The Relationship Of Knowledge About Diabetes Mellitus Risk Factors With The Healthy Lifestyle Among Nursing Students

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ABSTRACT

Background: The incidence of Type 2 Diabetes Mellitus (T2DM) in young age groups continues to increase. Student knowledge about diabetes risk factors is still in the category of lacking so that students cannot apply healthy lifestyle implementation behaviors correctly.

Purpose: The study aims to determine the relationship between knowledge and healthy living behavior in students of the Faculty of Nursing, Andalas University.

Methods: The design of this study was *cross sectional*. The sample number was 218 students of the Faculty of Nursing and used *the propotional random sampling technique*. The research data was collected with DM risk factor knowledge questionnaire and healthy lifestyle application questionnaire through *Google form* media. Data analysis using *chi-square test.*

Result: Researchers found that there was a relationship between knowledge of DM risk factors and the application of a healthy lifestyle (*p = 0.002*), where knowledge about DM risk factors was obtained in the sufficient category with the application of a low healthy lifestyle.

Conclusion: Therefore, it is still necessary to increase student knowledge about diabetes mellitus risk factors.

INTRODUCTION

International Diabetes Federation (IDF) reported the global prevalence of Diabetes Mellitus (DM) in 20-79 year olds in 2021 is estimated at 10.5% (536.6 million people), and is expected to increase to 12.2% (783.2 million) by 2045. The prevalence in 2021 was higher in urban areas (12.1%) than in rural areas (8.3%), in addition, the incidence of DM in high-income countries (11.1%) was higher than in low-income countries (5.5%). Based on these data, it shows that the progress of an area affects how the lifestyle of residents in the area. So that the high number of DM is in line with the progress of an area [1]–[3]

The prevalence of DM in Indonesia According to Riskesdas 2018 data, it shows an increase in all provinces. Based on blood sugar examinations, there was an increase in the number of DM patients in 2013, the prevalence of DM by 6.9% to 8.5% in 2018 [4]. The highest data is in the Special Capital Region (Jakarta) as much as 3.4%, while East Nusa Tenggara with the smallest DM prevalence is 0.9%, while West

Sumatra has a prevalence of 1.6%. Padang City As the highest prevalence of DM in West Sumatra [5]. The prevalence of DM in Padang City was found that from the characteristics of education at the D1 / D2 / D3 / PT level, the prevalence was 2.12%, where the highest rate was at the higher education level [4].

Based on the results of Yosmar's research (2018) on the risk of DM disease to the people of Padang City in the group of patients who have higher education, it was found that 201 (57.7%) respondents had a high risk of DM [6]. The World Health Organization (2020) reports that diabetes among 15 years and over is the seventh leading cause of death in Indonesia, accounting for 632.2 per 100,000 population compared to people without diabetes, patients with T2DM 2 aged 15 years and over have a life expectancy 14 years lower in men and lower in women [7].

DM risk factors are factors that can increase a person's risk of developing DM, including factors that can be modified and factors that cannot be modified. Risk factors that cannot be modified are race, ethnicity, age, gender, family history with DM, history of giving birth to babies > 4,000 grams, history of birth with low birth weight (BBLR or <2,500 grams). Meanwhile, modifiable risk factors are overweight, abdominal / central obesity, lack of physical activity, stress, hypertension, dyslipidemia, unhealthy and unbalanced diet (high in calories), prediabetes conditions characterized by impaired glucose tolerance (TGT 140-199 mg / dl) or impaired fasting blood sugar (GDPT < 140 mg / dl), and smoking [8][9].

The results of Fitriani's research (2022) found that good knowledge is characterized by respondents being able to know the factors that can cause DM such as like to eat foods that are high in sugar, salt, fat, ready-to-eat foods (*fast food*), and less physical activity. Knowledge of DM risk factors is needed in lifestyle changes [10]. The high proportion of DM sufferers in students can occur related to lifestyle and access to case detection in health services [11]. The results of Maulani Dinar's research (2022) show that 61.8% of students have an unhealthy lifestyle due to diet and physical activity [12]. Prevention that can be done by groups at risk of DM requires lifestyle change actions including exercise, weight loss, and dietary arrangements [11]. According to research by Azis et al., (2020), it shows a relationship between knowledge about DM risk factors and healthy lifestyle habits [3].

The phenomenon of student lifestyle in general is more likely to follow an unhealthy lifestyle. The unhealthy lifestyle carried out by students such as smoking habits, consumption of unbalanced nutrition, and poor stress control. In addition, students also often consume unbalanced meals that will have an impact on health such as the incidence of obesity and gastritis in students by 63% [13]. Lack of knowledge about the safe limit of food consumption can cause risks so that more students who have food consumption behavior at risk of DM (56.1%) while only 30.1% of students know the safe limit of consumption of sugar, salt 44.8% and fat 21.6% in one day. Low knowledge about the safe limit of consumption of sugar, salt and fat in a day makes more students have DM-risk food consumption behavior that exceeds the specified safe limit [10].

Students prefer to eat small meals at night rather than eating fruits and vegetables. In addition, it can be caused by the demands of assignments during lectures which cause students to experience stress more easily. The prevalence of students experiencing stress reached 68.2% [10]. In addition to these phenomena, students also often experience insomnia or difficulty sleeping. The prevalence of students experiencing insomnia is around 49.4% [14].

A preliminary study conducted by researchers to determine the lifestyle picture of Unand Faculty of Nursing students as many as 50% of respondents admitted that they only occasionally controlled nutrition and as many as 58.3% who sometimes checked signs and symptoms to health workers. In addition, it is also known that only half of respondents sometimes follow an exercise program while 41.7% others claim never, and 50% of respondents only occasionally have enough sleep. The existence of nursing faculty students who will become nurses and are responsible for emphasizing the incidence of DM disease and the discovery of the phenomenon of increasing the risk of DM disease, researchers are interested in conducting research on knowledge about the risk of DM disease and the application of a healthy lifestyle in S1 nursing students of Andalas University.

METHODS

Research Design

This study used a quantitative descriptive research design. The method used is the *cross sectional method.*

Population and Sample

The research population of nursing students was 482 people with a total sample based on the slovin formula with an alpa of 5% totaling 218 respondents. The inclusion criteria in this study are students who are actively enrolled in the Faculty of Nursing, Andalas University who have completed medical surgical nursing (KMB) courses, especially the endorin system. The study was conducted from February to July 2023.

Instrument

The research was conducted by conducting a survey using a google form questionnaire. The instrument used in this study is a google form questionnaire containing sociodemographic data, knowledge questionnaires and the application of a healthy lifestyle developed by the researcher himself and declared valid and reliable with the results of the knowledge questionnaire test validity 0.681 and reliability obtained results 0.491 questionnaire application healthy lifestyle reliability with results 0.503 and validity with results 0.712

Ethical clearence

This research has been conducted ethical feasibility test at the Faculty of Nursing, Andalas University, with ethical feasibility information No.028.laiketik/KEPKFKEPUNAND

RESULT AND DISCUSSION

Characteristics of respondents

Table 1. Frequency Distribution of Respondent Characteristics (n=218)

No	Characteristics of Respondents	*F*	(%)
1	**Force**		
	2019	65	29.8
	2020	76	34.8
	2021	77	35.3
2	**Age**		
	17 years old	1	0.5
	18 years old	1	0.5
	19 years old	19	8.7
	20 years	90	41.3
	21 years old	73	33.5
	22 years old	32	14.7
	23 years old	1	0.5
3	**Gender**		
	Man	16	7.3
	Woman	202	92.7
4	**Status of Residence**		
	Extended Family	13	5.9
	Nuclear Family	51	23.4
	Own/Boarding House	154	70.6
5	**Family History of DM**		
	Father	29	13.3
	Mother	27	12.4
	Neither.	154	74.3
6	**IMT**		
	Sanagt skinny	11	5.0
	Thin	30	13.8
	Usual	143	65.6
	Fat	15	6.9
	Obesity	19	8.7

Table 1 shows that the majority of respondents in this study came from the class of 2021, amounting to 77 respondents (35.3%), the age of the most respondents at the age of 20 years 90 respondents (41.3%), the majority of respondents were female 202 respondents (92.7%), their own residence/boarding status was 154 respondents (70.6%), the majority of respondents did not have a DM history of 218 respondents (74.3%), and on average had respondents having a normal BMI of 143 respondents (65.6%).

Knowledge of Diabetes Mellitus Risk Factors

Table 2. Frequency Distribution of Respondents' Knowledge of DM Risk Factors (n = 218)

Knowledge of DM Risk Factors	Frequency	(%)
Good	7	3.2
Good enough	114	52.3
Not good	97	44.5

Table 2 shows the frequency distribution of knowledge about DM risk factors, it can be seen that most respondents fall into the fairly good category, which is as many as 114 respondents (52.3%).

Implementation of a Healthy Lifestyle

Table 3. Frequency Distribution of Healthy Lifestyle Application (n=218)

Implementation of a Healthy Lifestyle	Frequency	(%)
Low	190	87.2
Keep	28	12.8
Tall	0	0

Table 3 shows the frequency distribution of implementing a healthy lifestyle, it can be seen that most respondents fall into the low category, which is as many as 190 respondents (87.2%).

The relationship between knowledge of DM Risk Factors and the Application of a Healthy Lifestyle

Bivariate analysis is used to see the relationship between the Independent Variable (knowledge of risk factors for diabetes mellitus) and the dependent variable (the application of a healthy lifestyle).

Table 4 Relationship of Knowledge of DM Risk Factors with the Application of a Healthy Lifestyle

Knowledge of DM Risk Factors	Healthy Lifestyle						p-value
	Low		Keep		Total		
	f	%	f	%	f	%	
Good	3	42.9	4	57.1	7	100	0.002
Enough	106	93.0	8	7.0	114	100	
Less	81	83.5	16	16.5	97	100	

Based on table 4, it was found that the majority of respondents had sufficient knowledge to have the application of a healthy lifestyle in the low category, which was as much as (93.0%). The results of the *Chi Square* test obtained *a p-value* of 0.002 (p<0.05). This shows that there is a meaningful relationship between knowledge of DM risk factors and the application of a healthy lifestyle in S1 students of the Faculty of Nursing, Andalas University.

Overview of respondents' knowledge about DM risk factors

The results of the data analysis showed that students who had knowledge about DM risk factors in the good category were 3.2%, the good enough category was 52.3%, and the poor category was 44.5%. These results can be seen that students of the Faculty of Nursing, Andalas University have a fairly good knowledge about the risk factors for DM. This is in line with research Prime (2013) that health students have sufficient knowledge about DM, which is 55.2% [16].

The results of this study are lower than the results of research obtained by Fitriani (2022), namely students have a high level of knowledge about DM risk factors by 53.3% and low knowledge by 46.7%.

The difference in the results of this study can be explained by the difference in the level of education in the research sample, where in the Fitriani study the sample used in the study was health students class of 2019 who had received courses on the endocrine system [10].

Student knowledge about DM risk factors is also influenced by the length of study time. This research can be seen that the percentage of students who have better knowledge in nursing students class of 2019, which is 83.4%. This figure is more in students of the class of 2020, and 2021. This can be because the class of 2019, which is currently in the fourth year of the lecture period, has gained more knowledge and exposure to information than the classes of 2020 and 2021, both because of lecture materials and clinical practice. Respondents at higher levels have better knowledge than respondents at lower levels, because they have received knowledge longer than those at lower levels [17]. In the age group of the majority of respondents aged 20 years, this age is classified as a late adolescent category, where the age range is 19-22 years. Biological changes, thought processes, and emotional changes will occur at this age, which at this age begins to prepare for adulthood. This is certainly expected to be able to make decisions in increasing understanding of DM risk factors [18].

Based on gender, there were more female respondents than men with 202 (92.7%). According to research Pibriyanti (2018) said that girls are 2.95 times more likely to have higher glucose levels than boys. Women are more at risk of developing DM because physically women have a greater chance of increasing body mass index. And the results showed that most respondents had a normal BMI, which was 143 respondents (65.6%). BMI has a very close relationship with DM, because the BMI value shows the state of a person who has an obese body or not, where obesity is one of the risk factors for DM. And the results showed that there were still respondents who were included in the vulnerable category, namely obese 15 respondents (6.9%) and obese 19 respondents (8.7%). Someone who has a family history of DM is more aware of the risk factors for DM and is more likely to behave healthily than those who do not have a history of DM [19].

Factors that affect respondents' knowledge are education, experience, and socio-culture. The respondents used in this study were students with more specific educational backgrounds studying DM, respondents who received lessons in endocrine system theory and clinical practice in the learning process, thus allowing respondents to receive more knowledge about DM [20]. However, the educational background is also still unable to present good knowledge about DM. This can be influenced by socio-culture. Culture is how an individual's view of life in the form of behavior and beliefs [21]. In this study, the majority of respondents lived alone/boarded so that this influenced how the knowledge and mindset of respondents towards DM.

The next factor is the respondent's experience or family history of DM which can also affect the level of knowledge of each respondent about DM risk factors. In this study, respondents who had a history of DM in the family were 56 respondents. Factors of eating habits and knowledge gained in the family greatly

influenced respondents' knowledge of DM risk factors [22]. Previous experience is related to the experience of a family history of DM, people who do not have a family history of DM do not have a feeling of vulnerability that they will have DM [21].

Question analysis was obtained from 30 questions on the questionnaire related to knowledge about DM risk factors. The questionnaire has 4 aspects, namely modifiable DM risk factors, DM risk factors that cannot be modified, the role of physical activity in disease prevention, and the role of healthy diet and food patterns in disease prevention. The results of questions regarding DM risk factors that can be modified into questions with the highest average value of 0.67. Modifiable risk factors include lifestyle, diet and nutrition, obesity, physical inactivity, smoking. As many as 98.6% of respondents answered correctly on the question obesity is one of the factors causing diabetes mellitus. This question is the question with the highest correct answer. The results of this study are in line with Dewi's research (2017) which shows as many as 72.5% of respondents who know knowledge about obesity as a risk factor for DM [23]. Obesity is a risk factor that can have adverse effects on the body, as it can make the body resistant to insulin and prevent cells from metabolizing glucose properly in the blood. The presence of imperfect metabolism in the body can lead to an increase in the level of glucose in the blood [24].

Furthermore, the question about the effect of smoking on the risk of DM disease got the lowest correct answer results on modifiable risk factor indicators as many as 53% of respondents answered correctly. Research Andini (2018) also showed knowledge about the effect of smoking on DM risk factors, where only 5% of respondents answered correctly about the effect of smoking on DM risk. These results show that there is still a lack of student knowledge about the effect of smoking on risk factors that cause DM. Smoking is included in the risk factors that allow resistance to thereby reducing the movement of the glucose digestive system leading to type 2 diabetes mellitus [25]. Smoking can lead to type 2 diabetes because the chemicals in tobacco can damage a person's body cells and disrupt the normal functioning of the body. This can cause inflammation throughout the body, make insulin less effective, and increase your risk of getting T2DM[26]. Meanwhile, based on several indicators on the questionnaire, DM risk factors that could not be modified became indicators that received the lowest average score with an average value of 0.36. These non-modifiable DM risk factors consist of age, family history or heredity.

In the questionnaire of DM risk factor indicators that cannot be modified, 98.1% of respondents answered correctly on the indicator questions of children who come from parents who suffer from DM at risk of DM. This question is the question with the highest correct answer. The results of this study are in line with Atmadani's research (2021) which shows that as many as 92.7% of respondents know a family history of DM, one of the risk factors for DM. Based on the literature explains that DM is a hereditary disease, meaning that if parents suffer from DM, their children will suffer from DM. Other studies have also shown that a person is at risk of DM if he has a history of DM. The closer the relationship with the lineage, the greater the risk of developing DM [27].

In the indicator of DM risk factors that cannot be modified, the questionnaire question that gets the lowest answer, namely women are more susceptible to diabetes than men, answered correctly as many as 67% of respondents. The results of this study are in line with research by Mutie et al., (2017) which shows as many as 60% of respondents who know that women are more susceptible to DM than men. Women are more likely to develop DM than men for hormonal and metabolic factors, that women experience monthly cycles and menopause which contributes to the attribution of an increase in the amount of body fat becomes very easy to accumulate due to the process so that women are more at risk of developing type 2 DM [18].

Someone who has these unmodifiable DM risk factors can reduce the risk level of DM by controlling and controlling modifiable risk factors by avoiding smoking, controlling blood pressure and blood sugar levels, increasing physical activity, and controlling cholesterol levels. The lifestyle carried out can affect the health of someone with DM, by doing physical activity such as walking and light running, consumption of vegetables and fruits can also reduce the risk of DM [20].

In the indikato role of physical activity in disease prevention by 97.2% of respondents answered correctly on the indicator question diligent exercise can minimize the risk of DM. By *American Medical Association* (2018) explains that physical activity can help manage diabetes effectively. Active activity increases insulin sensitivity, thus allowing for better regulation of blood sugar levels, regular physical activity helps control blood sugar directly, prevents spikes and promotes stability [28].

On the indicator of the role of diet patterns and healthy food in disease prevention by 95.8% of respondents answered correctly on the indicator question consuming vegetables and fruits can reduce the risk of diabetes mellitus. The results of this study are in line with Wang's research (2016) which showed as many as 96.2% of respondents who knew that consuming vegetables and fruits could reduce the risk of diabetes mellitus. Based on the literature, consuming enough vegetables and fruits can prevent type 2 DM, because vegetables and fruits contain a lot of fiber and water that have low energy density that causes a long feeling of fullness and can reduce energy intake [29].

It is necessary to increase student knowledge by deepening the understanding of the material about DM risk factors by adding a variety of learning methods, one of which is by method *Problem Based Learning* or case studies. By knowing the cause-and-effect relationship in a nursing case regarding DM, it is hoped that students' understanding of things that can be risk factors for DM can increase. Application *Problem Based Learning* has been studied on medical students of Sam Ratulangi University and found that the application *Problem Based Learning* has as much as 95% effectiveness in increasing knowledge [30].

Overview of the Application of a Healthy Lifestyle to Students

Based on research conducted on 218 respondents, it is known that 87.2% of respondents have healthy living habits that are in the low category and 12.8% of medium category respondents. From these results, it can be said that most respondents are in the low category for the implementation of a healthy lifestyle.

The results of this study are in line with the results of Sihombing's research (2018) conducted on nursing students, the results of the study showed that 59.8% of students had an unhealthy lifestyle or were in the low category [31].

The application of a healthy lifestyle that is still in this low category can be caused by the lack of willingness and opportunity for students to do things that support a healthy lifestyle, such as physical activity and sports. The knowledge factor also affects how the respondents' lifestyles [32]. The higher the respondent's knowledge of DM, the more respondents know how to apply a healthy lifestyle. And also the history of DM in the family also affects the application of a person's lifestyle [33]. The implementation of a healthy lifestyle is very important because this can affect the health condition of students in the future. Negative health behaviors will increase a person's risk of exposure to disease. According to WHO, 60% of morbidity and death rates from non-communicable diseases are caused by behavioral and lifestyle factors.

The application of a healthy lifestyle in this study can be seen from the five subscales of the application of a healthy lifestyle on the questionnaire, consisting of physical activity, diet and nutrition, staying up late, stress management, and smoking. The questions of the questionnaire consist of 25 questions. The results of the analyst from 25 questionnaire questions in the category of staying up late became the category with the highest average score of 2.59 respondents answered frequently. One of the health problems of students is lack of sleep, this is due to various reasons such as being forced to sleep late because they are busy doing assignments, going home at night because of organizational activities, gathering with friends and *Online Games* And *offline* thus causing sleep disorders [34]. Based on the literature physiologically sleep occurs restoration of human body functions, including glucose homeostasis. Disruption of the quantity and quality of sleep will trigger impaired glucose tolerance and reduce insulin sensitivity which will eventually lead to DM.

The results of the analysis of this study showed that the stress management subscale being the second highest category, stress management on the questionnaire gave an idea of how well the respondents' stress control. The results of the questionnaire question analysis obtained an average of 2.55 respondents answered frequently. This result is in line with the results of Napitupulu's (2021) research conducted on health students of Indonesian Christian University. Showed that 81.1% of respondents with the stress management subscale became the subscale with the highest score [35]. Students who manage stress well can form positive emotions by carrying out[36]Develop an optimistic attitude in them throughout their lives, especially in college life [37].

According to Andoko (2021) explained that the body reacts when a person experiences stress, and stress hormones in the body can directly affect blood sugar levels. This happens because the body releases the hormones adrenaline and cortisol into the bloodstream, which increases the respiratory rate and blood flow throughout the body. However, the body responds by fighting back, which can result in the body's inability to process sugar [38].

Furthermore, the diet and nutrition indicators are the third highest of all indicators with an average value of 2.33 respondents on the application of a healthy lifestyle, the majority of respondents answered sometimes in maintaining diet and nutrition. The results of this study are in line with the results of Damayanti's research (2016) which showed the second highest score with an average value of 2.42. During college, students can apply unhealthy dietary patterns, such as not eating breakfast, consuming foods that contain high salt and sugar, and less intake of vegetables and fruits [39]. A poor diet can lead to high blood sugar and potentially be one of the risk factors for type 2 diabetes. A change in one's diet follows the transition from natural food to fast food that is high in fat, salt, sugar and low in fat. Dietary fiber is one of the factors that influence the incidence of diabetes [40].

The results of the analysis of the questionnaire indicator of the application of a healthy smoking lifestyle became the lowest indicator with an average value of 1.44. This is influenced by the majority of nursing students who are female. Then from the results of this study it was found that the physical activity subscale became the category with the second lowest value with an average of 2.04 respondents sometimes in the application of physical activity. The results of this study are in line with Damayanti's research (2016) which conducted research on nursing students of Udayana University which showed the value of physical activity had the lowest value with an average value of 2.2 [39]. This finding is similar to a number of previous studies conducted on nursing students in several countries [41].

Low physical activity scores in respondents can be explained by the theory of the development of the young adult age group, this period is the transition period from adolescence to adulthood. Numerous studies have found that the age group of young adults, experiencing changes in their routines, including in terms of physical activity, tends to experience a decrease in quantity compared to their previous period of life [42].

Lack of physical activity in students is common in developed and developing countries, where there has been a habit of using technology that makes it easier for someone to carry out activities. In addition, some research results found that physical activity decreases with age, while behavioral traits get.*sedentary lifestyle* increases with adolescence [43].

The development of the times, technology will be more advanced and will also have an impact on the time used in staring at the screen, because more and more want to try and eventually will continue to be done. The progress of a technology is a difficult thing even cannot be avoided in life, because the progress of a technology will run in accordance with the progress of science [44]. The increasingly widespread development of computers and the internet can also cause students to prefer entertainment *Online* thus reducing their interest in sports and other physical activities [41].

The Relationship of Knowledge of DM Risk Factors with the Application of a Healthy Lifestyle

The results of the data analysis carried out, it was found that most students of the Faculty of Nursing, Andalas University had a fairly good knowledge of DM risk factors with the application of a healthy lifestyle in the low category, which was as much as 93%. Furthermore, respondents with good knowledge and moderate lifestyle application as much as 57.1%, and respondents with poor knowledge all have low lifestyle application as well.

Test results *Chi Square* Obtained *p value* = 0.002, this means that there is a meaningful relationship between students' knowledge of DM risk factors and the application of their healthy lifestyle. This is in line with the results of Alanazi's research (2018) which shows a relationship between knowledge of DM risk factors and the application of healthy living in people in Saudi Arabia. Research conducted by Abdulghani et al., (2021) which shows results where there is a positive correlation between knowledge and awareness of the risk of DM with the application of a healthy lifestyle in adults in the city of Riyadh, Saudi Arabia [45].

Furthermore, it is known that 114 respondents have a fairly good knowledge of DM risk factors, including the application of a healthy lifestyle in the low category. Then the knowledge in the low category is also in the application of a low lifestyle as well. According to Yudiana's research (2019) on students of the Faculty of Nursing, Padjadjaran University showed that as many as 130 people (47.44%) had self-awareness in the medium category. It states that the knowledge and understanding possessed by nursing students does not guarantee nursing students have self-awareness in the high category, this self-awareness greatly affects how to apply a healthy lifestyle to students [46]. According to Huda (2017), in addition to knowledge, the application of a healthy lifestyle is influenced by various factors, namely emotional, previous experience and social environmental factors [21].

High knowledge of a healthy lifestyle will make it easier for a person to absorb information carefully and rational thinking to apply healthy lifestyle behaviors. If a person's understanding is lacking about DM risk factors and in understanding a healthy lifestyle that is also lacking, it does not rule out the possibility for someone to carry out unhealthy behaviors, according to the results that have been proven in this study, which will also have an impact on one's health.

Knowledge is the result of understanding after individuals sense a particular object. Knowledge is influenced by formal education factors where it is expected that with higher education, a person will be more knowledgeable as well. The knowledge of each individual contains two aspects, namely positive aspects and negative aspects, these two aspects that affect how the application of each individual's lifestyle.

Based on research that has been done, it can be explained that the level of knowledge affects respondents' behavior, Knowledge plays an important role for respondents to make decisions in implementing a healthy lifestyle. Because knowledge becomes the basis for the formation of consciousness or attitude of each person. Attitudes become the basis for individuals to make decisions and determine

actions, which are then translated into behavior. Someone who has enough knowledge about DM risk factors can influence the application of lifestyle that will be applied by someone [24]. This can be caused by various factors, namely intelligence, previous experience and socio-cultural environmental factors. Previous experience is related to the experience of family history of DM, people who do not have a family history of DM do not have a feeling of vulnerability that they will have DM. Though DM disease does not only occur in those who have a family history of DM, but can occur for those who apply an unhealthy lifestyle [20].

Socio-cultural environmental factors that also affect respondents' self-awareness in the application of a healthy lifestyle. Environment and socio-culture are one of the factors that influence student consumption behavior. The stronger the influence of the social environment on irrational consumption behavior, the stronger the unhealthy life behavior. Lifestyle is one of the individual factors that also affects a person's consumption behavior. Busyness forces people to race against time, which makes some people often prefer to directly consume instant food and drinks.

One of the efforts so that the implementation of a healthy lifestyle can be improved is by continuing the Healthy Community Movement (GERMAS) program that has been planned by the Indonesian Ministry of Health. This program aims to socialize the culture of healthy living and leave unhealthy habits and behaviors of the community. There are 7 steps of GERMAS that can be applied, namely physical activity, consumption of fruits and vegetables, not smoking, not consuming cholesterol, conducting periodic physical examinations [8].

Nursing students who will later become professionals in health services, are not only required to have good knowledge about DM risk factors, but are also expected to be able to apply the knowledge they gain so that they can improvetheir own health degrees before playing a role in improving other public health degrees.

CONCLUSION

Most students of the Faculty of Nursing Unand have a fairly good knowledge of diabetes mellitus risk factors, especially on modifiable DM risk factor indicators and non-modifiable risk factor indicators get an average score lower than the average score of modifiable risk factors. There is a relationship between student knowledge about DM risk factors and the application of a healthy lifestyle in Unand Faculty of Nursing students. For educational institutions. So it is expected that there will be an increase in the quality and intensity of education, especially on risk factors for diabetes mellitus that cannot be modified. This can be done by using a variety of types of learning such as the use of the *Problem Based Learning method.* Students are expected to increase knowledge about DM risk factors, increase awareness and motivation in efforts to implement a healthy lifestyle. In addition, students can manage their daily time so that they have the opportunity to exercise and form sports-oriented student activity unit groups.

Declarations

The researcher stated that this manuscript had never been published before, or was not considered for publication elsewhere

Conflict of interest

No conflict of interest

Ethics approval

This research has received ethical approval from the institutional research board: Andalah University number: No.028.laiketik/KEPKFKEPUNAND

Consent to participate

All respondents in the study had described information about the study and signed all statements of consent to participate in the study

Consent for publication

The authors give consent to publish publication-related information

References

[1]   R. Pahlevi, "The Fifth Largest Number of Indonesian Diabetics in the World."

[2]   H. Sun *et al.*, "IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045.," *Diabetes Res. Clin. Pract.*, Vol. 183, p. 109119, Jan 2022, doi: 10.1016/j.diabres.2021.109119.

[3]   W. A. Azis, L. Y. Muriman, and S. R. Burhan, "The Relationship of Knowledge Level with Diabetes Mellitus Lifestyle," 2020, [Online]. Available on: https://api.semanticscholar.org/CorpusID:219800696.

[4]   Riskesdas, "2018 riskesdas report," p. 1–582, 2018, [Online]. Available on: https://dinkes.kalbarprov.go.id/wp-content/uploads/2019/03/Laporan-Riskesdas-2018-National.pdf.

[5]   Dinkes Padang, "2020 Annual Report 2021 Edition," *Health Office. Padang City*thing. Health Office. Padang City, 2021.

[6]   R. Yosmar, D. Almasdy, and F. Rahma, "Diabetes Mellitus Risk Survey for the People of Padang City," *J. Science Farm. Clin.*, 2018, [Online]. Available on: https://api.semanticscholar.org/CorpusID:58330582.

[7]   Y. Resti, H and H. Cahyati, W, "The Incidence of Diabetes Mellitus in Productive Age at Puskesmas Kecamatan Pasar," *J. Public Health (Bangkok).*, Vol. 6, No. 3, p. 35, 2022.

[8]   Ministry of Health, "Guidelines and Ethical Standards for National Health Research and Development," *Ministry. Wellness. RI*thing. 1–158, 2017, [Online]. Available on: http://www.depkes.go.id/article/view/17070700004/program-indonesia-sehat-dengan-pendekatan-keluarga.html.

[9]   Indonesian Ministry of Health, "Obesity Epidemic," *Health Journal*. thing. 1–8, 2018, [Online]. Available on: http://www.p2ptm.kemkes.go.id/dokumen-ptm/factsheet-obesitas-kit-informasi-obesitas.

[10]   N. S. Fitriani, A. Wurjanto, N. Kusariana, and S. Yuliawati, "The Relationship between Knowledge

Level and Influence of Social Media with Diabetes Mellitus Risk Food Consumption Behavior in Diponegoro University Students," *J. Epidemiol. Wellness. Community; Vol 7, No 1 February 2022*, 2022, doi: 10.14710/jekk.v7i1.13308.

[11] Ministry of Health of the Republic of Indonesia, "Infodatin remains productive, prevents, and overcomes Diabetes Mellitus 2020. In Data and Information Center of the Indonesian Ministry of Health," 2020.

[12] D. Maulani and E. Siagian, "The relationship of urogenital knowledge and hygiene with urinary tract infections," *J. Researcher. Nurse Prof.*, Vol. 3, No. 1, p. 153–158, 2021.

[13] A. Mayangsari, R. D. Arnanda, F. A. Isnaini, dan A. Iskandarsyah, "Health Literacy and Mental Health Status: Correlational Study of Undergraduate Students," *J. RAP (Actual Research Psychol. Univ. Negeri Padang)*, Vol. 11, No. 2, p. 104, 2020, doi: 10.24036/rapun.v11i2.109108.

[14] C. M. Morin dan D. C. Jarrin, "Epidemiology of Insomnia: Prevalence, Course, Risk Factors, and Public Health Burden.," *Sleep Med. Clin.*, Vol. 17, No. 2, p. 173–191, Jun 2022, doi: 10.1016/j.jsmc.2022.03.003.

[15] A. Dahlan, M. Journal, R. Nashuha, N. Ihsana, B. D. Purwant, and D. Yuniasih, "Knowledge of Diabetes Mellitus and Student Healthy Lifestyle Behavior Knowledge of Diabetes Mellitus and Healthy Living Behavior of Students," vol. 3, no. 2, p. 102–114, 2022.

[16] A. A. Perdana, B. Ichsan, and D. U. Rosyidah, "The Relationship of Knowledge Level of Dm Disease with Blood Glucose Level Control in Type II Dm Patients at Rsu Pku Muhammadiyah Surakarta," *Biomedicine*, Vol. 5, No. 2, p. 17–21, 2013, doi: 10.23917/biomedika.v5i2.265.

[17] N. Yahia, C. Brown, M. Rapley, and M. Chung, "Assessment of college students' awareness and knowledge about conditions relevant to metabolic syndrome," *Diabetol. Metab. Syndr.*, Vol. 6, No. 1, p. 1–15, 2014, doi: 10.1186/1758-5996-6-111.

[18] F. Qifti, H. Malini, and H. Yetti, "Characteristics of High School Adolescents with Diabetes Mellitus Risk Factors in Padang City," *J. Ilm. Univ. Batanghari Jambi*, Vol. 20, No. 2, p. 560, 2020, DOI: 10.33087/Jiubj.V20i2.950.

[19] K. Baptiste-Roberts *et al.*, "Family history of diabetes, awareness of risk factors, and health behaviors among African Americans," *Am. J. Public Health*, Vol. 97, No. 5, p. 907–912, 2007, doi: 10.2105/AJPH.2005.077032.

[20] L. Silalahi, "The Relationship of Knowledge and Prevention Measures of Type 2 Diabetes Mellitus," *J. PROMKES*, Vol. 7, No. 2, p. 223, 2019, doi: 10.20473/jpk.v7.i2.2019.223-232.

[21] P. F. K. Huda, "The Relationship Between Diabetes Mellitus Knowledge Level and Type 2 Diabetes Mellitus Self Awareness in Unires Putri Umy Resident," 2017.

[22] N. Lestari and B. Ichsan, "Diabetes Mellitus as a Risk Factor for Covid-19 Patient Severity and Mortality: Meta-Analysis," *Biomedicine*, Vol. 13, No. 1, p. 83–94, 2020, doi: 10.23917/biomedika.v13i1.13544.

[23] P. L. P. Dewi, "Relationship of Nutritional Knowledge, Physical Activity, Energy Intake, and Fat Intake with the Incidence of Obesity in Junior High School Adolescents," 2015.

[24] P. M. Mutie, G. N. Giordano, and P. W. Franks, "Lifestyle precision medicine: the next generation in type 2 diabetes prevention?," *BMC Med.*, Vol. 15, No. 1, p. 171, Sep 2017, doi: 10.1186/s12916-017-0938-x.

[25] A. Andini and E. S. Awwalia, "Study of Diabetes Mellitus Risk Prevalence in Adolescents Aged 15–20 Years in Sidoarjo Regency," *Med. Heal. Sci. J.*, Vol. 2, No. 1, p. 19–22, 2018, DOI: 10.33086/mhsj.v2i1.600.

[26] U. Galicia-Garcia *et al.*, "Pathophysiology of type 2 diabetes mellitus," *Int. J. Mol. Sci.*, Vol. 21, No. 17, p. 1–34, 2020, DOI: 10.3390/IJMS21176275.

[27] R. R. N. Atmadani, "Analysis of the Level of Knowledge and Attitude of Final Level Pharmacy Students towards Diabetes Mellitus," *J. Pharmaceutical Sciences*, Vol. 2, No. 1, p. 144, 2021, [Online]. Available on: https://doi.org/10.31764/lf.v2i1.3808.

[28] Diabetes Association American, "Standards of Medical Care in," *J. Clin. Appl. Res. Educ.*, Vol. 33, No. Supplement_1, p. 1–24, 2018, [Online]. Available on: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2797382&tool=pmcentrez&rendertype

=abstract.

[29] A. Nur M., "The Relationship between Vegetable and Fruit Consumption with Blood Sugar Levels of Type 2 DM Patients at the Kalumata Health Center in Ternate City," *Medica Majapahit*, Vol. 11, No. 2, p. 1–32, 2019.

[30] V. E. Pioh, Y. Mewo, and S. Berhimpon, "The effectiveness of problem-based learning tutorial discussion groups," *J. e-Biomedicine*, Vol. 4, No. 1, 2016.

[31] R. M. Sihombing and E. R. Pratama, "The Relationship of Healthy Living Behavior Patterns with Academic Achievement of Nursing Students," *Nurs. Curr.*, Vol. 6, No. 1, p. 50–59, 2018, [Online]. Available on: https://ojs.uph.edu/index.php/NCJK/article/download/1346/486.

[32] S. Mohebi, M. Parham, G. Sharifirad, dan Z. Gharlipour, "Social Support and Self - Care Behavior Study," no. January, p. 1–6, 2018, doi: 10.4103/jehp.jehp.

[33] Y. Yan, T. Wu, M. Zhang, C. Li, Q. Liu, and F. Li, "Prevalence, awareness and control of type 2 diabetes mellitus and risk factors in Chinese elderly population," *BMC Public Health*, Vol. 22, No. 1, p. 1382, 2022, doi: 10.1186/s12889-022-13759-9.

[34] R. Napitupulu, "The Relationship Between Physical Activity and Stress Management in Physiotherapy Students," *J. Physioter. and Rehabil.*, vol. 5, p. 76–95, 2021, DOI: 10.33660/jfrwhs.v4i2.112.

[35] R. Napitupulu, "The relationship between physical activity and stress management in physiotherapy students," *J. Physioter. And Rehabil.*, 2021, [Online]. Available on: https://doi.org/10.33660/jfrwhs.v4i2.112.

[36] R. Chaidir, A. S. Wahyuni, and D. W. Furkhani, "The relationship of self-care with the quality of life of diabetes mellitus patients," *J. Endur.*, Vol. 2, No. 2, p. 132, 2017, doi: 10.22216/jen.v2i2.1357.

[37] E. P. Wahyuningtiyas, S. S. Fasikhah, and S. Amalia, "The Relationship of Stress Management with Academic Procrastination Behavior in Students Who Are Preparing Thesis," *J. RAP (Actual Research Psychol. Univ. Negeri Padang)*, vol. 10, no. 1, 2019, [Online]. Available on: https://doi.org/10.24036/rapun.v10i1.105006.

[38] A. Andoko, D. N. Pangesti, and N. Asmawarni, "The relationship of stress with blood sugar levels of people with diabetes mellitus," *Holistic J. Health.*, Vol. 14, No. 4, p. 573–580, 2021, DOI: 10.33024/HJK.V14I4.1583.

[39] S. Damayant, *Diabetes Mellitus &; Nursing Management*. Yogyakarta: Nuha Medika, 2015.

[40] L. Y. Prastika, "The Relationship between Diet and the Incidence of Type II Diabetes Mellitus in Adults at UPT Puskesmas Sukajadi," p. 563–567, 2020.

[41] O. Alkhawaldeh, "Health promoting lifestyles of Jordanian university students," *Int. J. Adv. Nurs. Stud.*, Vol. 3, No. 1, p. 27–31, 2013, [Online]. Available on: https://doi.org/10.14419/ijans.v3i1.1931.

[42] A. Middelweerd *et al.*, "What features do Dutch university students prefer in a smartphone application for promotion of physical activity? A qualitative approach," *Int. J. Behav. Nutr. Phys. Act.*, Vol. 12, No. 1, p. 1–11, 2015, doi: 10.1186/s12966-015-0189-1.

[43] J. Lizandra, J. Devís-Devís, E. Pérez-Gimeno, A. Valencia-Peris, and C. Peiró-Velert, "Correction: Does Sedentary Behavior Predict Academic Performance in Adolescents or the Other Way Round? A Longitudinal Path Analysis.," *PloS one*, Vol. 11, No. 6. United States, p. E0158254, 2016, doi: 10.1371/journal.pone.0158254.

[44] M. Ngafifi, "Technological Progress and Human Life Patterns in a Socio-Cultural Perspective," *J. Dissbang. Educators. Foundation and App.*, Vol. 2, No. 1, p. 33–47, 2014, doi: 10.21831/jppfa.v2i1.2616.

[45] H. M. Abdulghani *et al.*, "Knowledge and awareness levels of diabetes mellitus risk factors among nondiabetic visitors of primary health care centers: a multicenter study.," *Eur. Rev. Med. Pharmacol. Sci.*, Vol. 25, No. 22, p. 7066–7077, Nov 2021, doi: 10.26355/eurrev_202111_27259.

[46] M. Yudiana, C. E. Kosasih, and H. Harun, "Overview of diabetes mellitus self-awareness of students of the Faculty of Nursing, Padjdajaran," *J. nursing*, Vol. 10, No. 2, p. 184–191, 2019.