue to soar to reach 300 million per world population in 2025 (Arisman, 2011; Mobasseri et al., 2020).

As a non-communicable disease, DM is caused by high blood sugar levels due to disorders of the pancreas and insulin (Shaikh et al., 2022). According to the World Health

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Health Organization (WHO), the four main types of non-communicable diseases are cardiovascular disease (coronary heart disease and stroke), cancer, chronic respiratory disease (asthma and chronic obstructive pulmonary disease), and DM (Parashar et al., 2022). Based on data from the WHO, around 347 million people worldwide suffer from DM, and it is estimated that deaths from the disease will increase by two-thirds from 2008 to 2030 (World Health Organization, 2016).

The burden of diabetes is increasing globally, especially in developing countries. In 2019, Indonesia ranked among the countries with the most diabetics in the world, with a total of 10.7 million (International Diabetes Federation, 2019). The 2013 Riskesdes (Riset Kesehatan Dasar or Basic Health Research) showed that the prevalence of DM in Maluku Province (1.0%) was below the average prevalence of the disease per province in Indonesia (1.5%). Although this number was low, based on the results of an initial survey at Dr. M. Haulusy Ambon General Hospital, people with type 2 DM in Ambon, the capital city of Maluku Province, in 2011-2013 reached 1,946 patients. In 2011, the number of patients who visited was 52 people; in 2012, it was 716, and in 2013, it was 1,178 people. Based on this data, from year to year, the number of patients coming to visit hospitals has dramatically increased in the city. The results of the 2013 Riskesdes analysis also showed that the age group most frequently diagnosed with DM was the age group over 45 years, namely 45-54 years with a prevalence of 3.3%, the age group 55-64 years with a prevalence of 4.8% and the group aged 65-74 years with a prevalence of 4.2%. Meanwhile, the age group that was slightly diagnosed with DM was the age group under 45 years, namely the age group 15-24 with a prevalence of 0.1%, the age group 25-34 with a prevalence of 0.3% and the age group 35-44 years with a prevalence of 1.1% (Ministry of Health of Republic of Indonesia, 2013).

Ways to keep blood sugar levels normal or under control include patients are adhering to self-management behaviors such as physical activity, healthy diet, reducing the risk factors, monitoring of blood glucose, healthy coping, and ability to solve problems (Kumar & Mohammadnezhad, 2022). To prevent and overcome the emergence of an increase in DM, the community and the government should work together to spread awareness about risk factors that can influence the disease's occurrence. This is as recommended by the Indonesian DM screening policy and to generate awareness about the health risks of DM disease to the community – the Regulation of the Minister of Health of the Republic of Indonesia Number 4 of 2019 concerning Technical Standards for Fulfilling Basic Service Quality in Minimum Service Standards in the Health Sector (Ministry of Health of Republic of Indonesia, 2019).

Based on observations made in Dian Darat Village, most community members needed more knowledge about blood sugar levels and DM disease. Moreover, many of them have never had their blood sugar checked. Therefore, the PKMD (Pembangunan Kesehatan Masyarakat Desa or Village Community Health Development) program held by Universitas Muhammadiyah Semarang was conducted. The PKMD community service activity encompassed DM education through blood sugar level screening for the adult and elderly group of Dian Darat Village Community at Southeast Maluku Regency. The aim was to improve awareness of the importance of self-monitoring of blood sugar levels and to generate awareness about the health risks of DM disease by providing education through blood sugar screening and counseling for the village's community. The additional purpose was to monitor the recent health status related to the blood sugar levels of community members.

2. METHOD

Our community service had been done on 1st - 30th January 2022, located in Southeast Maluku Regency, Indonesia. The participatory and counseling approach had been carried out in this community service by initiated by observation followed by planning, implementatiom and then finalized by evaluation.

2.1 Observation

A site survey in Dian Darat Village in Southeast Maluku Regency was initiated as a preparatory step of the community service activity. This observation was related to community demography, knowledge about DM diseases, and awareness about the benefits of examining blood sugar levels as early disease detection.

2.2 Planning

The planning step was initiated by correspondence with the Head of Dian Darat Village to request permission to carry out the Village Community Health Development (Pembangunan Kesehatan Masyarakat Desa, PKMD) program supported by the Diploma Study Program of Medical Laboratory Technology of Universitas Muhammadiyah Semarang. The permission request letter was submitted on January 24, 2022, stating that DM disease education and blood sugar level check was scheduled on Monday, January 24, 2022, with the target of adult or older adults of Dian Darat Village. Based on the observation results and the aim of this community activity, target participants were selected from the elderly population of Dian Darat Village. This was because the elderly age group is at high risk of DM disease. Subsequently, the educational material was prepared as a poster with the theme "Diabetes Can Be Prevented" (Saputra et al., 2021).

2.3 Public communication

The program began as soon as permission was obtained to hold education and blood sugar level screening. There are 10 questions in the distributed questionnaire, so each question is scored 10 if correct. The total score is 100. Invitations to respondents/participants were distributed. On January 24, 2022, each participant filled out and signed the attendance list, and the pretest questionnaires were given afterward, adopting a previous report (Pramesta et al., 2021). After the pretest Cres was administered, the blood sugar level of each participant was checked by

health professionals from Puskesmas assisted by Medical Laboratory students. Blood sugar levels were checked using Gluco Dr Auto AGM 4000 – Glucometer. Afterwards, the poster was delivered, and counseling was given by discussing the blood sugar level screening results while relating them to educational material in the poster. The material in the poster comprised DM definition, DM signs and symptoms, Risk factors causing DM, ways to prevent DM, and the relevance of blood glucose levels with DM. After the counseling and free discussion, the posttest questionnaire was distributed, and the participants were asked to complete it (Reaginta et al., 2022).

2.4 Evaluation

After the knowledge sharing and blood sugar checking were done, it was found that the people of Dian Darat Village were very enthusiastic about participating in knowledge sharing and blood sugar checking. The facilitator described the method to solve problems, challenges, or problems to answer the research objectives. This should consist of data collection techniques (including sample selection techniques, validity, and reliability of data collection tools), data analysis techniques, and location, time, and duration of activities. The questionnaire containing ten yes-no questions, which were previously validated using 20 respondents from the neighbor community with R-value > R-table (R = correlation coefficient) used. The questionnaire has ten questions (as shown below), so each question was scored with a total full score of 100.

1. Is Diabetes a health disorder? (Yes/No)
2. Do you think knowledge about Diabetes is important? (Yes/No)
3. Can Diabetes be prevented? (Yes/No)
4. Is Diabetes contagious? (Yes/No)
5. Is Diabetes a hereditary disease? (Yes/No)
6. Can foods high in carbohydrates and fats prevent Diabetes? (Yes/No)
7. Are drastic weight loss, easy thirst, and easy hunger early symptoms of Diabetes? (Yes/No)
8. Is age a factor that causes Diabetes? (Yes/No)
9. Diabetes is a disease that arises as a result of an excess of blood sugar levels. (Yes/No)
10. Is obesity a contributing factor to the onset of Diabetes. (Yes/No)

3. RESULT AND DISCUSSION

On January 24, 2022, DM disease education through blood sugar screening and counseling was successfully conducted for the Dian Darat Village community. A map of the location of the village community health development activity is shown in Figure 1. As seen in Figure 1, Dian Darat Village has two main areas separated by seawater; one area is an island. Such a location is relatively remote, requiring particular transportation to reach the location.

The activity community service of DM disease education through blood sugar screening and counseling was held in the Dian Darat village office with a total of 26 participants. The characteristics of respondents of the community service activity are presented in Table 1.

As seen in Table 1, most participants or respondents of this activity were elderly males. In terms of age group, the characteristics met the target of this community service activity based on a previous report stating that the age group most frequently diagnosed with DM is 55-64 years, with a prevalence of 4.8% (Ministry of Health of Republic of Indonesia, 2013). Also seen in Table 1 is that all participants have education below senior high school level (100%); 19% did not attend school. No participant has a college education. The low education characteristics of the participants showed that the target in this community

Figure 1 . The location and area coverage of Dian Darat Village of Southeast Maluku Regency, Indonesia, on Google Map. The village area includes Toad Island and its surrounding sea water

service, i.e., those who need education improvement, had been achieved.

The main activity of this community service was non-fasting blood sugar level screening of the 26 participants; the results are displayed in Figure 2. This activity was later followed by a discussion about the blood level status of participants (Figure 2).

Table 1 . Characteristics of respondents participating in Diabetes Mellitus education and blood sugar level screening activity at Dian Darat Village, Southeast Maluku

Characteristics	Total	Percentage
Gender		
Female	18	31
Male	8	69
Age		
Late teenager (17-25 y.o.)	-	-
Early adult (26-35 y.o.)	-	-
Late adult (17-45 y.o. or ≤ 45)	2	8
Early elderly (46-55 y.o.)	5	19
Elderly (56-65 y.o.)	13	50
Later elderly (66-.. y.o.)	6	23
Education Level		
Elementary School	7	27
Junior High School	9	35
Senior High	5	19
College	-	-
No formal education	5	19

Figure 2 . Education of Diabetes Mellitus by poster media with Dian Darat Village community

As seen in Table 2, with a non-fasting normal sugar level of < 200 mg/dL, 9 out of 26 respondents (35%) had abnormal results. These results underline the importance of complete health check to further assess the risk of DM disease to every Dian Darat Village community member.

The implementation of DM education activities was carried out by adopting the workflow of counseling activity, previously reported by Ethica et al. (2020). The counseling event was started by the opening speech by the team's representative of Department of Diploma of Medical Laboratory Technology, Universitas Muhammadiyah Semarang. Next, distribution of preliminary questionnaire to assess the basic knowledge of participants about DM was carried out before the posters as counseling material were distributed (Figure 3). As seen in Figure 3, participants actively filled the questionnaire and enthusiastically studied the education posters.

Table 2 . Screening of blood sugar level of respondents of Dian Darat Village community in Southeast Maluku

No.	Respondent's Initial	Gender	Non-fasting Blood Sugar Level (mg/dL)
1	EM	F	387*
2	IE	F	75
3	EE	F	166
4	SJ	F	230*
5	SM	F	211*
6	VE	F	143
7	EM	F	84
8	WK	F	264*
9	YM	M	157
10	IE	F	187
11	YM	F	283*
12	NE	M	92
13	NK	M	118
14	NK	M	144
15	SM	M	69
16	DY	F	445*
17	YM	F	145
18	KE	F	358*
19.	DE	F	262*
20.	IK	F	367*
21.	MM	M	80
22.	ME	F	105
23.	RK	F	71
24.	ME	M	104
25.	SM	M	137
26.	MS	F	166

Regency*Abnormal: Non-fasting normal sugar level is <200 mg/dL

Figure 3 . Pretest and posttest activities as part of Education on early detection for the prevention of Diabetes Mellitus (DM) disease to 26 adults of Dian Darat Village, Southeast Maluku Regency

The DM counseling activity was ended by conducting posttest after question-and-answer sessions were done. As

many as 26 respondents completed both pretest and posttest with the lowest score of 40 and the highest score of 100. As follow-up of the series of activities, an evaluation on scores of pretest and posttest of the participants was carried out, while the scores calculated using MS Excel 2013 with "CORREL" function were displayed in Table 3.

Overall, pretest and posttest results are displayed in Table 3. The pretest and posttest assessments were in the form of yes-no questions accompanied by interviews, particularly for participants with relatively low education (the elementary and non-formal education). For the particular participants, the delivery of the printed posters was accompanied by assistance to help them understand the material content. Based on data evaluation on Table 3, it was found that all 26 participants obtained more correct answers after DM counseling. This was implied by higher scores they had from an average of 56 ± 14 to 91± 10 scores (63%). Overall, it can be seen that all participants improved their motivation for self-monitoring and awareness about health risk after the activities, and some of them (42%) even achieved the highest scores (100). A strong correlation exists between pretest score and respondents' education level (r^2 = +0.5379). However, a weaker correlation (r^2 = +0.0029) between scores increases their education level.

Our community service activity was aimed at increasing awareness of the importance of self-monitoring blood glucose levels and the health risks of DM disease. Another objective was to monitor the current health status related to blood glucose levels of people in the community. After the activities, participants' motivation to self-monitor and awareness about the health risks of high blood glucose levels improved because of a better understanding of their relatedness to DM disease. Higher post-test scores represented such understanding compared to the pretest results obtained by participants. Printed posters presented in the counseling events were used because due to limited facility in rural area, any multimedia support was not available at Dian Darat Village. During counseling, the counselor invited participants to take roles in the discussion. They were free to express their opinions or comment throughout the session. Souvenirs were given as awards for participants contributing comments, questions or opinions. However, the effectiveness of printed posters in increasing community awareness of the health risks of DM can be proven by evaluating the increase in posttest scores, which was supported by materials contained in the posters.

Table 3 . The score of the pretest and posttest of respondents of the Dian Darat Village community in Southeast Maluku regency

Respondents	Pretest	Posttest	Score increase	Education*
1	40	90	50	1
2	40	80	40	1
3	50	90	40	1
4	80	100	20	3
5	70	100	30	3
6	70	100	30	2
7	40	100	60	3
8	40	70	30	2
9	60	100	40	3
10	50	90	40	2
11	50	70	20	1
12	60	90	30	3
13	60	80	20	1
14	70	90	20	2
15	60	100	40	3
16	40	80	40	1
17	40	80	40	1
18	50	90	40	2
19	60	80	20	1
20	50	100	50	3
21	70	100	30	3
22	90	100	10	3
23	50	90	40	2
24	60	90	30	2
25	70	100	30	3
26	40	40	60	2
Total	1460	2260	**Corr. Pre Test vs. Education**	0.0029
Mean	56	90	**Corr. Score increase vs. Education**	0.5379
Minimum	40	70		
Maximum	90	100		
Standard Deviation	14			

Based on the evaluation, the DM education through blood sugar level screening activity held was a very beneficial experience for the community of Dian Darat Village. This was revealed in the discussion session with the participants. More than 10 participants expressed their gratitude for having the time to learn about DM; the rest stated that it was the first time they checked their glucose level. The participants realized the benefit of self-monitoring of sugar levels by asking how it can be done regularly in the future. In the community service event, the group of elderly people could gather and get information about their blood sugar level status while improving their knowledge about the relationship between blood sugar level and the occurrence of DM disease. They also obtain more information and motivation to apply a healthier lifestyle to prevent the ailment.

In terms of awareness and knowledge increase about diabetes as an ailment (a term we used to refer to DM), it appeared in Table 3 that the education levels of participants weakly correlate (corr. score of 0.0029) with the pretest score. Those with high levels of education did not always have a good start understanding about diabetes. However, their education levels might support their capacity to improve their knowledge about diabetes, generally causing higher posttest scores.

Based on the results, DM education by combining counseling and blood sugar level screening improved knowledge about DM and awareness of ways to prevent it. It is suggested that similar activities could be done on a larger scale involving more elderly groups of other villages in Southeast Maluku Regency. This way, the awareness of DM early detection can be more widespread, and eventually will help in controlling the disease's prevalence and mortality. Future community services are recommended on similar and more sustainable community service activities by cooperation with other relevant stakeholders to optimize results (Ersanti & Oktafiani, 2019).

As exemplified by this DM education activity, the use of posters seemed to help significantly overcome the limitation of multimedia facilities to present the DM counseling materials. The use of poster as an effective DM education media had also been reported in previous publications regarding counseling on excessive sugar consumption and early diabetes mellitus prevention, respectively (Pramesta et al., 2021; Saputra et al., 2021).

During the pandemic, posters were preferred to comply with health protocol by avoiding crowds and limiting physical interaction (Ebrahimi et al., 2021). The poster as media to deliver DM education was also inexpensive and affordable for students to create. However, for DM education targeting larger population, the use of more media and means of communications is encouraged to support more effective interactions. In addition, in the longer term and for mapping and surveillance purposes, the use of database will make the medical record of blood sugar level more useful for the community.

Overall, our community-based activity by counseling using posters and health tests, targeting increased awareness and motivation for self-monitoring of blood glucose levels, has been used to prevent DM. However, the activity is only functional, insofar as they can be scaled up and sustained meaningfully. Social networks, which were defined by Abrahams et al. (2023) as "social structures that exist between actors, individuals or organizations," can play a role as an essential tool to identify underlying mechanisms that contribute to scaling up and sustaining our activity. Thus, improving social networking with other institutions or bodies, both from government and private sectors, is necessary to reach the ultimate goal of our community service: to increase community awareness to check sugar blood level regularly to anticipate the possibility of increasing prevalence of DM.

4. CONCLUSION

One-third of older adults of Dian Darat Village Community in Southeast Maluku Regency are at risk of DM due to their non-fasting high blood sugar levels. Therefore, it is necessary to have an education related to early detection to minimize DM health problems. Education on early detection using posters could improve knowledge based on average pretest and posttest scores by 62%. Future community services are recommended on similar and more sustainable community service activities by cooperating with other relevant stakeholders, making the results more optimal.

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CONFLICT OF INTERESTS

The authors declare there is no conflict of interest.

REFERENCES

Abrahams, N., Khodabakhsh, S., Toumpakari, Z., Marais, F., Lambert, E. V., & Foster, C. (2023). Using social networks to scale up and sustain community-based programs to improve physical activity and diet in low-income and middle-income countries: A scoping review. *International Journal of Behavioral Nutrition and Physical Activity, 20*(1), 1-12. https://doi.org/10.1186/s12966-023-01412-6

Arisman, (2011). *Obesity diabetes mellitus and dysplidemia: Concept, theory and applied treatment.* EGC Medical Book.

Arisman, M. B. (2014). *Buku ajar ilmu gizi: Obesitas, diabetes melitus, & dislipidemia: Konsep, teori dan penanganan aplikatif*. EGC Medical Book.

Ebrahimi, O. V., Hoffart, A., & Johnson, S. U. (2021). Viral mitigation and the COVID-19 pandemic: factors associated with adherence to social distancing protocols

and hygienic behaviour. *Psychology & Health*, 1-24. https://doi.org/10.1080/08870446.2021.1960987

Ersanti, A. M., Oktafiani, L. D. A. (2019). Non-communicable disease education through risk factor screening on employees of Bondowoso Campus, University of Jember. *Jurnal Pengabdian kepada Masyarakat (Indonesian Journal of Community Engagement), 8*(1), 17-20. https://doi.org/10.22146/jpkm.61673

Ethica, S. N., Sulistyaningtyas, A. R., Ernanto, A. R., Afriansyah, M. A., & Mukaromah, A. H. (2020). Socialization of lupus disease awareness for housewife group of Genting Village, Ambarawa, Central Java. *Jurnal Pengabdian Pada Masyarakat, 5*(4), 906-916. https://doi.org/10.30653/002.202054.444

International Diabetes Federation. (2019). *IDF Diabetes Atlas, 9th ed*. International Diabetes Federation. Retrieved in June 2023 from https://www.diabetesatlas.org/en/

Kumar, L., & Mohammadnezhad, M. (2022). Perceptions of patients on factors affecting diabetes self-management among type 2 diabetes mellitus (T2DM) patients in Fiji: A qualitative study. *Heliyon, 8*(6), e09728. https://doi.org/10.1016/j.heliyon.2022.e09728

Ministry of Health of Republic of Indonesia. (2013). *National report on basic health research Riskesdas 2013*. Repositori Badan Kebijakan Pembangunan Kesehatan. Retrieved on November 14, 2022 from https://repository.badankebijakan.kemkes.go.id/id/eprint/4519/

Ministry of Health of Republic of Indonesia. (2019). *Regulation of the ministry of health concerning technical standards for basic service quality at minimum service standards in the primary health care sector*. Ministry of Health of Republic of Indonesia. https://yankes.kemkes.go.id/unduhan/fileunduhan_1658478053_187189.pdf

Misra, A., Gopalan, H., Jayawardena, R., Hills, A. P., Soares, M., Reza-Albarrán, A. A., Ramaiya, K. L. (2019). Diabetes in developing countries. *Journal of diabetes, 11*(7), 522-539. https://doi.org/10.1111/1753-0407.12913

Mobasseri, M., Shirmohammadi, M., Amiri, T., Vahed, N., Fard, H. H., Ghojazadeh, M. (2020). Prevalence and incidence of type 1 diabetes in the world: a systematic review and meta-analysis. *Health promotion perspectives, 10*(2), 98.

Parashar, A., Willeboordse, M., Gupta, A. K., van Schayck, O. C. (2022). Effect of brief interventions to promote behavior change on clinical outcomes of selected non-communicable diseases: The World Health Organization (WHO) Package of Essential Non-communicable disease (PEN) Interventions for primary health care settings–study protocol of a quasi-experimental study. *Contemporary Clinical Trials, 113*(2022), 106675. https://doi.org/10.1016/j.cct.2022.106675

Pramesta, V., Cahya, A. I. B., Saptaningtyas, R., Sulistyaningtyas, A. R., Ethica, S. N. (2021). Penyuluhan bahaya konsumsi gula berlebih pada masyarakat Desa Sumberlerak Kabupaten Boyolali dengan media poster. *Majalah Ilmiah UPI YPTK*, 36-41. https://doi.org/10.35134/jmi.v28i2.77

Reaginta, T., Afriansyah, M. A., Ethica, S. N., Widyana, A. R. (2022). Sosialisasi pencegahan penyakit ginjal kronik pada kelompok remaja: Sebuah kewaspadaan dini penyakit Ginjal. *Jurnal Inovasi dan Pengabdian Masyarakat Indonesia, 1*(4), 1-4. https://doi.org/10.26714/jipmi.v1i4.56

Saputra, A. M., Indriyani, F., Putri, D. P. J., Ainutajriani, A., Ethica, S. N. (2021). Socialization of the importance of early diabetes mellitus prevention using poster media for young tenants of boarding house in Tembalang Sub-District, Semarang. *Jurnal Pengabdian Pada Masyarakat, 6*(3), 959-970.

Shaikh, A. A., Kolhatkar, M. K., Sopane, D. R., & Thorve, A. N. (2022). Review on: Diabetes mellitus is a disease. *International Journal of research in Pharmaceutical sciences, 13*(1), 102-109. https://doi.org/10.26452/ijrps.v13i1.27

World Health Organization. (2016). *Global report on diabetes*. World Health Organization. Retrieved on November 14, 2022 from https://apps.who.int/iris/bitstream/handle/10665/204871/9?sequence=1