Diabetes Melitus and Lifestyle Patterns in Society: A Comprehensive Literature Review

Ahmad Syaripudin[1], Karningsih[2], Abdul Supardi[3], Nura Ali Dahbul[4], Rolly H. S. Rondonuwu[5]
[1]Institut Teknologi dan Kesehatan Mahardika, Cirebon, Indonesia
[2]Poltekkes Kemenkes Jakarta III, Bekasi, Indonesia
[3]STISIP Guna Nusantara Cianjur, Indonesia
[4]Universitas Muhamadiyah Kudus, Indonesia
[5]Politeknik Kesehatan Kementerian Kesehatan Manado, Indonesia
Email: syarief@mahardika.ac.id

Abstract

Diabetes Mellitus, especially type 2 is a disease that is quite deadly. One of the causes of this disease is an unhealthy lifestyle in the community. This study then aims to look at how people's lifestyle patterns can cause diabetes mellitus. This research is qualitative research with a literature review method. The data used in this research comes from various relevant research results and studies. The results of this study then found that eating fast food can increase the sugar and fat content, which then disrupts blood regulation and insulin resistance. Then less physical activity causes the body's sensitivity to insulin to decrease. These things then lead to the development of diabetes mellitus due to an imbalance in insulin production with the body's needs. Therefore, a healthy lifestyle can increase insulin sensitivity and reduce the impact of the risk of diabetes mellitus.

Keywords: *Diabetes Mellitus, Lifestyle, Insulin.*

A. INTRODUCTION

In recent years, the disease progression trend has moved away from infectious illnesses to non-communicable or degenerative ailments. Presently, degenerative diseases have emerged as the primary global fatality factor. This phenomenon has resulted in significant repercussions for various nations worldwide. Approximately 38 million deaths, constituting 68% of the total 56 million global deaths in 2012, were attributed to degenerative diseases (Diminguez et al., 2021). The occurrence of Diabetes Mellitus (DM) is on the rise across the globe, encompassing both developed and developing nations. Consequently, DM is regarded as a worldwide health concern. The World Health Organization (WHO) approximates that over 346 million individuals globally are afflicted by DM, and this figure is projected to exceed twofold by 2030 unless preventative measures are taken. A significant portion, nearly 80%, of DM-related fatalities transpire in countries with modest to intermediate economic standings (Hossain et al., 2022).

Diabetes Mellitus (DM) is a persistent ailment marked by elevated blood sugar levels and reduced glucose tolerance. This condition arises due to insufficient insulin generation by the pancreas, an inability of the body to efficiently employ the produced insulin, or a combination of both factors. Diabetes Mellitus is categorized into two types. The first is type 1 DM, often termed insulin-dependent or childhood-onset

diabetes, characterized by an insufficiency of insulin synthesis. The second is type 2 DM, referred to as non-insulin dependent or adult-onset diabetes, attributed to the body's ineffectual utilization of insulin, leading to issues like excess weight and a sedentary lifestyle (Cao et al., 2023). In the interim, gestational diabetes refers to heightened blood sugar levels identified for the first instance during pregnancy. The elevated occurrence of diabetes, predominantly falling within the category of type 2 DM, emerges from the interplay between genetic predisposition elements and exposure to the surroundings. Transitions from rural to urban living conditions, such as urban migration, induce modifications in lifestyle that are considered to augment the vulnerability to type 2 DM. Among these changes, imbalanced dietary habits are noteworthy, contributing to obesity. This obesity condition serves as a catalyst for the onset of type 2 DM. In adults, the presence of obesity escalates the likelihood of developing type 2 DM, reaching up to a fourfold increase compared to individuals with normative nutritional statuses (Simmons, 2021).

Diabetes mellitus is ranked 7th as the 10th leading cause of death in the world; 90% -95% of cases are type 2 DM (DMT2). The International Diabetes Federation (IDF) estimates that Indonesia is ranked 6th with the number of people with diabetes aged 20-79 years around 10.2 million people in 2017 and is expected to increase to 16.7 million people in 2045 (Andamari et al., n.d).

DMT2 is a metabolic disease caused by insulin resistance and pancreatic beta-cell dysfunction. The dominant lifestyle that triggers DMT2 is diet and physical activity. The high number of people with DMT2 is partly due to changes in people's lifestyles and awareness for early detection of DM disease, lack of physical activity, and wrong eating patterns. Lack of knowledge about lifestyle causes people to become aware of DM after causing serious illness. Based on the background that has been stated, the authors are interested in exploring lifestyle as a risk factor for DMT2 (Calcaterra et al., 2022).

B. LITERATURE REVIEW

1. Diabetes Mellitus

Diabetes Mellitus (DM) encompasses an array of indications that manifest in individuals, triggered by elevated blood glucose levels. This increase results from a gradual reduction in insulin discharge, set against a backdrop of growing resistance to insulin. Diabetes Mellitus stands as an enduring hyperglycemic condition intertwined with diverse metabolic irregularities. These disruptions stem from hormonal imbalances, giving rise to enduring complications affecting the eyes, kidneys, nerves, and blood vessels. Diabetes constitutes a persistent ailment, emerging when the pancreas loses its capacity to synthesize insulin or when the body struggles to effectively harness the produced insulin (Mukhtar et al., 2020). Diabetes mellitus stands as a persistent ailment marked by elevated blood glucose levels, often accompanied by the notable manifestation of a copious output of sugary-tasting urine. This condition comprises a cluster of metabolic disorders distinguished by hyperglycemia, arising from deficiencies in insulin release, insulin effectiveness, or a

combination of both factors. Thus, it can be deduced that diabetes mellitus is a metabolic disorder defined by heightened blood glucose concentrations, stemming from compromised insulin secretion, impaired insulin function, or both (Magkos et al., 2022).

Diabetes mellitus can be categorized into four distinct groups:

a. Type I diabetes mellitus
   Type I DM emerges from the destruction of β-cells, usually resulting in a complete scarcity of insulin. This form is primarily driven by autoimmune factors and remains idiopathic in nature.
b. Type II diabetes mellitus
   In line with the Indonesian Endocrinology Association (PERKENI), the etiology of type II DM encompasses a spectrum, ranging from predominant insulin resistance partnered with relative insulin deficiency to prevailing flaws in insulin secretion alongside concurrent insulin resistance.
c. Gestational DM
   Gestational diabetes (GDM) denotes elevated blood glucose levels occurring during pregnancy.
d. Other classifications
   According to PERKENI, there exist alternative forms of diabetes mellitus, engendered by various elements. These factors encompass defects in β-cell function attributed to genetics, defects in insulin action linked to genetics, disorders of the exocrine pancreas, endocrinopathies, reactions to medications or chemicals, infections, rare immunological triggers, and additional genetic syndromes linked to diabetes. (McAlister et al., 2021)

Priyoto asserted that there are substantial risk factors significantly associated with diabetes mellitus, including:

a. Family history
   Genetic or familial elements play a significant role in the development of diabetes mellitus. If an individual hails from a family with a history of diabetes mellitus—such as a parent afflicted with the condition—the likelihood of the child developing diabetes mellitus is notably higher compared to those without such history.
b. Obesity (Body Mass Index ≥ 25 kg/m2)
   Obesity triggers resistance to insulin within the body, as fat tissue and bodily cells engage in intense competition for insulin absorption. Consequently, the pancreas is compelled to ramp up insulin production, which can ultimately lead to exhaustion and harm to the organ.
c. Advancing Age
   Beyond the age of 40, several vital bodily functions begin to decline, resulting in reduced insulin sensitivity. Even post-menopausal women tend to exhibit diminished responsiveness to insulin.

d. Inadequate physical activity
   Insufficient physical activity stands as a significant contributor to obesity and weakens essential organs like the heart, liver, kidneys, and pancreas.
e. Smoking
   Cigarette smoking poses intricate and deleterious effects on health, including heightened susceptibility to diabetes mellitus.
f. Race/ethnicity
   Several human races in this world have a high potential for developing diabetes mellitus. The increase in diabetes patients in the Asian region is much higher than in other continents. It is estimated that more than 60% come from Asia.
g. History of Gestational Diabetes or giving birth to a baby with a birth weight > 4 kg
   During pregnancy, the placenta produces hormones that disrupt the balance of the insulin hormone and in certain cases trigger the body's cells to become resistant to the insulin hormone. This condition usually returns to normal after pregnancy or after childbirth. However, it becomes very risky for babies born to have the potential for diabetes mellitus in the future.
h. Stress over a long period
   Conditions of severe stress can disrupt the balance of various hormones in the body, including the hormone insulin. Besides that, stress can spur the body's cells to run wild which has the potential for someone to get cancer and also trigger the body's cells to become insensitive or resistant to the hormone insulin.
i. Hypertension (blood pressure ≥140/90 mmHg)
   Consuming excess salt triggers a person to suffer from hypertension which in turn plays a role in increasing the risk of developing diabetes mellitus if blood pressure is not controlled (Klein, 2021).

2. Lifestyle

As per Kotler and Keller, lifestyle pertains to an individual's manner of existence in the world, which becomes apparent through their engagements, preferences, and viewpoints. Lifestyle encapsulates the complete interaction of an individual with their surroundings. It encompasses the entire spectrum of an individual's behaviors and interactions within the world. Meanwhile, Setiadi defines lifestyle as an extensive concept encompassing the manner in which individuals allocate their time (activities), their prioritizations within their surroundings (interests), and their self-perceptions and perspectives about themselves and their environment (opinions) (Annisa, 2021).

The lifestyle exhibited by one community will inherently differ from that of other communities. Furthermore, over time, the lifestyle of both individuals and specific groups can undergo dynamic shifts. Lifestyle functions as a conduct that mirrors the concerns residing within the minds of consumers, who often engage with

a multitude of aspects tied to emotional and psychological issues associated with consumption (Wiley et al., 2020).

Lifestyle stands as a more modern, all-encompassing, and pragmatic notion when contrasted with personality. Due to this, it becomes essential to approach the concept or term of Lifestyle with thorough consideration—comprehending its definition, measurement, and application. Lifestyle is denoted as the framework within which individuals reside and allocate their time and resources. It is influenced by consumer motivations, previous experiences, societal strata, demographic factors, and other relevant variables. Lifestyle, serving as a condensed representation, encapsulates consumer values (Niezgoda & Kowalska, 2020).

Psychographically categorizing consumers can be accomplished through various methods, with lifestyle being just one of them. Fundamentally, lifestyle pertains to how an individual allocates their time and financial resources. Different individuals display preferences such as enjoying socializing with friends, seeking solitude, engaging in family travel, shopping, participating in dynamic activities, or having additional resources for socio-religious pursuits (Dahana et al., 2019). Lifestyle wields the power to influence behavior and ultimately shape consumption decisions. A comprehensive grasp of personality necessitates an understanding of the concept of lifestyle. Lifestyle emerges as a more contemporary and easily measurable concept than personality. It is defined as the recurrent pattern in which individuals choose to spend their time and monetary resources. (Kang et al., 2021).

C. METHOD

The chosen methodology for conducting this research involves a qualitative approach, primarily utilizing a comprehensive literature review. This approach aims to delve into the existing body of knowledge concerning diabetes mellitus and its connection to lifestyle factors. By examining a range of previous studies and research related to this topic, a deeper understanding of the intricate relationship between lifestyle choices and the prevalence of diabetes will be attained. In the initial phase, the focus will be on collecting a wide array of relevant research material. This will involve scouring databases, academic journals, and reputable sources to compile a comprehensive collection of studies. These sources will serve as the foundation for the subsequent analysis. Once the research data is amassed, the process of data synthesis and analysis will commence. The collected data will undergo meticulous processing to draw meaningful insights. This will involve organizing, categorizing, and identifying patterns within the gathered information. By systematically examining the findings of various studies, this research aims to extract overarching themes that shed light on how lifestyle factors contribute to the development and progression of diabetes mellitus. Ultimately, this systematic approach will lead to a comprehensive and insightful understanding of the subject matter, allowing for the formulation of informed conclusions and recommendations (Abdussamad & Sik, 2021).

D. RESULT AND DISCUSSION

Based on the results of a literature study on the theme of lifestyle and diabetes mellitus, many studies related to this study were found. But then the various studies were sorted and re-selected. The result is 10 studies that match the theme of diabetes mellitus and people's lifestyles. The following details contain the literature study used:

Table 1. Study of Research Literature on Diabetes Mellitus and Lifestyle

No	Researcher (Year)	Population and Research Sites	Types of Research	Research Result
1	Hariawan et al. (2019)	All outpatients diagnosed with DM for more than 10 years at the NTB Provincial Hospital	Retrospective study	These results confirm that unhealthy eating patterns are part of a lifestyle that predisposes to diabetes mellitus
2	Masi & Mulyadi (2017)	All DMT2 patients at the internal medicine polyclinic at Pancaran Kasih Hospital, Manado	Cross Sectional	The results of this study can show that there is a relationship between physical activity patterns and eating patterns with blood sugar levels, thereby justifying the relationship between physical activity patterns and eating patterns with blood sugar levels affecting the incidence of T2DM.
3	Nuraini & Supriatna (2016)	A total of 1299 patients were controlled at the internal medicine polyclinic at Bunda Margonda Hospital, Depok	Cross Sectional	The results of the study can show the perception of three variables, namely diet, activity towards DMT2, and family history of the disease. The results that have a relationship with the incidence of DMT2 are bad eating patterns
4	Subiyanto (2018)	The case population is all patients with T2DM and controls are all	Case-control	The results of the analysis show that the variables obtained are related to the results of research on cases and controls. There

		patients who do not have DM at the Gatot Subroto Hospital polyclinic.		is an effect of physical activity on the incidence of DMT2 and there is an influence on eating patterns on the incidence of DMT2.
5	Amanina et al. (2015)	The case population is DMT2 sufferers while the control population is not DMT2 sufferers at the Surakarta Health Center	Case-control	Statistical test results showed a relationship between carbohydrate intake and the incidence of DMT2 in the working area of the Purwosari Health Center and there was a bad relationship between fiber intake and the incidence of DMT2 in the working area of the Purwosari Health Center.
6	Cahill et al. (2014)	In 70,842 women from the Nurses' Health Study and 40,789 men from the Health Professionals Follow-Up Study in the United States	Cross-Sectional	The results in the respondent group found that there was a relationship with the risk of developing DMT2 which was generally stronger in respondents who ate fried food outside the home with a frequency of 4 times/week than eating fried food at home with a frequency of 1 time/week.
7	Maemunah (2020)	All DM sufferers were sampled in cases and controls, 120 respondents (60 cases and 60 controls) at DR.H.Moc Ansari Sale Hospital	Case-control	The results showed that eating patterns that were not good included a relationship and the risk of developing type 2 DM.
8	Yunanto (2017)	The total population (22,236) of the	Cross-sectional	The results of this study indicate that there are still wrong eating patterns in

		selected sample is at least 96 young respondents in the Kraton District		adolescents, such as high consumption of fast food, consumption of fried foods, and sweet drinks or snacks. So the high number of respondents who consume sweet foods and drinks excessively can affect the increased risk of developing DMT2.
9	Petermann et al. (2017)	Selected sample corresponded to 4700 persons (4162 normal, 538 diabetics) at a large university, in Santiago Chile	Cross-sectional	The results of the study can compare DM sufferers with non-DM. It was reported that lower total physical activity, with a higher prevalence of physical inactivity and longer time spent on relaxing activities and sitting a lot can have risk factors for DMT2 and there are much higher levels in people with DM.
10	Sami et al. (2020)	Data was collected from patients visiting Primary Health Centers of 350 samples in the Kingdom of Saudi Arabia	Cross-sectional	The results of one sample test on the overall diet attitude of patients with DM 2 were quite good, but there were positive attitudes and negative attitudes when compared in the subgroups, which showed that DM patients also influenced inappropriate dietary attitudes toward bad food choices.

The results of this study indicate that there is an influence of lifestyle on diet and physical activity as risk factors for DMT2. Individuals who have irregular eating patterns have worse blood sugar levels than those who have irregular eating patterns. Individuals who do light daily physical activities have 2.68 times the risk of having DMT2 compared to those who do moderate and heavy daily physical activities.

Hariawan et al, (2009) research states that unhealthy eating patterns cause an imbalance between carbohydrates and other ingredients needed by the body. As a result, the sugar content in the body becomes high beyond the work capacity of the pancreas which results in diabetes mellitus.

According to Nuraini and Supriatna (2016), those who consume at least one type of carbonated sweet drink every day will have twice the risk of developing DMT2 compared to those who rarely consume it. There is no doubt that nutrition is an important factor in the development of T2DM. Westernized lifestyles and relaxed living are factors that increase the prevalence of DM. You need to pay attention to a healthy and balanced daily diet, so you can maintain an ideal body weight.

Yunanto (2017) also stated that fast food with a frequency of eating less than 3 times a week had the highest percentage (61.5%) compared to respondents who ate it less than 1 time a week. Consumption of ready-to-eat food at least once a week has a positive relationship with a high-fat diet and an increased risk of developing T2DM. Apart from fast food, consumption of fried foods with a frequency of eating once a day is the highest percentage (39.6%), and consumption of more than once a day has a fairly high percentage (21.9%). The high percentage of fast food consumption can be influenced by the environment in urban areas which are more advanced than rural areas so they have a modern lifestyle with lots of food menus and a less/unhealthy way of life.

Cahill et al. (2014) showed that eating fried food outside the home has a stronger risk of developing DMT2 than eating fried food at home. This is due to: firstly, the oil deteriorates during frying, especially when the oil is reused which is a practice that is probably more common outdoors than at home; secondly, the frequency of serving sizes is often larger and has a higher sodium content. In addition, respondents who consumed fried foods outside the home or restaurant also consumed sugar-sweetened drinks so the intake of food and drinks consumed included high-calorie intake, sodium intake, and sugar.

The results of this study are also supported by research by Amanina et al. (2015). The mechanism for the relationship between carbohydrate intake and the incidence of DMT2 is that carbohydrates will be broken down and absorbed in the form of monosaccharides, especially sugar. Absorption of sugar can cause an increase in blood sugar levels and increase insulin secretion. Excessive consumption of carbohydrates causes more sugar in the body. In people with DMT2, body tissues are unable to store and use sugar, so blood sugar levels are affected by the high intake of carbohydrates eaten. In people with DMT2 with carbohydrate intake exceeding needs, the risk is 12 times greater for not being able to control blood glucose levels compared to people who have carbohydrate intake according to needs.

Maimunah and Rahman (2020) found a significant relationship between diet and the incidence of DMT2. Individuals who have a bad diet have a 3.8 greater risk of developing DM than those who have a good diet. If a person maintains a good diet, such as consuming low sugar and high fiber (eating more fruits and vegetables), this can reduce the risk of having DMT2. The Indonesian Ministry of Health also states

that unbalanced food consumption, high in sugar and low in fiber is also a risk factor for DM.

Research by Sami et al. (2020) in Saudi Arabia stated that the role of cultural attitudes and behavior towards food in the management of diabetes cannot be ignored, because the attitude of people with DM towards food is influenced by a strong culture. Most persons with disabilities stated that food selection, its health impact, healthy choices, food restrictions, and food categorization were not important to them. Cultural barriers in Saudi Arabia regarding food choices and consumption and their health impacts have also been supported by local research. The majority of patients stated that they did not like eating diet foods, also did not like to stay away from foods containing sugar, and still consumed red meat, rice, dairy products, and junk food. Most of the patients in the study were unaware of the calorie content of the food they consumed.

Regarding the effect of physical activity patterns on DMT2, Masi, and Mulyadi (2017) reported that insufficient physical activity causes insulin resistance in DMT2. According to the Indonesian Diabetes Association, apart from genetic factors, DMT2 can also be triggered by the environment which causes unhealthy lifestyle changes, such as overeating (fat and lack of fiber), lack of physical activity, and stress. DMT2 can be controlled or prevented through a healthy lifestyle, such as healthy food and regular physical activity. This is supported by the research of Leiva et al which stated that physical activity and a sedentary lifestyle (long sitting periods) contribute to the risk of DMT2 in both individuals who are not physically active and those with sedentary lifestyles (≥ 4 hours a day).

According to Subiyanto (2018), physical activity is closely related to metabolic disease because if a person does not do physical activity 30 minutes per day or 3 times a week; then there will be the accumulation of fat in the body and insufficient insulin to convert glucose into energy which results in the occurrence of DMT2 with increased blood glucose. Most of the respondents admitted that they did not carry out daily physical activities because of their busy work, they only sat in the office and only moved their hand muscles and did not do physical activity ("lazy to move").

Putra stated that physical activity such as daily activities and regular physical exercise which is carried out 3-4 times a week for approximately 30 minutes is one of the steps in managing DMT2. It is said that light physical activity includes just walking leisurely, playing golf, walking to the market (not using a car), sitting a lot at the computer, and watching television for a long time. As a moderate physical activity that includes gardening, brisk walking, leisurely cycling, and regular swimming. In strenuous physical activity that is often done, namely soccer, using stairs, jogging, heavy swimming (in competitions), and cycling with an uphill trajectory. The intensity of moderate and vigorous physical activity needs to be increased to prevent risk factors for DMT2 and for light physical activity as much as possible to avoid.

In line with Sinaga's research, it is said that the maximum heart rate that must be achieved during physical activity using the maximum heart rate formula is 220 minus age. The maximum heart rate target in physical activity that must be achieved

is between 60% -79% of the maximum value. A pulse rate exceeding 79% can endanger health.

E. CONCLUSION

Lifestyle has a significant role in determining a person's risk of experiencing Type 2 Diabetes Mellitus (DMT2). An eating pattern that is dominated by the consumption of fast food, junk food, high carbohydrates, and sweet drinks can increase a person's chances of developing this disease. The excess sugar, trans fat, and calories in these foods can interfere with blood sugar regulation and contribute to insulin resistance. In addition to unhealthy eating patterns, a lifestyle that lacks physical activity is also a major risk factor for DMT2. Many people spend long hours in a seated position, whether at work or in their leisure time. Less physical activity results in reduced body sensitivity to insulin, which means the body needs more insulin to control blood sugar levels. This can be a foothold for the development of DMT2 because of the imbalance between insulin production and the body's needs. To reduce the risk of T2DM, every individual needs to adopt a healthy lifestyle. This includes eating a balanced nutritious diet, avoiding foods high in sugar and trans fats, and controlling portion sizes. In addition, regular physical activity such as walking, running, or swimming can help improve insulin sensitivity and maintain a healthy weight. Awareness of the impact of lifestyle on the risk of T2DM can encourage positive changes in daily habits for long-term well-being.

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