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Literature Study: Risk Factors for the Incidence of Diabetes Mellitus in Productive Age in Indonesia

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ABSTRACT

Diabetes mellitus (DM) is a type of degenerative disease that has increased continuously from year to year. as well as the occurrence of the biggest global health emergency in the 21st century. The increasing cases of diabetes mellitus every year have a negative impact on Indonesia, especially many diabetics are around productive age. productive age is the age with the highest rate of diabetes mellitus in Indonesia with the following age groups and prevalence: 15-24 years of age by 0.1%, age 25-34 by 0.2%, age 35-44 by 1.1%, and age 45-64 by 6.3%, thus it can be said that the increasing age is increasingly at risk of diabetes mellitus. The purpose of writing a literature review is to find out what risk factors affect the incidence of diabetes mellitus at productive age in Indonesia. The research design in the study uses the Literature Review method. Research journal articles using online database facilities through the Google Scholar page published in the period 2020-2023 (4 years). Based on the results of research from 10 articles, it was found that there was a relationship between family history, diet, sleep patterns, physical activity, obesity, and hypertension with the incidence of leprosy in Indonesia.

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Keywords: Diabetes mellitus, risk factors, productive age.

INTRODUCTION

Diabetes mellitus (DM) is a type of degenerative disease that has increased continuously from year to year. as well as the occurrence of the biggest global health emergency in the 21st century. According to data from the World Health Organization (WHO, 2022), there are around 422 million people in the world who suffer from Diabetes Mellitus. Where diabetes mellitus is one of the top 10 causes of death worldwide in 2022. Data from the International Diabetes Federation (IDF) found that the number of people with diabetes in 2021 in Indonesia has increased rapidly in the last ten years. The number is expected to reach 28.57 million by 2045, 47% more than the 19.47 million in 2021. Based on the data, the prevalence is 9% in women and 9.65% in men (Ministry of Health, 2021).

Patients with diabetes mellitus can no longer control blood sugar levels due to metabolic disorders in the process of absorbing sugar in the body. Risk factors that cause diabetes mellitus in a person can be caused by dietary factors, smoking habits, obesity, hypertension, stress, physical activity, consuming alcohol, etc. or can be caused by a family history that can increase blood sugar levels.

Based on the results of the Basic Health Research (Riskesdas, 2018) Balitbangkes,

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shows that the prevalence of diabetes mellitus in Indonesia based on doctor's diagnosis at the age of > 15 years is 2%. This figure shows an increase compared to the prevalence of diabetes mellitus in the population > 15 years in the 2013 Riskesdas results of 1.5%. The increase in diabetes mellitus cases every year has a negative impact on Indonesia, especially since many diabetics are around productive age. productive age is the age with the highest rate of diabetes mellitus in Indonesia with the following age groups and prevalence: 15-24 years of age by 0.1%, age 25-34 by 0.2%, age 35-44 by 1.1%, and age 45-64 by 6.3%, thus it can be said that the increasing age is increasingly at risk of diabetes mellitus.

The significant increase in the number of cases indicates that the urgency of diabetes mellitus is still high and needs further identification of what risk factors are associated with the incidence of diabetes mellitus. Through this literature review, the author aims to identify risk factors that affect the incidence of diabetes mellitus.

METHODS

The design of this research is a literature review by searching for articles using e-resources databases including Google Schoolar. After the search, it is necessary to select the criteria for the literature sources used, namely journals from 2020 to 2023 and then conduct a review. Risk factors that affect the incidence of diabetes mellitus are keywords in the search for selected articles. We obtained 20 journal articles, but only 10 of them were included because they specifically discussed the risk factors that affect the incidence of diabetes mellitus in productive age.

RESULTS AND DISCUSSION

The results of this study are based on the results of a review of previous research journals to become the basis for the findings of this study. The following review results from journal references are presented in the following table.

Table 1. Journal review results of risk factors for the incidence of diabetes mellitus in productive age

Peneliti	Metode Penelitian	Hasil Penelitian
(Habibah Yulia Resti et al, 2022)	This research design is quantitative research, using a case control design.	The results showed that there was a relationship between education level (p=0.031), stress level (p=0.032), smoking status (p=0.001), obesity status (p=0.005), and family history (p=0.025). There was no association between age (p=0.836), gender (p=0.063), employment status (p=0.225), physical activity (p=0.156), history of hypertension (p=0.536), and coffee consumption (p=0.056).
(Francelina Ivanty Sao Da et al, 2021)	This research design is an analytic survey research with a case control approach.	The results showed that dietary variables (p-value = 0.017 < 0.05 and OR = 3.168 (1.309 - 7.665 and 95% CI), physical activity (p-value = 0.028 < 0.05 and OR = 2.971 (1.212 - 7.279 and 95% CI), alcohol consumption (p-value = 0.023 < 0.05 and OR = 3.285 (1.273 - 8.478 and 95% CI) had an association with the incidence of Type 2 Diabetes Mellitus. Knowledge variable (p-value = 0.829 > 0.05 and OR = 1.206 (0.516 - 2.816 and 95% CI) has no association with the incidence of Type 2 Diabetes Mellitus.
(Andi Ulfryza Dwi Riwansyah et al, 2021)	This research design uses a case control study design.	The results showed that the risk factors for type 2 diabetes mellitus were body mass index P-value = 0.003, OR = 3.237 (CI 95% 1.529-6.853), upper arm circumference P-value = 0, 001, OR = 3.923 (CI 95% 1.806-8.524), abdominal circumference P-value = 0.000, OR = 5.675 (CI 95% 2.560-12.580), and sleep quality P-value = 0.001, OR = 5.923 (CI 95% 2.056-

		17.064).
(Sry Rahayu et al, 2022)	The type of research used was analytic observational research using a case control study.	The study showed that palm sap consumption (OR=1.694; 95%CI=0.613-4.682), diet (OR=4.772; 95%CI=1.846-12.336), family history of DM (OR=2.870; 95%CI=1.135-7.252), physical activity (OR=2.777; 95%CI=1.119-6.894) are risk factors for the incidence of diabetes mellitus at Galesong Health Center, Takalar Regency. Diet is the factor that has the strongest influence on the incidence of Diabetes Mellitus with a p value = 0.001 and an OR value of 5.794.
(Fibra Milita et al, 2021)	This study is analytic in nature with a cross sectional design.	The bivariate results of this study illustrate, there is a relationship between type 2 DM in the elderly with education (OR = 0.403, p value = 0.000), occupation (OR = 3.010, p value = 0.000), physical activity (OR = 1.466, p value = 0.000), smoking habits (OR = 0.764, p value = 0, 000), fruit/vegetable consumption (OR=0.797, p=0.000), obesity (OR=1.896, p=0.000) and history of hypertension (OR=1.960, p=0.000) as well as risky foods/beverages except grilled foods (p=0.577) and preservatives (p=0.577).
(Amelia Vadila et al, 2021)	This research design uses a case control design.	Factors significantly associated with type 2 DM were age (p=0.000, OR=6.500 (95%CI=2.702-12.521)), gender (p=0.012, OR=2.987 (95%CI=1.257-7.099)), and obesity (p=0.000, OR=14.304 (95%CI=4.483-45.644)).
(Elfrina Mirna et al, 2020)	This research method is a combination of quantitative research methods and qualitative research methods known as mixed methods.	The results of the study were that there was a significant relationship between the incidence of diabetes mellitus and the age of respondents (p = 0.000) OR = 0.986, BMI (p = 0.000) OR = 0.758, Gender (p = 0.047) OR = 1, 536, Hypertension (p = 0.041) OR = 2.159, Smoking (p = 0.016) OR = 0.372, while Physical activity has no significant relationship (p = 0.151) OR = 0.551, Diet (p = 0.109) OR = 1.149.
(Ni'ma Meilani et al, 2022)	The type of research used was analytic research with a case control approach.	The results showed that there was a relationship between knowledge and the incidence of DM in the elderly (PValue = 0.004; OR = 0.390), there was a relationship between attitude and the incidence of DM in the elderly (PValue = 0.003; OR = 0.339), there was a relationship between diet and the incidence of DM in the elderly (PValue = 0.000; OR = 0.241) and there was a relationship between activity and the incidence of DM in the elderly (PValue = 0.007; OR = 0.336).
(Erna Elfrida Simanjuntak, 2023)	This study is a quantitative study with a case control approach	The results of this study indicate that there is a significant relationship between genetic factors and the incidence of type II diabetes mellitus with a p-value of 0.024 and OR 6.0. There is a significant relationship between physical activity and the incidence of type II diabetes mellitus with a p-value of 0.026 and OR 5.5. There is a significant relationship between diet and the incidence of type II diabetes mellitus with a p-value of 0.007 and an

		OR of 11.0.
(Akhmad Fanani, 2022)	The research design was survey research with a cross sectional approach.	The results of this study indicate that of the 52 respondents on the age risk factor obtained a p value = 0.047 < α 0.05 while on other risk factors obtained a p value = 0.000 < α 0.05, age has an odd ratio value = 8.889 which means that someone older than 40 years has a risk of 8 times, genetics has an odd ratio value = 21. 538 which means someone who has a hereditary history has a risk of 21 times, obesity has an odd ratio value = 92,500 which means someone who is obese has a risk of 92 times, and smoking has an odd ratio value = 23,400 which means smokers have a risk of 23 times.

Based on the journals that have been reviewed, there are a number of variables that can increase the incidence of diabetes mellitus in people of productive age. These articles have been reviewed. obtained from various sources, with research areas spread throughout Indonesia and beyond. Over the years, diabetes mellitus (DM) has not only affected the elderly, but also people of productive age due to several factors. The following are the risk factors for diabetes mellitus in individuals aged between >15 and 64 years old.

Dietary habit

Diet is defined as a person's regular and permanent pattern of choosing, consuming, and utilizing various types of food to meet their body's nutritional needs. One of the things that can affect a person's diet is the shift from a traditional diet to a modern diet caused by the times. Elevated blood glucose levels are the result of the current lifestyle in modern society, which includes fast food, high fat and carbohydrate content, and excessive sugar intake. The main factor contributing to the development of diabetes mellitus is diet. This definition is supported by research on dietary variables that influence the incidence of diabetes mellitus.

Table 2: Results of the dietary pattern study

Researcher Name	OR value	Meaning
(Sry Rahayu et al, 2022)	4,772	The results of the analysis in the study showed that people with diabetes mellitus with a poor diet had a 4 times greater risk than people with diabetes mellitus who had a good diet.
(Erna Elfrida Simanjuntak, 2023)	11,0	Based on the results of the analysis in the study showed that it means that respondents who have a bad diet are 11 times more likely to develop diabetes mellitus than those who have a good diet.
(Francelina Ivanty Sao Da et al, 2021)	3,168	The results of the analysis in the study showed that people with diabetes mellitus with a poor diet had a 3 times greater risk than people with diabetes mellitus who had a good diet.

Sleep Pattern

How easily someone falls asleep and stays asleep is a measure of the quality of their sleep. determined by the duration of sleep and complaints experienced during or after waking up. The relationship between blood glucose levels and sleep is the hypothalamic-pituitary-brain pathway, which produces a number of hormones that can influence insulin resistance and glucose tolerance, as well as sympathetic nervous system activity related to hormonal changes in blood glucose levels and sleep. Reduced glucose tolerance can occur while you sleep. Blood glucose levels can increase during sleep, with increases ranging from 20 to 30%,

and the greatest increase in blood glucose levels occurs in the middle of the night.

Table 3. Results of sleep pattern research

Researcher Name	OR value	Meaning
(Andi Ulfryza Dwi Riwansyah et al, 2021)	5,923	The results of the research show that sleep quality is a risk factor for diabetes mellitus, where people who have poor sleep quality have a risk of suffering from type 2 diabetes mellitus, which is 5 times greater than people who have good sleep quality.

Physical Activity

A series of body movement activities that consume energy is called physical activity. Doing physical activity helps regulate blood sugar levels. This is because the body uses the sugar it contains as energy when active, thereby reducing the need for insulin. Less insulin will be used because the body will burn it and convert it into energy so that the body's cells become more sensitive to insulin. A person's body will accumulate and store food substances as fat and sugar when they are not physically active, making them more susceptible to diabetes mellitus.

Table 4. Results of physical activity research

Researcher Name	OR value	Meaning
(Sry Rahayu et al, 2022)	2,777	Based on the results of the analysis from this study, diabetes mellitus sufferers with low physical activity have a risk 2 times greater than diabetes mellitus sufferers who have high physical activity.
(Fibra Milita et al, 2021)	1,466	The results of the analysis of physical activity and the occurrence of type 2 DM in the elderly showed that elderly people with less physical activity had a higher risk of developing type 2 DM compared to elderly people with sufficient physical activity.

Family History of DM Sufferers

Diabetes mellitus is a genetic or hereditary condition, which means that when the parents of children or offspring will also be affected by diabetes mellitus. This is intended so that a person can receive a diagnosis more quickly due to the combination of genes that carry diabetes mellitus. One of the risk factors associated with the family history of diabetes mellitus patients is genetics or hereditary history. The following study, which shows a link between genetics and the incidence of diabetes mellitus, provides evidence for the existence of genetics.

Table 5. Results of research on family history of DM sufferers

Researcher Name	OR value	Meaning
(Habibah Yulia Resti et al, 2022)	2,53	Based on the results of the analysis of the relationship between the family history of DM sufferers, people of productive age who have a family history of diabetes mellitus have a 2 times greater risk of developing diabetes mellitus than those who do not have a family history of diabetes mellitus.
(Sry Rahayu et al, 2022)	2,870	The results of the analysis for the family history variable show that people with a family history of suffering from DM have a 2 times greater risk than those who do not have a family history of suffering from DM.
(Akhmad Fanani, 2022)	21,538	The results of the analysis in this study show that someone who has a hereditary history of DM has a risk 21 times greater than someone who has no family history.

Obesity

Obesity is excessive fat accumulation caused by an imbalance between energy needs and calorie intake. The number of functioning insulin receptors in the cells that form fat and skeletal muscle decreases due to obesity. Peripheral insulin resistance is the term for this. Obesity reduces the number and activity of insulin receptors in all body cells, including muscle cells, and decreases the response of pancreatic beta cells to increases in blood glucose. The following states that there is a relationship and link between obesity and the incidence of diabetes mellitus.

Table 6. Obesity research results

Researcher Name	OR value	Meaning
(Habibah Yulia Resti et al, 2022	3,25	Based on data analysis, it was found that people of productive age who are obese are 3 times more likely to experience diabetes mellitus than those who are not obese.
(Fibra Milita et al, 2021)	1,896	The results of data analysis showed that people of productive age who were obese had a 1.9 times greater risk of developing diabetes mellitus than those who were not obese
(Amelia Vadila et al, 2021)	14,304	The results of data analysis showed that obesity has a significant relationship with the incidence of type 2 DM, namely that obese sufferers have a 14,304 times risk of developing type 2 DM compared to people who do not suffer from obesity.
(Akhmad Fanani, 2022	92,500	Based on the results of data analysis, it was found that someone who is obese has a 92 times greater risk of developing diabetes mellitus compared to people who are not obese.

Hypertension

Hypertension causes insulin resistance which results in hyperinsulinemia. Type 2 diabetes develops when damage to the beta cells of the pancreas eventually occurs. Narrowing of the diameter of the arteries caused by thickening of the arteries also contributes to the impact of hypertension on the incidence of diabetes mellitus. As a person with diabetes mellitus (DM) ages, the incidence of hypertension increases, with a prevalence of 40% at age 40 years increasing to 60% at age 75 years. One variable that can contribute to the development of macrovascular and microvascular problems in diabetes mellitus is hypotension.

Table 7. Results of hypertension research

Researcher Name	OR value	Meaning
(Elfrina Mirna et al, 2020)	2,159	The results show that there is a significant relationship between hypertension and the incidence of diabetes mellitus, which means that hypertension has an influence of 2.159 times on the incidence of diabetes mellitus.
(Fibra Milita et al, 2021)	1,960	Based on the results of the analysis, there is a relationship between hypertension and the incidence of diabetes mellitus, which means that hypertension has a 1.9 times greater influence on the incidence of diabetes mellitus compared to people who do not suffer from hypertension.

CONCLUSION

Based on several research journals that have been carried out on the conditions and risk factors that can cause this. This is based on how human habits themselves can lead to diabetes mellitus in productive age.

Several risk factors that can influence but cannot be modified or changed are genetic factors or inheritance from parents who suffer from diabetes mellitus; so that early prevention efforts and increase awareness through regulating daily lifestyle habits. Apart from that, risk factors such as diet, sleep patterns, physical activity, obesity and hypertension. Other risk factors are stress, BMI, smoking habits, alcohol consumption, etc. These risk factors include risk factors that can be changed or modified by changing daily living behavior to reduce the risk of developing diabetes mellitus in productive age.

Author's declaration

Authors' contributions and responsibilities

The authors made substantial contributions to the conception and design of the study. The authors took responsibility for data analysis, interpretation and discussion of results. The authors read and approved the final manuscript.

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Availability of data and materials

All data are available from the authors.

Competing interests

The authors declare no competing interest.

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