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Type 2 Diabetes Mellitus Management with Holistic Approach

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ABSTRACT

Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic illness defined by hyperglycemia and insulin deficiency or insensitivity, which continues causing severe complications and mortality to the world population. The focus of the medical management of the disease has been primarily pharmacological in order to achieve blood glucose control. Unfortunately, it has been stated that since T2DM is a multi-faceted disorder, medication alone is not enough and many more approaches have to be undertaken that include not only the physiological aspects but also the psychosocial, behavioral, and lifestyle factors contributing to the disease. This review explores the effectiveness of a holistic approach in the management of T2DM, integrating medical treatment with lifestyle modifications, psychological support, and patient education. The holistic model seeks to help the patients, promote compliance, and optimize quality of life and minimize costs for therapeutic measures. The model embraces enhancing empowerment of patients for improved therapeutic adherence and overall quality of life. It has been indicated by studies today that when care of diabetes patients involves different professionals such as physician, dietitian, psychologist, diabetes educators for treatment delivery, patients will have better control of diabetes and have less complications.

Keywords **:** Diabetes Mellitus, disease management, holistic approach, multidiscipline management, glycemic control

Introduction

The epidemiology of Type 2 Diabetes Mellitus (T2DM) reflects a significant global health challenge, characterized by rising prevalence rates across various populations and regions. This increase is influenced by a multitude of factors, including obesity, lifestyle changes, and environmental conditions, which collectively contribute to the growing burden of this chronic disease. Globally, the prevalence of T2DM has escalated dramatically over the past few decades. Estimates indicate that the number of adults with diabetes has surged from 108 million in 1980 to approximately 463 million in 2019, with projections suggesting that this figure could rise to 700 million by 2045 if current trends continue[1], while The International Diabetes Federation has stated in Indonesia the people with diabetes could reach 21.3 million by 2045[2]. Indonesia ranks seventh globally in terms of the number of individuals affected by diabetes, with approximately 10 million confirmed cases of T2DM[3]. The prevalence of diabetes in Indonesia has shown a concerning upward trajectory, increasing from 5.7% in 2007 to 6.9% in 2013, and it is projected to continue rising[4]. This alarming trend is particularly pronounced in low- and middle-income countries, where rapid urbanization and lifestyle changes have led to increased rates of obesity and sedentary behavior, both of which are significant risk factors for T2DM[5]. The World Health Organization (WHO) has highlighted that the prevalence of overweight and obesity is increasing globally, which is a primary driver of the rising incidence of T2DM[6]. Moreover, hypertension and other comorbid conditions have been shown to compound the risk of developing T2DM, further complicating the public health response to this disease[7,8]. The management of T2DM through a holistic approach encompasses a variety of strategies that address not only the physiological aspects of the disease but also the psychological, social, and behavioral dimensions. This multifaceted strategy is essential for improving patient outcomes and enhancing quality of life. Key components of this approach include lifestyle modifications, psychological support, education, and the integration of technology in monitoring and management.

Pharmacological Interventions

Metformin stands out as the main pharmacological therapy of Type 2 Diabetes Mellitus (T2DM) because of its great blood glucose-lowering effect and safety. It is used essentially in reducing the hepatic production of glucose as well as enhancing insulin sensitivity[9]. In addition, it also has weight neutrality or even weight loss effects, making it suitable for obese patients[10]. Cardiovascular risk reduction has been well documented and is supported by several studies further entrenching type 2 diabetes management approaches[11]. GLP-1 receptor agonists, particularly liraglutide and exenatide, belong to a different class of T2DM medication and are equally important. These agents help in enhancing insulin secretion that is dependent on sugar ingestion and that of glucagon secretion as well as enhance the feeling of fullness leading to decrease in body weight[12]. However, recent studies have underscored on additional cardiovascular and diabetic kidney disease risk reduction benefits[13]. Nevertheless, the burden of injections, as well as

possible gastrointestinal adverse events, may not be well tolerated by certain groups of patients[12]. GLP-1 receptor agonists provide a substantial reduction in weight and when combined with metformin, improve glycemic control more than metformin alone[11]. SGLT2 inhibitors such as empagliflozin and dapagliflozin are novel medications that lower blood glucose levels by increasing excretion of glucose in the urine. These agents have been linked with weight reduction and a decreased incidence of heart failure and chronic kidney disease. There has been increasing recognition of the cardiovascular and renal benefits, where GLT-2 inhibitors are also reasonable therapeutics in T2DM with cardiovascular disease[13]. Adjunct therapies, like DPP-4, and thiazolidinediones therapy, also have their benefits when dealing with T2DM. DPP-4 inhibitors, like sitagliptin, are drugs that assist in increasing the incretin level so that the insulin secretion and glucose levels can be controlled[14]. Generally, these medications are easy to take and carry low risks of hypoglycemia hence they are safe for most patients. Another class of medications which is the thiazolidinediones like pioglitazone are beneficial in enhancement of insulin sensitivity although they come with the risk of being obese or fluid retention which is undesirable in some populations[11]. In recent years, there has been increasing attention to combination treatments with a view to achieving better glycemic targets. The efficacy of the drug metformin is maximized when combined with pharmaceutical preparations such as GLP-1 receptor agonists or SGLT2 inhibitors[11]. Imeglimin, a new glucose-lowering agent, is beginning to be developed as a first-in-class medication that acts on several pathways of glucose homeostasis. It has also been shown to enhance insulin sensitivity, improve β-cell function and decrease glucose production from the liver. The clinical usability of this medication has also been ascertained through clinical trials which showed effectiveness of decreasing HbA1c levels whereby the drug is been sought to complement treatment in patients with poorly controlled illness in the preexisting treatment regimen[15]. The unique mechanism of action of imeglimin positions it as a promising option for patients with T2DM, particularly those with insulin resistance. Combination therapies are also emerging as a key strategy in T2DM management. The use of fixed-dose combinations, such as sitagliptin and glimepiride, allows for more convenient dosing and improved adherence[16]. These combinations can target different aspects of the pathophysiology of T2DM, providing a more comprehensive approach to glycemic control. Furthermore, lifestyle modifications, including dietary changes and physical activity, remain essential components of T2DM management, often working synergistically with pharmacotherapy to improve patient outcomes[17,18].

Lifestyle Modifications

The modification of lifestyle remains the most important aspect of treatment of Type 2 Diabetes Mellitus (T2DM), as it helps to achieve the desired blood glucose levels, lessen the risks of complications, and improve health. Such an approach includes modification of nutrition, modification of physical activity as well as behavioral aspects which are crucial for the long term maintenance of healthy habits. Numerous studies have demonstrated these parameters, and therefore, can help in both the prevention and treatment of T2DM. Dietary modifications are essential for managing T2DM. Research indicates that structured dietary interventions can lead to significant improvements in glycemic control. For example, a systematic review reported that lifestyle modification programs, including changing the diet, always decrease fasting plasma glucose in patients with disordered glucose tolerance or development risk of diabetes[19]. Furthermore, patients on a Mediterranean or a low-carbohydrate diet plan demonstrate better glycaemic control and weight loss compared to those using the conventional food plan[20]. These changes in diet do not only serve in attaining the stability of blood glucose levels but also bring about weight loss that is especially important for obese patients with T2DM[20]. Physical activity is another critical component of lifestyle modification. Regular exercise improves insulin sensitivity and aids in weight management, both of which are vital for controlling T2DM. The American Diabetes Association recommends at least 150 minutes of moderate-intensity aerobic activity per week, along with resistance training [21]. Furthermore, structured exercise programs have been shown to be more effective than unstructured physical activity in achieving glycemic control[21]. Behavioral strategies, including self-management education and cognitive-behavioral approaches, are crucial for sustaining lifestyle changes. It was shown that patients who are educated about self-management, goal setting, and problem solving, are more likely to adhere to lifestyle modifications[22]. Additionally, mobile health applications have emerged as effective tools for promoting lifestyle changes, providing personalized feedback and support to individuals with T2DM[23]. Stopping smoking is given much attention as part of lifestyle management in order to mitigate issues related to T2DM, decrease the risk and complications of T2DM[24].

Technological Advancements

Telemedicine has been a beneficial method in the management of T2DM, especially to people residing in rural or other areas with limited healthcare access. It has been established that telemedicine programs are effective in enhancing diabetes knowledge and self-management practice among patients[24,25,26]. Telemedicine allows healthcare professionals to liaise with patients online thus making it possible to modify the therapeutic approach when necessary and maintaining patient's interest in the treatment. The use of telehealth services increased dramatically during the COVID-19 pandemic, and it has been shown in this group the need for continued care and the effectiveness of these techniques[27]. Mobile health applications constitute another technological development that can be useful in managing T2DM[24,26]. These applications empower patients to monitor their blood glucose levels, track dietary intake, and manage medications effectively. Some studies suggest that mobile health technologies can improve self-care behaviours and glycaemic control in patients suffering from T2DM[28]. For example, the Integrated Diabetes Self-Management (IDSM) mobile application developed in Indonesia has shown potential in enhancing self-management and glycemic control by connecting patients, families, and healthcare providers[29]. Continuous glucose monitoring (CGM) systems have brought a positive change in diabetes care by facilitating the real time assessment and monitoring of glucose levels[24,30]. CGM technology makes it possible for the patients to know their sugar levels patterns, thus allowing them to determine the appropriate time to eat or take insulin accordingly. Even though CGM has been shown to be useful in glycaemic control, there are also obstacles to its routine use including device encumbrance and alarm fatigue. In addition, how CGM data will be integrated in clinical management of patients in daily practice requires clearly defined flow of work and communication between patients and health care workers[31]. Remote

patient monitoring (RPM) systems are very often utilized in order to improve the management of T2DM. Healthcare providers can use these systems, as a result, they can track health-related parameters, including but not limited to, the levels of glucose in the blood as well as the physical activity of the patients without necessarily meeting them face. RPM facilitates clinical management and increases patients' satisfaction[32]. Optimal usage of RPM is achieved if the challenges with technology access, health literacy, and patient engagement are resolved[33]. It is essential because the deficiencies of knowledge and following protocol during remote monitoring can be overcome by the coordination with caregivers[34]. While these technologies show great potential, there are still many uncertainties in how these technologies can be used as part of daily clinical practice. Remote monitoring of patients can be lapsed due to several issues caused by factors related to the patients, their knowledge of the procedures or technology used for monitoring[34]. In order to protect patients' confidence on the remote monitoring technologies, they should be assured of data security and privacy[35].

Multidisciplinary Care

A comprehensive approach is crucial in the management of Type 2 Diabetes Mellitus (T2DM) given the multifaceted nature of the condition. This approach means that people like physicians, nurses, dieticians, pharmacists, and mental health experts work together in an interdisciplinary way that focus on medical, nutritional, psychological, and social factors for the treatment of patients. It is essential to identify the roles of all the members of the healthcare team in a multidisciplinary team approach. Diabetes is usually managed by physicians with primary attention being on pharmacological management and glycemic control. However, dietitians are very crucial in recommending nutrient-rich meal plans which are very useful in managing the body weight since this is very important in controlling blood sugar levels[36]. The role of pharmacists could involve increasing the effectiveness of its medication regimen, giving advice on medication and teaching about the importance of adherence to the medication, and checking for any medication interactions[37]. In addition, it is crucial to involve mental health professionals to provide patients with psychological support and to deal with the psychological issues arising from diabetes[38]. Interdisciplinary care requires management of communication in team members to enable achievement of goal of the medical contexts. A study further underlined that the coordination of a care team that works in synergy generates more capabilities to be attentive and fast which will enhance care results[36]. However, there could be issues that would be hard to address which include lack of clear of roles of members who are in the multidisciplinary team. In a qualitative work by Desse[39], called for proper guidelines for the undertaking of collaborative activities by the health care-workers. Overcoming these barriers is vital to maintain a healthy and strong team sense within the healthcare field which will lead to improved client experiences. The effectiveness of multidisciplinary care for the management of T2DM is evident in different research in which enhanced health has been reported. For instance an identified meta-analysis revealed that team based care ensured enhanced glycemic control and a decrease of complications of diabetes[40]. It has also been noted that diabetes self-management activities are enhanced through the use of community health workers in particular integrated care models, who transfer knowledge and assist patients in places of their choosing[41]. This is particularly advantageous in areas where resources are limited and specialized diabetes management services are not within reach.

Complementary Management in Treating Diabates in Indonesia

In Indonesia, management of Type 2 Diabetes Mellitus (T2DM) includes a complementary method which comprises traditional medicine, new technology, and community-based approaches to improve diabetes management. Findings from a study on practitioners of self-administered acupressure that is targeted at acupuncture points ST36, LR3, KI3, and SP6, show improvement in diabetes control parameters such as HbA1c, LDL, BMI, and fasting blood glucose levels. This indicates that the method of self acupressure can be a suitable T2DM management option in Indonesia[42]. In addition, the potential anti-diabetic activity of herbs and particularly, local traditional medicine, has also been studied[43,44]. Studies have suggested that some plants such as torch ginger have enzymatic inhibitory action on carbohydrate metabolism, a condition likely to assist in blood sugar control[44]. However, there is an absolute necessity to fuse these age-old practices with sound scientific dietary advice to achieve optimal outcomes. The community health volunteers or cadres are also key figures in handling T2DM. All the same, their present capability and knowing ability require improvement through specific training programs to make them more effective in diabetes care support[45]. In Indonesia, the Chronic Disease Management Program (PROLANIS) has been beneficial in sustaining or even improving such parameters as the body mass index, fasting blood glucose, and HbA1c levels in DM patients. It also improve self-efficacy, self-management, and quality of life, indicating its significance as a complete diabetic management strategy[46].

Conclusion

The holistic approach to managing Type 2 Diabetes Mellitus (T2DM) offers a comprehensive and effective strategy for improving patient outcomes. By integrating pharmacological treatment with lifestyle modifications, psychological support, patient education, and technological advancements, this approach addresses the multifaceted nature of T2DM. The evidence suggests that a multidisciplinary care model, involving collaboration among healthcare professionals, leads to better glycemic control, reduced complications, and enhanced quality of life for patients. Despite challenges in implementation, particularly in resource-limited settings, the holistic approach is a promising avenue for achieving sustainable and positive health outcomes in individuals with T2DM.

Conflicts of Interest

The authors declared no conflicts of interest.

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