

# Behavioural changes to prevent the risk of diabetes mellitus through health education

*By Atti Yudiernawati*

2

## ARTICLE INFORMATION

Received: February, 15, 2024

Revised: June, 22, 2024

Available online: June, 29, 2024

at : <https://ejournal.malahayati.ac.id/index.php/minh>

## Behavioural changes to prevent the risk of diabetes mellitus through health education

Atti Yudiernawati, Moh Zainol Rachman, Pudji Suryani, Andi Hayyun Abiddin\*

12 Sekkes Kemenkes Malang

Corresponding author: \*E-mail: [muhamuddin21@ui.ac.id](mailto:muhamuddin21@ui.ac.id)

### Abstract

**Background:** Diabetes Mellitus (DM) is a dangerous disease which is often referred to as the silent killer. DM is a major health problem. DM is characterized by chronic hyperglycaemia and disorders of carbohydrate metabolism, as a preventive measure it is necessary to control risk factors.

**Purpose:** To analyse the effect of health education using e-Booklet media on changes in behaviour to prevent the risk of type 2 DM.

**Method:** The research method used a quasi-experiment with one group pre and post-test design. Research subjects were taken from several community groups who are at risk of developing type II DM. Samples will be taken using a purposive sampling technique, totalling 78 participants who are at risk of developing DM based on measuring DM risk factors based on the Finnish Diabetes Association score. Data analysis using chi square.

**Results:** Based on the results of risk factor identification, there was a significant relationship between BMI, abdominal circumference, systolic blood pressure, blood sugar levels, fruit consumption and exercise activity before and after being given health education with p-value 0.000.

**Conclusion:** The risk of reduction occurred in the factors of vegetable and fruit consumption, exercise and weight loss. This will of course contribute to a decrease in body mass index and abdominal circumference. health education through booklet media has an influence on behaviour in preventing type 2 DM.

**Keywords:** Behavioural; Diabetes Mellitus; Health Education.

1

### INTRODUCTION

Diabetes Mellitus (DM) is a dangerous disease which is often referred to as the silent killer (Rani, 2023). DM is a major health problem. DM is characterized by chronic hyperglycaemia and disorders of carbohydrate, fat and protein metabolism (Dilworth, Facey, & Omoruyi, 2021). When the body becomes resistant to insulin or does not make enough insulin, adults can develop type 2 diabetes. In type 2 diabetes, the pancreas makes insulin but it is not enough and does not work well. If you have risk factors, then those at risk of developing type 2 diabetes are not only participants over 40 years old, it can even occur in participants under 40 years old. Long-term complications include cardiovascular disease (double risk), chronic kidney failure (the main

cause of dialysis), retinal damage which can cause blindness, as well as nerve damage which can cause impotence and gangrene with the risk of amputation (Ekacipto, Sukriyadi, & Suhartatik, 2019; Dwivedi, & Pandey, 2020).

Data from the Global Study shows that the number of Diabetes Mellitus sufferers in 2011 reached 366 million participants (Maffi, & Secchi, 2017). If no action is taken, it is estimated that it will increase to 552 million by 2030 (Shahid, & Jawed, 2022). Diabetes Mellitus has been the cause of 4.6 million deaths (Sya'diyah, Widayanti, Kertapati, Anggoro, Ismail, Atik, & Gustayansyah, 2020). The World Health Organization (WHO) warns that the prevalence of diabetes sufferers in Indonesia has the potential to

Behavioural changes to prevent the risk of diabetes mellitus through health education

increase drastically from 8.4 million participants in 2000 to 21.3 million sufferers in 2030 (Suryanto, 2023). This surge in sufferers could occur if our country is not serious about preventing, treating and complying with DM treatment.

The aim of the Diabetes Mellitus control program in Indonesia is to control risk factors to reduce morbidity, disability and death rates caused by DM (Sari, Arafat, Yanti, Hidayat, Paizer, & Syahfitri, 2023). DM control is prioritized on early prevention through efforts to prevent DM risk factors, namely promotive and preventive efforts (Setyaningrum, & Nissa, 2020). One important component of preventing and managing type 2 diabetes mellitus is regular physical activity. In prediabetic individuals, 150 minutes of moderate activity/week has been shown to be more effective in preventing type 2 DM because it is correlated with a decrease in the causes of diabetes. In nondiabetic subjects, regular physical activity has been shown to increase HDL-C, reduce triglyceride levels, lower blood pressure, reduce body weight, and increase insulin sensitivity. WHO recommends that effective strategies need to be carried out in an integrated, community-based manner through cross-program and cross-sector collaboration, including the private sector (Araiza, Hewes, Gashetewa, Vella, & Burge, 2006; Setyaningrum, & Nissa, 2020).

DM prevention can be done with various efforts, one of which is by increasing knowledge about preventing type 2 diabetes mellitus so that participants are more familiar with it and can change their attitudes and behaviour (Putri, Nada, & Wijayanti, 2021). Various educational programs have also been carried out and made into programs. The improvement of behaviour to control risk factors, health education is needed (American Association of Diabetes Educators, 2020). The importance of media in providing health information must be effective so that it makes it easier to receive health information (Afriyani, & Salafas, 2019). In the current era, the use of information technology in the form of electronic media is growing in accordance with the increasing information needs of both children and adults, interactive learning media that is easy to understand containing material and images can help you understand the material both when studying with a teacher and studying independently, one of them is electronic booklet or e-booklet (Setiawan, &

Wardhani, 2018; Eliana, Sunardi, & Susanto, 2022). E-booklets contain information in the form of text and images in portable document format with file types that are easy to read, downloaded from/to the internet, do not require special devices to open them, can be opened on all Windows and Android operating systems (Najahah, & Mawaddah, 2022). The closeness of gadgets to society has given birth to an innovation for the development of e-booklet media which allows it to be used to provide health education (Octamil, 2022). This media provides information that can be accessed according to developments (Setiawan, & Wardhani, 2018). Apart from that, this e-booklet media makes it possible to provide a friendly and easy to access service (Octamil, 2022). This makes it easier to get the information you need.

## RESEARCH METHOD

The research uses a quasi-experimental design with a one group pretest – post-test design approach, namely research by providing a pretest or intervention, then carrying out a post-test or final observation again. The intervention was given for 2 months in August-September 2021, 3 times, pretest in August and post-test in September. The working methods and data collection techniques in this research include: Identifying subjects, then identifying the risk of developing DM in research subjects and carrying out tests before and after being given education. Research subjects were taken from several community groups at risk of developing type II DM. Samples will be taken using a purposive sampling technique, totaling 78 participants who are at risk of developing DM based on measuring DM risk factors based on the Finnish Diabetes Association score. Data analysis uses the chi square test to determine whether there is an effect of health education using e-Booklets on preventive behavior against risk DM.

Education was provided after participants were given a pre-test regarding the prevention of diabetes mellitus. Education is provided face to face between the presenter and the participants with the help of an e-Booklet which can be accessed by each participants via their gadget. Before accessing it, an explanation is given on how to access and understand the information in the e-booklet. Next, participants were asked to understand the e-Booklet again at home. At

**Atti Yudiernawati, Moh Zainol Rachman, Pudji Suryani, Andi Hayyun Abiddin\***

<sup>2</sup>Ittekkes Kemenkes Malang

Corresponding author: \*E-mail: muhamuddin21@ui.ac.id

DOI: <https://doi.org/10.33024/minh.v7i4.176>

Behavioural changes to prevent the risk of diabetes mellitus through health education

the next meeting, a post test was carried out to demonstrate the impact of the e-Booklet.

Interpretation of the Risk Score is said to be low if it is lower than 7 so it is estimated that 1 in 100 will get the disease, it is in the slightly low category if the risk score is 7-11 so it is estimated that 1 in 25 participants will get the disease, a risk score of 12-24 is in the moderate category so it is estimated to be 1 out of 6 participants will get the disease, the high category is

if the score is 15-20 so it is estimated that 1 in 3 participants will get the disease and in the category of more than 20 it is estimated that 1 out of 2 participants will get the disease.

This research has received recommendation permission from the Indonesian University Ethics Commission with number: 1806/KEPK-POLKESMA/2021.

**RESEARCH RESULTS**

**Table 1. Characteristic of Participants (N= 78)**

Variable	Results
<b>Age (n/%)</b>	
<b>(Mean+SD)(Range)(Year)</b>	(51.24+7.457)(40-64)
< 45	20/25.6
45-54	19/24.4
55-64	39/50.0
<b>Gender (n/%)</b>	
Male	40/51.3
Female	38/48.7
<b>History DM (n/%)</b>	
There isn't any	64/82.1
Descendants of parents	5/6.4
Descendants of grandparents	9/11.5

In Table 1, the characteristics of participants show mean data of 51.24 and standard deviation of 7.457 with an age range of 40-64 years. The majority of participants were men, 40 participants (51.3%), while there were 38 women (48.7). Characteristics of DM history: 64 participants (82.1%) never had a history of DM, 5 participants (6.4) had a hereditary history of DM from their parents and 9 participants (11.5) had a hereditary history of DM from their grandparents.

**Atti Yudiernawati, Moh Zainol Rachman, Pudji Suryani, Andi Hayyun Abiddin\***

**2** Itekkes Kemenkes Malang

Corresponding author: \*E-mail: muhamuddin21@ui.ac.id

DOI: <https://doi.org/10.33024/minh.v7i4.176>

Table 2. Distribution Frequency of Participants Pre and Post Treatment (N=78)

Variables	Pre-Treatment	Post Treatment	p-value	Coefficient
<b>BMI (n/%)</b>				
< 25 kg/m <sup>2</sup>	27/34.6	29/37.2	0.000	0.896
25 -30 kg/m <sup>2</sup>	37/47.4	44/56.4		
> 30 kg/m <sup>2</sup>	14/17.9	5/6.4		
<b>11 Abdominal Circumference (n/%)</b>				
<b>Male</b>				
<94 cm	21/52.5	23/57.5	0.000	0.704
94-102 cm	12/30.0	13/32.5		
>102 cm	7/17.5	4/10.0		
<b>Female</b>				
<80 cm	3/7.9	7/18.5	0.000	0.683
80-88 cm	15/39.5	17/44.7		
>88 cm	20/52.6	14/36.8		
<b>Systolic Blood Pressure (n/%)</b>				
<150 mmHg	62/79.5	66/84.6	0.000	0.839
≥150 mmHg	16/20.5	12/15.4		
<b>Random Blood Sugar (n/%)</b>				
<200 mg/dl	66/84.6	72/92.3	0.000	0.677
≥200 mg/dl	12/15.4	6/7.7		
<b>Frequency of Fruit Consumption (n/%)</b>				
Every day	48/61.5	52/66.7	0.000	0.894
Sometimes	30/38.5	26/33.3		
<b>Frequency of Exercise Activities in A Week (n/%)</b>				
Every day for at least 30 minutes	43/55.1	48/61.5	0.000	0.876
Sometimes	35/44.9	30/38.5		
<b>Risk Score Interpretation (n/%)</b>				
Very Low	28/35.9	36/46.1		
Slightly Low	33/42.3	35/44.9		
Moderate	8/10.3	2/2.6		
High	8/10.3	5/6.4		
Very high	1/1.2	0/0		

Table 2 shows that of the 78 participants, the majority had a BMI of 25-30kg/m<sup>2</sup>, 37 (47.4%) at pre-treatment and 44 (56.4%) at post treatment, BMI <25kg/m<sup>2</sup> at pre-treatment as many as 27 (34.6%) and post treatment as many as 29 (37.2%), while for BMI >30kg/m<sup>2</sup> there were 14 (17.9%) in pre-treatment and 5 (6.4%) in post treatment.

Atti Yudiernawati, Moh Zainol Rachman, Pudji Suryani, Andi Hayyun Abiddin\*

2. Itekkes Kemenkes Malang

Corresponding author: \*E-mail: muhamuddin21@ui.ac.id

DOI: <https://doi.org/10.33024/minh.v7i4.176>

## Behavioural changes to prevent the risk of diabetes mellitus through health education

The majority of male participants' abdominal circumference was <94 cm, pre-treatment was 21 (52.5%) and post treatment was 23 (57.5%). There were 12 (30.0%) men with an abdominal circumference of 94-102 cm at pre-treatment and 13 (32.5%) at post treatment. Meanwhile, there were 7 (17.5%) men with abdominal circumference >102 cm at pre-treatment and 4 (10.0%) at post treatment.

There were 3 (7.9%) female participants with abdominal circumference <80 cm at pre-treatment and 7 (18.4%) at post treatment. There were 15 (39.5%) women with abdominal circumference of 80-88 cm at pre-treatment and 17 (44.7%) at post treatment. Meanwhile, in women with abdominal circumference >88 cm, there were 20 (52.6%) pre-treatment and 14 (36.8%) post treatment.

Participants with systolic blood pressure <150mmHg were 62 (79.5%) at pre-treatment and 66 (84.6%) at post-treatment, while with systolic blood pressure ≥150mmHg there were 16 (20.5%) at pre-treatment and 12 (15.4%) at post treatment.

Participants with random blood sugar <200mg/dl were 66 (84.6%) at pre-treatment and 72 (92.3%) at post treatment, while with random blood sugar ≥200mg/dl were 12 (15.4%) at pre-treatment and 6 (7.7%) at post treatment.

Participants who consumed fruit every day were 48 (61.5%) in pre-treatment and 52 (66.7%) in post treatment, while in pre-treatment there were 30 (38.5%) who did not consume fruit every day and 26 (33.3%) in post treatment.

Participants who did sports activities every week for at least 30 minutes were 43 (55.1%) in pre-treatment and 48 (61.5%) in post treatment. Meanwhile, it was found that 35 (44.9%) did not exercise every day at pre-treatment and 30 (38.5%) at post treatment.

Based on the results of identifying risk factors, there was a significant relationship between BMI, abdominal circumference, systolic blood pressure, random blood sugar, fruit consumption, and exercise activities in a week before and after being given health education.

## DISCUSSION

Based on the results of data analysis from calculating scores to determine the risk of DM after education, it was found that the **1** were changes in behaviour that led to a reduction in risk, based on the

diabetes risk assessment from the Finnish Diabetes Association, some of the risk factors were persistent (age and family history) and some could be changed through reduction. Risk factors such as body mass index, abdominal circumference, exercise, consumption of vegetables and fruit. From the research results it was found that the risk of reduction occurred in the factors of vegetable and fruit consumption, exercise and weight loss. This will certainly contribute to a decrease in body mass index and abdominal circumference.

One of the factors related to a person **1** experiencing diabetes mellitus is the age factor, when over 40 years old, many vital organs weaken and the body begins to experience sensitivity to insulin (**1**iskas, & Abrar, 2023). Even women who are older (over 40 years) and have experienced menopause have a tendency to be less sensitive to the hormone insulin (Purnama, & Sari, 2019). The age group **3** that suffers most from DM is the 45-52 age group. The risk of diabetes increases with age, especially at age over 40 years, because at that age glucose intolerance begins to increase (Imelda, 2019). The aging process causes a reduction in the ability of pancreatic  $\beta$  cells to produce insulin (Imelda, 2019). In addition, in older individuals there is a 35% decrease in mitochondrial activity in muscle cells (Wulandari, & Kurnianingsih, 2018). This is associated with an increase in fat levels in the muscles by 30% and triggers insulin resistance (Wulandari, & Kurnianingsih, 2018).

Hereditary or genetic factors have a contribution that cannot be underestimated in someone developing diabetes. Eliminating genetic factors is very difficult, it can be done for someone to avoid diabetes mellitus due to genetic causes is to improve their lifestyle and diet (Purnama, Adzidzah, Solihat, & Septrian, 2023). Diabetes mellitus sufferers do not inherit type I diabetes itself but inherit a genetic predisposition or tendency towards developing type I diabetes (Izza, 2022). This genetic predisposition is **8**-terminated in individuals who have a certain type of HLA (Human leucocyte antigen). HLA is a collection of genes responsible for transplantation antigens and other immune processes (Wulandari, & Kurnianingsih, 2018).

Prevention efforts can be carried out through health promotion efforts. One of the efforts to provide health education is to provide information to the public regarding health problems (Putri et al., 2021). Efforts

Atti Yudiernawati, Moh Zainol Rachman, Pudji Suryani, Andi Hayyun Abiddin\*

**2**tekkes Kemenkes Malang

Corresponding author: \*E-mail: muhamuddin21@ui.ac.id

DOI: <https://doi.org/10.33024/minh.v7i4.176>

Behavioural changes to prevent the risk of diabetes mellitus through health education

to control DM can be carried out with early detection, namely early diagnosis and appropriate treatment to prevent the risk of developing the disease (Aristya, 2018). Efforts related to early diagnosis of DM include: carrying out DM screening in the community and conducting surveys on food consumption patterns at the family level in community groups.

From the research results, there are changes in behaviour that can lead to a decrease in risk from the factors of consuming vegetables and fruit, exercise and weight loss. This will of course contribute to a decrease in body mass index and abdominal circumference. Dietary management is an important management of both types of DM. Incoming food must be distributed evenly throughout the day. This must be consistent from day to day. between foods that come in with a balanced intake of vegetables and fruit. Type II DM tends to be overweight which is associated with insulin resistance and hyperglycemia. Glucose tolerance **6**en improves with weight loss. 3) Physical Exercise. Daily physical activity and regular physical exercise (3-4 times a week for approximately 30 minutes), is one of the pillars in managing type II diabetes. Physical exercise can reduce weight and improve insulin sensitivity, thereby improving blood glucose control. The physical exercise in question is walking, cycling, jogging, swimming.

Type 2 diabetes generally occurs when lifestyle and behavioural patterns have become firmly established. Successful self-management of diabetes requires the active participation of patients, families and the community. The health team must **1**company patients towards changing behaviour. To achieve successful behaviour change, comprehensive education, skill development and motivation are needed. This education includes an understanding of: 1) DM disease, 2) The meaning and need for controlling **1**and monitoring DM, 3) Complications of DM, 4) Pharmacological and non-pharmacological interventions. 5) Hypoglycemia. 6) Specific problems faced. 7) Foot care in diabetes. 8) How to develop support systems and teach skills.

The role of health education is very important in efforts to control risk factors so as to increase participants's knowledge and attitudes to change the level of behaviour in individuals by modifying a person's knowledge, attitudes, beliefs or behaviour. Through health education it will be easier to transfer knowledge, attitudes and healthy behaviour through

habituation to a healthy lifestyle so that. Increasing knowledge about healthy lifestyle behaviours that can prevent the occurrence of DM through controlling risk factors for type 2 DM.

## CONCLUSION

Health education using e-Booklets is effective in improving behaviour in preventing type 2 DM. Based on the results of data analysis from calculating scores to determine the risk of DM after education, there is an increase in behaviour in controlling **1**k factors in preventing type 2 DM, based on the diabetes risk assessment from Finnish Diabetes. The association of risk factors is permanent (age and family history) and some can be changed by reducing risk factors such as body mass index, abdominal circumference, exercise, consumption of vegetables and fruit. From the results of the research, changes in behaviour in controlling DM risk factors occurred in factors such as consumption of vegetables and fruit, exercise and weight loss, this will certainly contribute to a decrease in body mass index and abdominal circumference.

## REFERENCES

- Afriyani, L. D., & Salafas, E. (2019). Efektivitas media promosi kesehatan ASI perah terhadap peningkatan pengetahuan ibu bekerja untuk memberikan ASI eksklusif. *Jurnal Siklus*, 8(1), 60-66.
- American Association of Diabetes Educators. (2020). An effective model of diabetes care and education: revising the AADE7 Self-Care Behaviors®. *The Diabetes Educator*, 46(2), 139-160.
- Aristya, M. (2018). Hubungan kepatuhan dalam kegiatan prolans dengan kadar gula darah pada pasien diabetes mellitus tipe 2 di Puskesmas Lamper Tengah. *Arpusda Semarang*, 2(1), 1-12. Received by: [https://arpusda.semarangkota.go.id/uploads/data\\_karya\\_ilmiah/20210415095644-2021-04-15data\\_karya\\_ilmiah095015.pdf](https://arpusda.semarangkota.go.id/uploads/data_karya_ilmiah/20210415095644-2021-04-15data_karya_ilmiah095015.pdf).
- Dilworth, L., Facey, A., & Omoruyi, F. (2021). Diabetes mellitus and its metabolic complications: the role of adipose tissues. *International journal of molecular sciences*, 22(14), 7644.

**Atti Yudiernawati, Moh Zainol Rachman, Pudji Suryani, Andi Hayyun Abiddin\***

Poltekkes Kemenkes Malang

Corresponding author: \*E-mail: muhamuddin21@ui.ac.id

DOI: <https://doi.org/10.33024/minh.v7i4.176>

Behavioural changes to prevent the risk of diabetes mellitus through health education

- Dwivedi, M., & Pandey, A. R. (2020). Diabetes mellitus and its treatment: An overview. *J. Adv. Pharmacol*, 1(1), 48-58.
- Ekacipto, B. S., Sukriyadi, S., & Suhartatik, S. (2019). Pengaruh tingkat pengetahuan terhadap kejadian komplikasi dm di RS Pelamonia Makassar. *Media Keperawatan: Politeknik Kesehatan Makassar*, 8(2), 67-72.
- Haskas, Y., & Abrar, E. A. (2023). Gambaran disparitas diabetes melitus tipe 2 ditinjau dari faktor sosiodemografi. *JIMPK: Jurnal Ilmiah Mahasiswa & Penelitian Keperawatan*, 3(6), 263-269.
- Imelda, S. I. (2019). Faktor-faktor yang mempengaruhi terjadinya diabetes melitus di Puskesmas Harapan Raya tahun 2018. *Scientia Journal*, 8(1), 28-39.
- Izza, S. F. (2022). *Hubungan antara Kadar Glukosa Darah dan Pemberian Konseling dengan Kepatuhan Kontrol Pasien Diabetes Mellitus Berbasis Aplikasi PAGIPA (Pantau Gizi Pasien) di Puskesmas Wonodadi Blitar* (Doctoral dissertation, Poltekkes Kemenkes Yogyakarta).
- Maffi, P., & Secchi, A. (2017). The burden of diabetes: emerging data. *Management of Diabetic Retinopathy*, 60, 1-5.
- Najahah, I., & Mawaddah, S. (2022). *Monograf Peningkatan Pengetahuan ASI Eksklusif melalui Media E-Booklet*. Penerbit NEM.
- Octamil, M. T. (2022). *Pengembangan media pembelajaran e-booklet pada materi sistem ekskresi di SMP Negeri 2 Pematang Siantar* (Doctoral dissertation, UIN Ar-Raniry Fakultas Tarbiyah dan Keguruan).
- Putri, I. I., Nada, N., & Wijayanti, A. C. (2021). *Hubungan antara pengetahuan dan sikap dengan upaya kepatuhan diet pada penderita diabetes mellitus tipe 2 di Surakarta* (Doctoral dissertation, Universitas Muhammadiyah Surakarta).
- Purnama, A., & Sari, N. (2019). Aktivitas Fisik dan Hubungannya dengan Kejadian Diabetes Mellitus. *Window of Health: Jurnal Kesehatan*, 368-381
- Purnama, H., Adzidzah, H. Z. N., Solihat, M., & Septriani, M. (2023). Determinan risiko dan pencegahan terhadap kejadian penyakit diabetes melitus tipe 2 pada usia produktif di Wilayah DKI Jakarta: Determinants of Risk and Prevention of Type 2 Diabetes Mellitus in the Productive Age in the DKI Jakarta Area. *Journal of Public Health Education*, 2(4), 158-166.
- Rani, T. J. (2023). Awareness of Diabetes Mellitus: A cross sectional study. *International Journal of Science and Research Archive*, 10(2), 367-373.
- Sari, F., Arifah, M., Yanti, L., Hidayat, A. T., Paizer, D., & Syahfitri, R. D. (2023). Peningkatan pengetahuan kader dan masyarakat kesehatan dalam pencegahan diabetic foot ulcer di Desa Burai. *Jurnal Peduli Masyarakat*, 5(2), 403-408.
- Setiawan, H., & Wardhani, H. A. K. (2018). Pengembangan media e-booklet pada materi keanekaragaman jenis Nepenthes. *Edumedia: Jurnal Keguruan dan Ilmu Pendidikan*, 2(2).
- Setyaningrum, Y. I., & Nissa, C. (2020). Penyuluhan konsumsi pangan lokal untuk penderita diabetes melitus di Desa Dilem, Kepanjen, Malang. *Kumawula: Jurnal Pengabdian Kepada Masyarakat*, 3(3), 435-440.
- Shahid, S. M., & Jawed, M. (2022). The risk for the development of diabetic nephropathy: interplay of biochemical, genetic, nutritional and lifestyle factors.
- Suryanto, S. (2023). Hubungan antara asam urat dan hba1c dengan nilai nlr pada pasien dm tipe 2. *Cerdika: Jurnal Ilmiah Indonesia*, 3(6), 620-626.
- Sya'diyah, H., Widayanti, D. M., Kertapati, Y., Anggoro, S. D., Ismail, A., Atik, T., & Gustayansyah, D. (2020). Penyuluhan kesehatan diabetes melitus penatalaksanaan dan aplikasi senam kaki pada lansia di Wilayah Pesisir Surabaya. *Jurnal Pengabdian Kesehatan*, 3(1), 9-27.
- Wulandari, D., & Kurnianingsih, W. (2018). Pengaruh usia, stres, dan diet tinggi karbohidrat terhadap kadar glukosa darah. *Infokes: Jurnal Ilmiah Rekam Medis dan Informatika Kesehatan*, 8(1).

**Atti Yudiernawati, Moh Zainol Rachman, Pudji Suryani, Andi Hayyun Abiddin\***

Poltekkes Kemenkes Malang

Corresponding author: \*E-mail: muhamuddin21@ui.ac.id

DOI: <https://doi.org/10.33024/minh.v7i4.176>



# Behavioural changes to prevent the risk of diabetes mellitus through health education

---

ORIGINALITY REPORT

---

# 14%

SIMILARITY INDEX

---

## PRIMARY SOURCES

---

1	<a href="http://innovareacademics.in">innovareacademics.in</a> Internet	158 words — 5%
2	<a href="http://ejurnal.malahayati.ac.id">ejurnal.malahayati.ac.id</a> Internet	82 words — 2%
3	<a href="http://ejournal.uika-bogor.ac.id">ejournal.uika-bogor.ac.id</a> Internet	69 words — 2%
4	<a href="http://en.tokomaduraonline.com">en.tokomaduraonline.com</a> Internet	32 words — 1%
5	<a href="http://www.atlantis-press.com">www.atlantis-press.com</a> Internet	29 words — 1%
6	<a href="http://jurnal.agdosi.com">jurnal.agdosi.com</a> Internet	24 words — 1%
7	Paul Araiza, Hilary Hewes, Carrie Gashetewa, Chantal A. Vella, Mark R. Burge. "Efficacy of a pedometer-based physical activity program on parameters of diabetes control in type 2 diabetes mellitus", <i>Metabolism</i> , 2006 Crossref	22 words — 1%
8	<a href="http://gmumedical.com">gmumedical.com</a> Internet	18 words — 1%

---

9 Dewi Andariya Ningsih, Eliyawati, Istidamatul Ludvia, Lutfiatur Rohmani et al. "YOUTH NUTRITION EDUCATION FOR FEMALE STUDENTS", *Community Service Journal of Indonesia*, 2022 17 words — < 1%  
Crossref

---

10 Donal Nababan, Rulihta Sembiring, Daniel Ginting. "Determinants of diabetes in prolanis patients", *Jurnal Aisyah : Jurnal Ilmu Kesehatan*, 2023 16 words — < 1%  
Crossref

---

11 [link.springer.com](https://link.springer.com) 16 words — < 1%  
Internet

---

12 [repo.poltekkes-palangkaraya.ac.id](https://repo.poltekkes-palangkaraya.ac.id) 15 words — < 1%  
Internet

---

EXCLUDE QUOTES OFF  
EXCLUDE BIBLIOGRAPHY ON

EXCLUDE SOURCES < 10 WORDS  
EXCLUDE MATCHES < 15 WORDS