RISK FACTORS ASSOCIATED WITH TYPE II DIABETES MELLITUS INCIDENCE IN COASTAL COMMUNITIES ON HIRI ISLAND, TERNATE

Dini Rahmawati[1], Fera The[2], Andri William Johan Imbar[3*]
Faculty of Medicine, Universitas Khairun[1,2,3]
Corresponding Author : andriimbar5@gmail.com

ABSTRAK
Diabetes Melitus (DM) merupakan suatu kelainan metabolisme yang ditandai dengan hiperglikemia yang dapat terjadi akibat kelainan sekresi insulin, kerja insulin, atau kedua-duanya. Hiperglikemia jangka panjang yang terjadi pada DM berhubungan dengan kerusakan jangka panjang berupa disfungsi beberapa organ tubuh seperti pembuluh darah, saraf, ginjal dan mata. Indonesia menduduki peringkat kelima dari 10 besar negara atau wilayah dengan jumlah penduduk dewasa berusia (20-79 tahun) berjumlah 19,5 juta jiwa pada tahun 2021. Indonesia didominasi oleh wilayah kepulauan sehingga mayoritas penduduk Indonesia bermukim di wilayah pesisir dan pesisir. mempunyai mata pencaharian sebagai nelayan. Penduduk pesisir memiliki kondisi sosial ekonomi dan kesehatan yang berbeda dengan penduduk pegunungan atau perkotaan, beberapa permasalahan kesehatan yang sering muncul pada masyarakat pesisir seperti hipertensi, hiperurisemia, penyakit sendi, dan DM. Penelitian ini merupakan penelitian *cross sectional* dengan menggunakan analisis univariat dan bivariat untuk mengetahui hubungan faktor risiko dengan penyakit diabetes melitus tipe 2. Pengambilan sampel menggunakan teknik *accidental sampling*. Alat yang digunakan dalam penelitian ini adalah kuesioner dengan pertanyaan terstruktur. Penelitian ini memperoleh beberapa hasil menarik yaitu, terdapat 3 faktor risiko yang mempunyai hubungan dengan kejadian DM antara lain obesitas, aktivitas fisik, riwayat keluarga DM, sedangkan beberapa faktor risiko tidak mempunyai hubungan bermakna dengan kejadian DM, meliputi aktivitas fisik, usia, pekerjaan, jenis kelamin, pola tidur, konsumsi buah dan sayur, riwayat hipertensi, dan dislipidemia.

Kata kunci   : diabetes melitus tipe ii, daerah pesisir, faktor resiko

ABSTRACT
Diabetes Mellitus (DM) is a metabolic disorder characterized by hyperglycemia which can occur due to abnormalities in insulin secretion, insulin action, or both. Indonesia is ranked fifth out of the top 10 countries or regions with an adult population aged 20-79 years (20-79 years) totaling 19.5 million people in 2021. Indonesia is dominated by archipelagic regions so the majority of Indonesia's population lives in coastal and coastal areas. has a livelihood as a fisherman. Coastal residents have different socio-economic and health conditions from mountain or urban residents, several health problems that often arise in coastal communities such as hypertension, hyperuricemia, joint disease, and DM. This research is a cross sectional study using univariate and bivariate analysis to determine the relationship between risk factors and type 2 diabetes mellitus. Sampling used an accidental sampling technique. The tool used in this research is a questionnaire with structured questions. This study obtained several interesting results, namely, there were 3 risk factors that had a relationship with the incidence of DM, including obesity, physical activity, family history of DM, while several risk factors did not have a significant relationship with the incidence of DM, including physical activity, age. , occupation, gender, sleep patterns, fruit and vegetable consumption, history of hypertension, and dyslipidemia.

Keywords   *: coastal communities diabetes mellitus type ii, risk factor*

INTRODUCTION

Diabetes Mellitus (DM) is a chronic metabolic disease caused by disruption of insulin formation, insulin action, or both and is characterized by an increase in glucose in the blood.

The most common type of diabetes mellitus is type 2, commonly experienced in adults due to the onset of resistance to insulin and lack of insulin production. Type 1 diabetes occurs due to damage to cells β the pancreas, which results in at least the production of insulin or not producing insulin (Petersmann *et al.*, 2019).

Diabetes Mellitus (DM) is a non-communicable disease which is still a scourge of health problems in the world, in 1980 there were 108 million individuals with DM, this figure continues to increase in 2014, it is estimated that as many as 422 million individuals in the world suffer from DM. According to the World Health Organization (WHO), in 2019 the death rate due to DM and its complications reached 2 million deaths. Meanwhile, in 2021 DM cases reached 536.6 million cases (WHO, 2023).

Indonesia is a country with the highest number of DM sufferers in the world, in the age group of 20-79 years it is estimated that there are as many as 19.5 million people with DM (IDF, 2021). From a geographical perspective, Indonesia is a country whose territory is mostly water with large and small islands. Indonesia has more than 17,508 islands. This makes Indonesia a country with a large sea area. It is estimated that the area of Indonesia's sea waters is approximately 7.9 million km2. There are around 22% of Indonesia's total population who live in coastal areas (Jamal, 2019). From an economic perspective, the source of income for seaside villages is dominated by the agricultural subsector including fisheries. In 2018, 89.38% of seaside villages had agricultural income sources including fisheries. The type of settlement is closely related to socio-economic conditions, in general coastal settlements with low-income fishermen will make residential areas look uninhabitable, crowded and crowded. This condition can also reduce the quality of population health (BPS, 2020).

According to Riskesdas in 2018, the prevalence of DM in all age groups in North Maluku province was 4,723 cases with a percentage of 1.0% (Kemenkes, 2018). Based on data from the Ternate City Health Office in 2017, the prevalence of DM cases was 41.5%. In addition, data was obtained from the Regional Technical Implementation Unit (UPTD) diabetes center in 2017, with 1802 cases (Wadja, Rahman and Supriyatni, 2019). Type 2 diabetes is a multifactorial disease with genetic and environmental components that are equally strong in the process of the disease. The influence of genetic factors on this disease can be seen clearly by the high number of diabetics who come from parents who have a previous history of diabetes mellitus. Type 2 diabetes mellitus is often also called diabetic life style because the causes apart from heredity, environmental factors include age, obesity, insulin resistance, food, physical activity, and unhealthy lifestyle of sufferers also play a role in the occurrence of this diabetes. The slow development of type 2 diabetes mellitus often makes the signs and symptoms unclear (Betteng, Pangemanan and Mayulu, 2014).

In research conducted on Hiri Island, it was discovered that 49% of people suffered from non-communicable diseases such as DM, high cholesterol, hypertension, cataracts and heart disease (Dewi, 2019). Seeing the problem of the high incidence of non-communicable diseases on Hiri Island, researchers are interested in researching "Factors associated with Type II Diabetes Mellitus in coastal communities on Hiri Island".

METHODS

This research was carried out in June 2023 – August 2023 on Hiri Island, Ternate City. This type of research is cross-sectional using univariate and bivariate analysis to determine the relationship between risk factors and the incidence of Diabetes Mellitus. This research began with permission from the Ternate City Health Service and the Community Health Center. The research sample was adults on Hiri Island. The inclusion criteria in this study are: People aged > 18 years, People who can communicate well and understand the reading

clearly so they are able to respond to the statements in the questionnaire, and Willing to become research subjects by filling out an informed consent form. Exclusion criteria in this sample are: People who did not come during data collection and People who don't want data collection.

The sample will be divided into several health centers studied. The variables studied were age, gender, genetic factors, smoking history, history of hypertension, alcohol consumption, physical activity, obesity, and dyslipidemia. The data collection tool is in the form of a questionnaire with structured questions. The data collection results were then processed using SPSS using univariate analysis and bivariate analysis to see the relationship of risk factors with the incidence of diabetes Mellitus in the elderly and pre-elderly.

RESULTS

This study was conducted on adult patients in the Hiri Island, which totaled 62 respondents. The respondents' characteristics are summarized:

Table 1.   Distribution of Demographic Characteristics of the Subject

Distribution of respondents based on demographics	Numbers	Percentage
Age	11	17.7
• < 45 years old	30	48.4
• 45-60 years old	21	33.9
• > 60 years old		
Housewife	32	51.6
• Housewife	22	35.5
• Farmer	8	12.9
• Businessman		
Gender	13	21.0
• Male	49	79.0
• Female		
Total	62	100

Age

From the table above, it can be seen from the total number of research subjects totaling 62 respondents, obtained research subjects with age <45 years as many as 11 people (17.7%), subjects aged 45-60 years as many as 30 people (48.4%) and subjects research aged > 60 years there were 21 people (33.9%).

Profession

From the table above, it can be seen from the total research subjects totaling 62 respondents, obtained research subjects with jobs as IRT as many as 32 people (51.6%), subjects with farmer work as many as 22 people (35.5%) and research subjects as entrepreneurs 8 people (12.9%).

Gender

From the table above, it can be seen from the total research subjects totaling 62 respondents, 13 male research subjects (21.0%) were obtained, and 49 female research subjects (79.0%)

Based on the research results, a frequency distribution was obtained based on diagnosed DM.

Table 2.   Frequency Distribution By Diagnosed DM

Distribution of respondents diagnosed with DM	Numbers	Percentage
DM	31	50.0
Non-DM	31	50.0
Total	62	100

From the table, it can be seen from the total number of research subjects totaling 62 respondents, it was obtained that 31 research subjects were diagnosed with DM and 31 other samples were not diagnosed with DM

The Relationship Between Obesity and Diabetes Mellitus

Based on the research results, distribution was obtained based on the relationship between diabetes mellitus and obesity.

Table 3.   The Relationship Between Obesity and Diabetes Mellitus

DM	Obesity		Total	Significance
	Non-Obese	Obese		
Non-DM	23	8	31	0.002
DM	10	21	31	
Total	33	29	62	

The results of the analysis obtained from a total sample of 62 samples, there were 21 obese people who were diagnosed with diabetes mellitus, and 10 people who were not obese who were diagnosed with diabetes mellitus. Obtained $p = 0.002$, it can be concluded that there is a significant relationship between obesity and diabetes mellitus.

The Relationship Between Physical Activity and Diabetes Mellitus

Based on the research results, distribution was obtained based on the relationship between diabetes mellitus and physical activity.

Table 4.   The Relationship Between Physical Activity and Diabetes Mellitus

DM	Physical Activity			Total	Significance
	Light	Moderate	Heavy		
Non-DM	5	11	15	31	0.003
DM	17	9	5	31	
Total	22	20	20	62	

The results of the analysis were obtained from research subjects diagnosed with diabetes mellitus as many as 31 people, subjects with light physical activity as many as 17 people, moderate physical activity as many as 9 people and heavy physical activity as many as 5 people. There were 31 people who were not diagnosed with diabetes mellitus, 5 people with light physical activity, 11 people with moderate physical activity and 15 people with heavy physical activity. Obtained a value of $p = 0.003$, it was concluded that there was a significant relationship between diabetes mellitus and physical activity

The Relationship Between Age and Diabetes Mellitus

Based on the research results, distribution was obtained based on the relationship between age and Diabetes Mellitus.

Table 5. **The Relationship Between Age and Diabetes Mellitus**

DM	Age			Total	Significance
	< 45 years	45-60 years	> 60 years		
Non-DM	7	16	8	31	0.343
DM	4	14	13	31	
Total	11	30	21	62	

The results of the analysis were obtained from research subjects diagnosed with diabetes mellitus as many as 31 people aged <45 years as many as 4 people, 45-60 years as many as 14 people and >60 years as many as 13 people. The research subjects who were not diagnosed with hypertension were 31 people aged <45 years, 7 people, 16 people aged 45-60 years, and 8 people >60 years old. Obtained p value = 0.343, it was concluded that there was no significant relationship between age and diabetes mellitus.

The Relationship Between Profession and Diabetes Mellitus

Based on the research results, distribution was obtained based on the relationship between profession and diabetes mellitus.

Table 6. **Relationship of Profession with Diabetes Mellitus**

DM	Profession			Total	Significance
	Housewife	Farmer	Businessman		
Non-DM	16	10	5	31	0.771
DM	16	12	3	31	
Total	32	22	8	62	

The results of the analysis were obtained from research subjects diagnosed with diabetes mellitus as many as 31 people, subjects with jobs as housewives as many as 16 people, as farmers as many as 12 people and entrepreneurs as many as 3 people. There were 31 people who were not diagnosed with diabetes mellitus, 16 people working as housewives, 10 farmers and 5 entrepreneurs. Obtained a value of p = 0.771, it was concluded that there was no significant relationship between diabetes mellitus and work.

The Relationship Between Gender and Diabetes Mellitus

Based on the research results, distribution was obtained based on the relationship between age and diabetes mellitus.

Table 7. **Relationship between Age and Diabetes Mellitus**

DM	Obesity		Total	Significance
	Male	Female		
Non-DM	7	24	31	1.000
DM	6	25	31	
Total	13	49	62	

The results of the analysis obtained, respondents who were diagnosed with diabetes mellitus were 25 people who were female and 6 people who were male. Respondents who

were not diagnosed with diabetes mellitus as many as 24 people were female and 6 were male. Obtained p = 1,000, it can be concluded that there is no significant relationship between gender and diabetes mellitus.

The Relationship Between DM Family History and Diabetes Mellitus
        Based on the research results, distribution was obtained based on the relationship between DM family history and diabetes mellitus.

Table 8.   Relationship of DM Family History with DM

DM	DM family history		Total	Significance
	Non-DM	**DM**		
Non-DM	28	3	31	0.002
DM	16	15	31	
Total	44	18	62	

        The results of the analysis obtained, respondents who were diagnosed with diabetes mellitus were 15 people who had a family history of DM and 16 people who did not have a family history of DM. Respondents who were not diagnosed with diabetes mellitus as many as 3 people had a family history of DM and 28 people had no family history of DM. Obtained a value of p = 0.002, it can be concluded that there is a significant relationship between a family history of DM and diabetes mellitus.

The Relationship Between Sleep Pattern and Diabetes Mellitus
        Based on the research results, distribution was obtained based on the relationship between sleep pattern and diabetes mellitus.

Table 9.   Relationship of Sleep Pattern with Diabetes Mellitus

DM	Sleep Pattern		Total	Significance
	Abnormal	**Normal**		
Non-DM	Abnormal	Normal	31	0.283
DM	8	23	31	
Total	13	18	62	

        The results of the analysis obtained, respondents who were diagnosed with diabetes mellitus were 18 people who had normal sleep patterns and 13 people who had abnormal sleep patterns. Respondents who were not diagnosed with diabetes mellitus as many as 23 people had normal sleep patterns and 8 people had abnormal sleep patterns. Obtained a value of p = 0.283, it can be concluded that there is no significant relationship between sleep patterns and diabetes mellitus.

The Relationship Between Fruit Consumption and Diabetes Mellitus
        Based on the research results, distribution was obtained based on the relationship between fruit consumption and diabetes mellitus.
        The results of the analysis obtained, respondents who were diagnosed with diabetes mellitus were 23 people who had a habit of consuming fruit and 8 people who did not consume fruit. Respondents who were not diagnosed with diabetes mellitus as many as 23 people had fruit consumption habits and 8 people did not have fruit consumption habits. Obtained p = 1,000, it can be concluded that there is no significant relationship between fruit consumption and diabetes mellitus.

Table 10.   Relationship of Fruit Consumption with Diabetes Mellitus

DM	Fruit Consumption		Total	Significance
	Non Fruit Consumer	Fruit Consumer		
Non-DM	8	23	31	1.000
DM	8	23	31	
Total	16	46	62	

The Relationship Between Vegetable Consumption and Diabetes Mellitus

Based on the research results, distribution was obtained based on the relationship between vegetable consumption and diabetes mellitus.

Table 12.   Relationship of Vegetable Consumption with Diabetes Mellitus

DM	Vegetable Consumption		Total	Significance
	Non Vegetable Consumer	Vegetable Consumer		
Non-DM	5	26	31	0.705
DM	3	28	31	
Total	8	54	62	

The results of the analysis obtained, respondents who were diagnosed with diabetes mellitus were 28 people who had a habit of consuming vegetables and 3 people who did not consume vegetables. Respondents who were not diagnosed with diabetes mellitus were 26 people who had a habit of consuming fruit and 5 people who did not have a habit of consuming vegetables. Obtained p = 0.705, it can be concluded that there is no significant relationship between vegetable consumption and diabetes mellitus.

The Relationship Between Hypertension Family History and Diabetes Mellitus

Based on the research results, distribution was obtained based on the relationship between hypertension family history and diabetes mellitus.

Table 13.   Relationship of Hypertension Family History with Diabetes Mellitus

DM	Hypertension Family History		Total	Significance
	Non-Hypertension	**Hypertension**		
Non-DM	21	10	31	0.434
DM	17	14	31	
Total	38	24	62	

The results of the analysis obtained, respondents who were diagnosed with diabetes mellitus were 14 people who had a history of hypertension and 17 people who did not have a history of hypertension. Respondents who were not diagnosed with diabetes mellitus as many as 10 people had a history of hypertension and 21 people did not have a history of hypertension. Obtained p = 0.434, it can be concluded that there is no significant relationship between history of hypertension and diabetes mellitus.

The Relationship Between Dyslipidemia and Diabetes Mellitus

Based on the research results, distribution was obtained based on the relationship between dyslipidemia and diabetes mellitus.

Table 14.   **Relationship of hypertension family history with Diabetes Mellitus.**

DM	Dyslipidemia		Total	Significance
	Non-Dyslipidemia	**Dyslipidemia**		
Non-DM	28	3	31	1.000
DM	27	4	31	
Total	55	7	62	

The results of the analysis obtained, respondents who were diagnosed with diabetes mellitus were 4 people who had a history of dyslipidemia and 27 people who did not have a history of dyslipidemia. Respondents who were not diagnosed with diabetes mellitus as many as 3 people had a history of dyslipidemia and 28 people had no history of dyslipidemia. Obtained a value of p = 1,000, it can be concluded that there is no significant relationship between a history of dyslipidemia and diabetes mellitus

DISCUSSION

General Characteristics
In this study, results were obtained based on the age characteristics of sufferers, 11 subjects aged <45 years (17.7%), 30 subjects aged 45-60 years (48.4%) and 21 subjects aged >60 years. (33.9%). The highest results were in the age group between 45-60 years with a result of 48.4%. These results are in line with research conducted by Nababan et al.,(2020) which states that the majority of the characteristics of the majority of respondents aged 50-64 years (60%) with age, there will be physiological changes in the human body. Diabetes mellitus is a metabolic disease with risk factors for over 45 years of age. The underlying thing is reduced activity, increased body weight, reduced muscle mass, and shrinkage of pancreatic β cells and the effect on glucose intolerance (Milita, Handayani and Setiaji, 2021).

Based on job characteristics, job results were obtained from 62 respondents, the majority of whom were housewives, totaling 32 people (51.6%). This is in line with research conducted by Sriyani and Mulyana (2021) with the majority of respondents' characteristics being housewives, 25 (28.6%) respondents. The Netherland Nutrition Council classifies household activities as light activities which increase the likelihood of increasing the body mass index of housewives (Betteng, Pangemanan and Mayulu, 2014).

Based on gender, the highest percentage were female respondents with 49 people (79%) out of 62 respondents. This is in line with research conducted by Gunawan and Rahmawati (2021) with the results that the majority of female respondents totaled 172 people (65.2%) of 264 respondents. The risk factor in women is caused by the physical body mass index of women being higher. This is due to the lack of physical activity of women compared to men who use muscles more often and burn calories by more muscles.

Based on a family history of diabetes mellitus, the majority of respondents did not have a family history of DM with a total of 44 respondents (71%), this is in line with research conducted by Fradina dan Nugroho (2020) with the number of characteristics of respondents without a family history of DM being 78 respondents (70, 3%).

Based on a history of hypertension, the majority of respondents did not have a history of hypertension with the number of respondents being 38 respondents (61.3%) out of 62 respondents. This is in line with research conducted by Gunawan and Rahmawati (2021) with the number of respondents without a history of hypertension being 210 respondents (79.5%).

Based on a history of dyslipidemia, respondents without a history of dyslipidemia constituted the majority with a total of 55 respondents (88.7%). This is in line with research conducted by Mahfudzoh, Yunus and Ratih (2019) with the majority of respondents without a history of dyslipidemia, namely 49 respondents (61.3%). Based on smoking habits, the majority of respondents were non-smokers with 55 respondents (88.7%). This is in line with

research conducted by Irnayanti and Bantas (2021) with the majority of non-smoking respondents' characteristics of 4106 (65.2%).

Based on alcohol consumption habits, the majority of respondents do not consume alcohol with a total of 62 respondents (100%). This is in line with research conducted by Da, Riwu dan Ndoen (2023) with a total of 57 respondents (66.3%) without consuming alcohol. Based on vegetable consumption, the majority of respondents have the habit of consuming vegetables with a total of 54 respondents (87.1%). This is in line with research conducted by Ali (2019) with the number of respondents with vegetable consumption habits of 27 people (60%). Based on fruit consumption, the majority of respondents have the habit of consuming fruit with a total of 46 respondents (74.2%). This is in line with research conducted by Fatimah dan Siregar (2020) with the number of respondents with vegetable consumption habits of 86 respondents (96%).

Based on sleep patterns, the majority of respondents in this study had good sleep patterns with 41 respondents (66.1%). This is not in line with the research conducted by Arzaq, Hamidi and Isnaeni (2022) where the majority of respondents had poor sleep quality with a total of 32 respondents (51.6%) and the study of Tubalawony and Parinussa (2023) with the majority of respondents with poor sleep patterns of 41 respondents (78.8%). This can be caused by an uneven frequency distribution. Based on obesity, the majority of respondents were not obese with a total of 33 respondents (53.2%). This is in line with research conducted by Mahfudzoh, Yunus and Ratih (2019) with the number of respondents without obesity being 44 respondents (55%).

Frequency Distribution Based on Diagnosed Diabetes Mellitus

In this study, the results showed that respondents diagnosed with diabetes mellitus and without diabetes mellitus were balanced by the number of 31 people (50%) of 62 respondents. Risk factors for diabetes mellitus vary widely, for example those related to sociodemographics such as occupation, age and gender. As well as health-related risk factors such as family health history and personal health history. Then factors related to the patient's lifestyle such as physical activity, smoking, vegetable consumption, sleep patterns, alcohol consumption.

The Relationship Between Obesity and Diabetes Mellitus

Based on the statistical analysis, the value of $p = 0.002$ is obtained, it can be concluded that there is a significant relationship between obesity and diabetes mellitus. These results are in line with research by Suwinawati, Ardiani and Ratnawati (2020) which found a statistically significant relationship between obesity and the incidence of diabetes mellitus with a p value $= 0.020$. The condition of obesity with fat tissue, body tissue, muscle tissue will be increasingly resistant to insulin action, especially if body fat or excess weight accumulates in the central or abdominal area. This fat will inhibit the work of insulin so that glucose cannot be transported into cells and accumulates in the blood circulation

The Relationship Between Physical Activity and Diabetes Mellitus

Based on statistical analysis, the p value $= 0.003$ is obtained, so it can be concluded that there is a significant relationship between physical activity and diabetes mellitus. These results are in line with research by Mahfudzoh, Yunus and Ratih (2019) there is a statistically significant relationship between obesity and the incidence of diabetes mellitus with a value of p=0.000. Physical activity is body movement that requires energy. Vigorous activities are body movements that require greater energy expenditure compared to moderate and light activities. Thus, with more strenuous physical activity, the amount of sugar in the body will also decrease and thus the need for the hormone insulin will also decrease.

The Relationship Between Age and Diabetes Mellitus

Based on the results of statistical analysis, the results obtained were p>0.05 (p=0.343) so it can be concluded that there is no significant relationship between age and diabetes mellitus. The results of this study are not in line with research conducted by Milita, Handayani and Setiaji (2021) with the result that there is a correlation with a p value = 0.000 between age and the incidence of diabetes mellitus. This could be due to the uneven distribution of frequencies among the respondents. As we get older, the physiological function of the body will decrease. This can have an effect on decreasing insulin sensitivity to glucose.

The Relationship Between Profession and Diabetes Mellitus

After doing the research, the value of p = 0.771 was obtained so that it was concluded that there was no significant relationship between work and diabetes mellitus. This is in line with research conducted by Sriyani and Mulyana (2021) with a value of p = 0.779 which concluded that there is no relationship between work and diabetes mellitus.

The Relationship Between Gender and Diabetes Mellitus

After conducting research, the relationship between respondents diagnosed with diabetes was 25 women and 6 people were male. So that the p value = 1.000 was obtained, it was concluded that there was no significant relationship between gender and diabetes mellitus. The same results were also found by Komariah dan Rahayu (2020) with a p value = 0.331 and it can be stated that there is no significant relationship between gender and diabetes mellitus. The relationship between gender and diabetes mellitus can occur because the ability to respond to insulin in the blood can increase due to the presence of the hormones estrogen and progesterone. When menopause occurs, the hormone estrogen will decrease which causes a decrease in insulin response.

Relationship of Family History of DM and Diabetes Mellitus

Based on the analysis carried out, it was found that 16 respondents without a family history of DM were diagnosed with DM, and 15 respondents with a family history of DM were diagnosed with DM, from these respondents the p value was obtained = 0.002 so it can be concluded that there is a significant relationship between family history of DM and DM. The same results were also obtained by Paramita and Lestari (2019) the p value = 0.001, so it can be concluded that there is a significant relationship between family history and DM.

The Relationship Between Sleep Patterns and Diabetes Mellitus

Based on the analysis that was carried out, it was found that 13 respondents with poor sleep patterns were diagnosed with DM, and 18 respondents with good sleep patterns who were diagnosed with DM, from these respondents obtained a p value = 0.283 so it can be concluded that there is no significant relationship between sleep patterns and DM. However, in a study conducted by Arzaq, Hamidi and Isnaeni (2022) a p value = 0.000 was obtained so that it could be concluded that there was a significant relationship between sleep patterns and DM.

Relationship Between Fruit Consumption and Diabetes Mellitus

Based on the analysis that was carried, it was found that 23 respondents with fruit consumption were diagnosed with DM and 8 respondents without fruit consumption were diagnosed with DM. These respondents obtained p = 1.000 so that it can be concluded that there is no significant relationship between fruit consumption and Diabetes Mellitus. The same result was also found by Ali (2019) obtained a p value = 0.140 and it can be concluded that there is no significant relationship between fruit consumption and diabetes mellitus.

Relationship Between Vegetable Consumption and Diabetes Mellitus

Based on the analysis carried out, the p value = 0.705, so it can be concluded that there is no significant relationship between obesity and diabetes mellitus. The same results were also found by Fatimah and Siregar (2020) obtaining a p value = 0.412, which can be concluded that there is no significant relationship between vegetable consumption and DM.

Relationship Between Family History of Hypertension and Diabetes Mellitus

Based on the analysis carried out, it was found that 14 respondents with a history of hypertension were diagnosed with DM, and 17 respondents without a history of hypertension were diagnosed with DM, from these respondents the p value was obtained = 0.434 so it can be concluded that there is no significant relationship between history of hypertension and DM. These results are in line with research conducted by Gunawan and Rahmawati (2021), where the p value = 0.879 and it can be concluded that there is no significant relationship between a history of hypertension and DM. Hypertension can increase the risk of thickening of blood vessel walls which has an effect on impaired glucose transport process.

Relationship of Dyslipidemia History with Diabetes Mellitus

Based on the analysis carried out, it was found that 4 respondents with dyslipidemia were diagnosed with DM, and 27 respondents without dyslipidemia were diagnosed with DM. From these respondents, the p value = 1,000 was obtained so it can be concluded that there is no significant relationship between dyslipidemia and DM. Different results were obtained by Hidayatullah *et al.*, (2022) with a p value = 0.018 which can be concluded that there is a relationship between dyslipidemia and diabetes mellitus. Lipid toxicity causes the atherogenesis process to increase. As a result, lipoproteins undergo metabolic changes, which then play a role in increasing the risk of insulin resistance which then leads to type 2 DM.

CONCLUSION

In this study, several interesting findings emerged. First, there was a significant association between obesity and the incidence of diabetes mellitus. Second, there was no significant association between age and diabetes mellitus. Third, there was also a significant association between physical activity and the incidence of diabetes mellitus. Finally, however, there was no significant association between profession and the incidence of diabetes mellitus. Similarly, there was no significant association between gender and the incidence of diabetes mellitus. Next, there was no significant association between the history of hypertension and the incidence of diabetes mellitus. Moreover, there is a significant association between family history of DM and the incidence of diabetes mellitus. There was also no significant association between sleep pattern and the incidence of diabetes mellitus. Nonetheless, there was no significant association between fruit consumption and the incidence of diabetes mellitus. Some of the other risk factor also didn't have significant association such as vegetable consumption, history of hypertension, and dyslipidemia.

The conclusion above then leads to propose suggestions. Practically, it is hoped that the public will increase awareness of their health conditions, and people who have risk factors for obesity, physical activity, and family history DM need to improve lifestyle and community patterns and carry out routine examination activities in the form of early detection or regular screening to prevent complications. Moreover, it is hoped that PUSKESMAS or any other health facilities can perform early screening of risk factors for type 2 DM.

The activity can be done by examining blood sugar so that if it is found, people with risk factors can immediately be educated, intervened, and referred to the PUSKESMAS. Furthermore, in health promotion activities, counseling should be carried out on foods that

are low in glycemic loads, such as fruits and vegetables, to be consumed every day and motivate the community, especially the elderly, to do physical activity or 30-minute diving exercise that can be done 3-5 times a week while at home. It is also expected to provide counseling to schools with specific counseling on Type 2 DM disease about information on risk factors for developing Type 2 DM in coastal communities. For future studies, it is recommended that subsequent researchers, so that they can be used as one of the sources of referral for subsequent research, can use different research methods and variables in order to obtain more accurate results in describing the target population.

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