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Literature Review: Management of Depression with Physical Exercise on Changes in Blood Sugar Levels in the Family of Diabetes Mellitus

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ABSTRACT The increase in blood sugar in type 2 diabetes mellitus is a big problem because it can have physical and psychological impacts. Type 2 diabetes mellitus can cause lifestyle changes, physical weakness, vision problems, and potentially death. All the physical issues that arise indeed have the opportunity to cause emotional problems and depression in people with diabetes mellitus. This review aims to identify research articles on managing depression with physical exercise on changes in blood sugar levels in families with diabetes mellitus. This review is expected to provide benefits to increase knowledge of health service institutions in providing nursing care to patients with diabetes mellitus. The methods used in compiling this literature review are (1) identifying variables in the literature, (2) identifying relevant literature based on topics and titles, (3) obtaining literature in complete reading form, and (4) analyzing the results of various variables in the literature. A literature search was attempted on several databases, such as US Proquest, ScienceDirect, Pubmed, and Google Scholar. The results of this review were obtained from a total of 10 evidence bases, found one qualitative study, two quasi-experiments, four cross-sectionals, 2 Systematic Literature Reviews (SLRs) and meta-analyses, and one randomized controlled trial (RCTs).The conclusions based on this review explain that research on the application of physics exercise for families with diabetes mellitus who are depressed with blood sugar levels above normal has decreased, which means it has a significant effect.

Keywords: Depression, Diabetes Mellitus, Physical Exercises

I. INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder caused by impaired insulin secretion, impaired insulin action, or both. High blood sugar levels and carbohydrate, lipid, and protein metabolism disturbances due to insufficient insulin function are hallmarks of diabetes mellitus, a chronic metabolic disorder with various causes[1]. In reduced or in the absence of insulin, glucose is retained in the blood and causes an increase in blood sugar, while cells become deprived of glucose, which is necessary for cell survival and function[2]. Insulin deficiency can also be caused by a lack of responsiveness of the body's cells to insulin[3].

World Health Organization (WHO) statistics show that more than 415 million people worldwide had diabetes in 2018. By 2040, the number of people with diabetes is expected to reach 642 million, or 70 percent more in 25 years. With a prevalence rate of 6.67 percent of the 258 million population, Indonesia ranks fifth in the world for people with diabetes mellitus. While India, China, and the United States occupy the highest ranking, WHO projects the number of DM sufferers in Indonesia will increase from 9.1 million in 2016 to around 21.3 million in 2030[4]. Based on Basic Health Research (Riskesdas) data, the prevalence of diabetes mellitus is estimated to increase from 6.9% in 2013 to 8.5% in 2018, putting more than 16 million people in Indonesia at risk. Suffer from Type 2 Diabetes[5].

In type 2 diabetes mellitus, increased blood sugar is a problem that is significant enough to require severe treatment. This is because it can hurt those who experience it, affecting their physical and mental condition. Type 2 diabetes mellitus can cause lifestyle changes, physical weakness, visual disturbances, and death. People with diabetes mellitus are at risk for emotional problems and depression from physical problems[6].

Several chronic diseases, including type 2 diabetes mellitus, have been linked to depression, according to the report. Diabetic patients have an odds ratio for comorbid depression that is two times higher than the general population. Patients with DM and comorbid depressive symptoms have a higher risk of morbidity and mortality as well as increased behavior when compared with those who only have diabetes. The relationship between depression and diabetes mellitus significantly impacts clinical outcomes, disease management, healthcare costs, and patient welfare. In addition, about 14% of people with diabetes experience anxiety. Depression is a mental disorder characterized by depressed mood, loss of interest or pleasure, guilt or low self-esteem, insomnia, decreased appetite, low energy, and poor concentration[7]. A qualitative study of the

psychosocial experience of DM patients conducted by Ningsih (2018) shows that patients develop psychological responses to depression. According to the findings of this study, DM patients are more likely to suffer from depression characterized by fear, helplessness, being a burden on the family, and blaming themselves. Effect of Depression on the Increased Rate of Glucose Blood This emphasizes that nurse No only focus on controlling blood sugar alone but must be capable of recognizing existing psychological response that appears in the patient's DM as well as give intervention following the authority and competence owned by a nurse. The benefits of this review are to increase knowledge of health service institutions in providing nursing care to patients with diabetes mellitus so that, in practice, they truly offer services in a holistic manner, which includes biopsychosocial and spiritual benefits, further increase the number of studies on the management of depression, blood sugar levels, the use of physical exercise and the link between the management of depression and changes in KGD and can be used as a basis for future researchers to conduct research in the same context.

This study is a literature review that aims to:

1. Identify the management of depression in diabetes patients
2. Identify blood sugar levels in diabetic patients who are depressed
3. Identify physical exercise in diabetic patients
4. Analyzing the management of depression with physical exercise on changes in blood sugar levels.

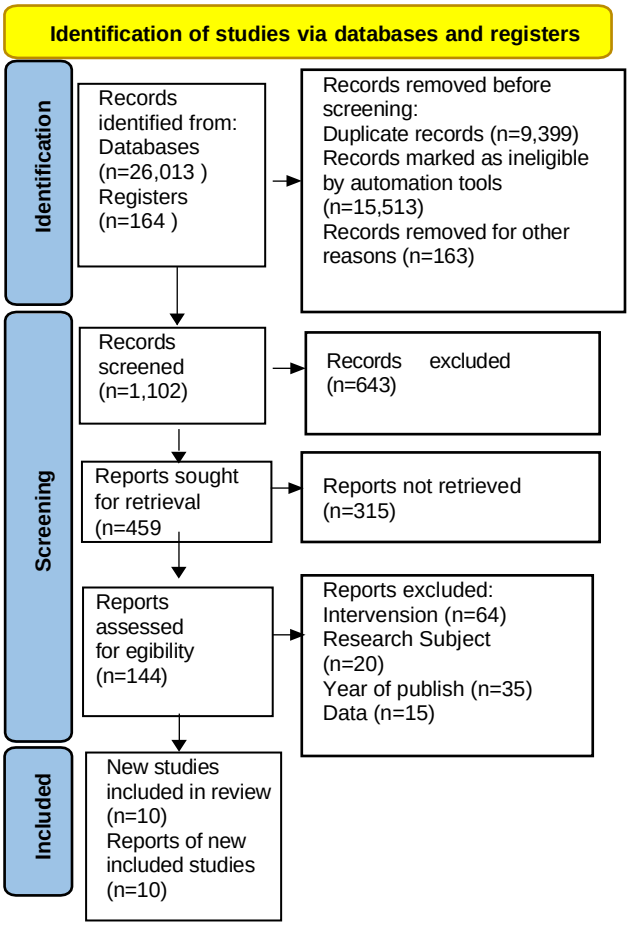

FIGURE 1. Diagram Prisma

II. METHOD

The methods used in compiling this literature review are (1) identifying variables in the literature, (2) identifying relevant literature based on topics and titles, (3) obtaining literature in complete reading form, and (4) analyzing the results of various variables in the literature. A literature search was attempted on several databases, such as Proquest, ScienceDirect, Pubmed, and Google Scholar. The results of this review were obtained from a total of 10 evidence bases found one qualitative study, two quasi-experiments, four cross-sectionals, 2 Systematic Literature Reviews (SLR) and meta-analyses, and one randomized controlled trial (RCT).

III. RESULT

Diana Best, C. (2021), in his research in New York by design cross-sectional, produced significantly for patient activation in the regression analysis final linear: Depression (β(72) = -.27, p = .01) states that the combination of diabetes and depression presents a clinical challenge big. Nurses can develop strategies to increase patient activation by addressing depressive symptoms in clients' diabetes so as they improve quality of life and increase control of diabetes in a manner overall [8]. A study by Khan et al. (2022) in Bangladesh found depression in the sufferers of *diabetes mellitus*, even in patients using insulin, six times more Possible develop deep depression. [9] other studies by Hu et al. (2020) found a level of depression different in *people with diabetes* manifold sex Women with man- man, Where Women are more prone to experience depression[10].

Mahmoud, JM (2021) in Iraq found depression in people with diabetes mellitus, which was followed by an increase in plasma glucose levels (Hb A 1c), causing stress and tension (symptoms of depression)[11].

In research, Peyrot et al. (2019) get the prevalence of depression in patients with diabetes millions as significant at 41.3%.Incident depression in a manner significantly taller on a person with diabetescompared to a person with No. A systematic review of 10 studies that covered the total population of 51,331 people showed that the prevalence of depression was two times taller in a person with DM type 2 compared to those who didn't. Meta- another analysis consisting of 39 studies and a total of 20.218 person report that diabetes is associated with a two-time possibility of developing symptoms of depression. Condition This cause tastes Sick And makes circumstances No safe(*unsteadiness*) so which causes a decline in the perception of self because no capable of operating social role as usual[12].

IV. DISCUSSION

The relationship between depression and response immunity is depicted in the science of psychoneuroimmunology introduced by Holden (1980) and Ader (1981). These studies involve various facets of science, including neurology, psychiatry, pathobiology, and immunology[23]. Depression arises from influences neurons part medial parvocellular nucleus paraventricular hypothalamus (mpPVN). The neurons will synthesize Corticotrophin releasing hormones (CRH) And arginine vasopressin (AVP) which then stimulates the pituitary anterior to synthesize Adrenocorticotropin hormones (ACTH) from its precursor as well as express it[19].

TABLE 1
Summary Study previously related depression on diabetes mellitus and handling with practice physique

Researcher/ Year	Objective	Method	Results
Jiang, G., et al/ 2023	identify the depressive mediating effect of attack strokes on population diabetes	A total of 8530 respondent aged ≥Forty-five years involved in advanced studies. Regression models logistics, regression Cox, and analysis Mediation are used to explore the relationship between diabetes, depression, and attack strokes	The mediation effect of depression on attack strokes new on patient diabetes is more evident in the medium term until long (>3 years) after adjustment covariate.
Xia, T. et al./ 2022	identify the appropriateness of gift intervention mindfulness-based stress reduction (MBSR) dose low between patient prediabetes/ internal diabetes arrangement clinical.	Intervention MBSR low dose be delivered in format group for four waves, and every a wave consists from 8-10 O'clock from 8 session during 6-8 Sunday. Step- step psychological, behavior, and physique compared before and after an intervention.	Analysis qualitative between 11 participants shows that 90.9% have experienced the whole positive with intervention the. Compared to with pre-intervention, there is a decrease in depression score significant _ (subtraction flat = 5.04, SD = 7,66, p.s = 0.02), proportion Which deeper high do flexibility exercises (42.86% vs. 85.71%, p.s=0.01).
Cai, Y., et al./ 2022	Explore products and dose relationship response Tai Chi for Diabetes mellitus type 2 (T2DM) And the quality methodology	Connection effect and response dose rated with meta-analysis and meta-regression use Stata.16. Quality methodological of study that included rated use tool bias risk. Quality proof from results assessed using the grade tool.	Findings show that enhancement every 18 Sundays duration or enhancement 823 O'clock in total time intervention Tai Chi produces around One reduction unit SMD FBG.
Li, X, et al./ 2022	Test influence teaching-oriented practice independently added psychological intervention to rate glucose blood and status psychological patient type 2 diabetes in insulin therapy first.	insulin Injection, nurse satisfaction, rate glucose blood, and awareness of disease compared between second group. Scale Exercise of Self-Care Agency (ESCA) was used to assess the maintenance capacity self patients, and scale generic Quality of Life Inventory 74 (GQOLI-74) was used for evaluate the quality of life, And The patient's emotional state is evaluated on a hospital scale, anxiety and depression (had)	Nurse satisfaction was significantly higher, and the score ESCA was observed after the intervention ($p<0.05$). Teaching independent practice-oriented plus intervention psychological produce index post-intervention glycemic index Which very low ($p<0.001$). Knowledge score disease Which Far taller And score GQOLI-74 seen in the observation group different with group control ($p<0.001$) patient group observation shows score lower compared to the group control ($p<0.001$).
Chen, C,. et al/ 2022	To examine the beneficial effects of exercise on depression. To assist clinicians in their decision_ making process, how to include physical activity into their toolkit of potential therapeutic responses to depressed patients.	Summarizes the interaction between depression and physical activity, focusing on the potential antidepressant physiological effects of physical activity. We then identified some of the barriers that hinder physical activity used to fight depression.	It presents several perspectives and ideas that can assist in optimizing mitigation strategies to overcome this barrier, including representational measures of physical activity, ways to increase the accessibility of physical activity, and the potential of technology to help clinicians and patients.
Albermany, SA,et al/ 2021	Identifying the effects of integrated practice online on the reduction of mild depressive symptoms and blood pressure high in a group of older men during the covid 19 pandemic	Sixty-seven people were identified as having mild depression using the Geriatric Depression Scale. These depressed individuals were divided into control and experimental groups who participated in exercise sessions provided online for (45–60 minutes) daily for eight weeks in which participants measured their blood pressure before and immediately after the session, and their depressive symptoms were followed with the use which scale the same after the program ends.	The gymnastic program compiled is useful in relieving mild depressive symptoms in elderly males when guided online during COVID-19 social distancing measures and total lockdown, blood pressure readings in elderly males can be reduced using exercise during the COVID-19 pandemic.
Omar, SM, et al/ 2021	To evaluate the prevalence of depression and related factors among patients with type 2 DM (T2DM).	Cross-sectional study. Anthropometric parameter data, demographic characteristics, and blood glucose levels were collected through a questionnaire. Depression was assessed using the Patient Health Questionnaire (PHQ-9).	Logistic regression analysis showed a significant association between depression and rural residence (adjusted odds ratio [AOR] = 2.11, 95% confidence interval [CI] = 1.20–3.72), non-employee (AOR = 2.32, 95% CI = 1.34) –4.00), comorbidity (AOR = 2.35, 95% CI = 1.43–3.86) and obesity AOR = 2.19, 95% CI = 1.48– 4.18). Low-intensity exercise is just as effective as high-intensity exercise. Heterogeneity among the primary studies was high, possibly due to differences in study quality and characteristics of sport.
Purnomo, RT, et al/ 2021	To determine the effect of diabetic exercise on reducing depression scores at Persadia RSI Klaten.	Quasy experimental pre-post-test design with a cross-sectional approach. The study population was Type II DM patients who joined Persadia RS Islam Klaten. The sampling technique is a purposive sampling of 30 respondents. The data collection instrument used was the PHQ questionnaire. Bivariate data analysis using the Wilcoxon test.	The Wilcoxon test results showed a significant effect of diabetes exercise on reducing depression scores in type II diabetes mellitus patients at Persadia RSI Klaten value ($p=0.000$, $Z=-4.813$).

Table 1
(Continued)

Researcher/ Year	Objective	Method	Results
Prestige, TA, et al/ 2018	To analyze the connection of depression with the rate of blood sugar fast on a patient with diabetes mellitus type II in the Work area Public health center Dawan 1.	*Cross*-design *sectional* with 34 respondents and use *purposive sampling*.	Research results show 1) the Level of depression in the sufferer of type II diabetes mellitus, the highest with a score of 19 And Lowest with a value of 4 with an average value flat 11.72 And mark standard deviation of 5.697; 2) Based on the rate of sugar blood fast on people with diabetes mellitus type II, the highest with a value of 179 And Lowest with the value of 88 with mark average as hefty 122.77 And mark standard deviation 24,667.
Nusantoro, AP, et al/ 2018	To analyze the influence of Tai Chi for Diabetes (TCD) against change level depression And rate blood glucose in sufferers of diabetes mellitus type 2.	Intervention group 22 respondents were given exercise TCD 2 times a week for 4 Sundays, whereas in group control, 22 respondents observed without given exercise TCD. Technique the sampling used is simple random sampling and test analysis using the Wilcoxon test and Mann-Whitney test.	Measurements before and after the TCD was obtained showed depression level scores and blood glucose levels in group intervention experienced a decline. The mark mean depression was 5,27, And the mark means glucose blood was 30.50, whereas the control group experience enhancement, Where the mark mean depression was 1.22, And the spot mean glucose blood was 13,22.

The released ACTH will regulate the formation of glucocorticoid, cortisol, And hydrocortisone. Enhancement glucocorticoids cause solving glucose from storage body (body store), increase blood sugar levels, lower natural killer (NK) cell activity and production interferons gamma (IFN-), and reduce granulocyte mobilization. This will press the immune system[13].

Based on research by Cai et al. (2022) found that physical exercise like tai chi can reduce fatigue and stress, so the rate of blood sugar can usually range to 15. This is supported by research by Nusantoro et al. (2018), i.e., there is a change level of depression and the rate of glucose in the blood in a sufferer with diabetes mellitus type 2 by applying tai chi[22]. Results study in Indonesia (2021) found the influenced exercise diabetes to decline scoredepression patient diabetes mellitus with resultsp<0.00[20].

Psychological factors, especially disease-related stress, and anxiety, are associated with long-term glycemic variability in subjects with type 1 diabetes resulting in higher levels of oxidative stress and vascular and tissue damage than permanent hyperglycemia, and many observational studies with posthoc analyses of *clinical* trials have reported associations between glycemic variability and the development of micro- and macrovascular diabetic complications, severe and nocturnal hypoglycemia and overall mortality[24].

Characteristics of exercise through meta-analysis prove that from this study, practice significantly reduces depressive symptoms in the general population across a wide age range. Because exercise has been shown to benefit many aspects of health and is an inexpensive and easily adaptable lifestyle factor with virtually no adverse side effects, the evidence from this systematic review can help develop early intervention strategies for depression[25].

Tang et al. (2021) showed that Jiao Tai-Wan (JTW), a physical exercise in treating DM, has hypoglycemic and antidepressant effects. The possible mechanisms explored by tissue pharmacology, reflecting its multi-component, multi-target, and multi-pathway characteristics, provide a theoretical foundation for future experimental research and clinical applications of JTW[25].

Aerobic exercise, resistance training, and combination exercise have benefits in lowering blood glucose and HbA1c levels and improving the quality of life of people with type 2 diabetes mellitus. The type and intensity of activity chosen to manage T2DM must be adjusted to the patient's clinical condition and physical fitness. Further studies are needed to assess the combined effect of aerobic exercise and glucose resistance, HbA1c, and quality of life adjusted for different age categories. The implication for nursing is that it can be used as a form of therapeutic modality to promote and prevent complications of type 2 diabetes mellitus[26].

Physical activity and exercise should be recommended for all individuals with diabetes to manage glycemic control and overall health. Recommendations and precautions will vary according to the type of diabetes, the age involved, and the presence of diabetes-related health complications[27].

Some results of physical exercise research show that exercise physique effectively creates an atmosphere of relaxation inpatient Who experiences depression. The relaxation created can stimulate the hypothalamus. Stimulating the pituitary gland lowers the secretion of ACTH. It is followed by a decline rate of glucocorticoids And cortisol, Which play a role in the arranged response of inflammation, response immune, And the arrangement rate of sugar blood. These internal factors are very influential in managing depression, so the blood sugar rate is controlled.

V. CONCLUSION

People with diabetes mellitus generally experience depression. The increase in blood sugar in diabetes mellitus impacts physical and psychological conditions. DM patients tend to experience depression characterized by fear, helplessness, being a burden on the family, and blaming themselves. The effect of depression on increasing blood glucose levels emphasizes that nurses do not only focus on controlling blood sugar but must be able to recognize psychological responses that arise in DM patients and provide interventions according to the authority and competence nurses possess. Physical exercise is effective for creating a relaxed atmosphere in depressed patients. The relaxation created can stimulate the hypothalamus to stimulate the pituitary gland to decrease ACTH secretion and be followed by a decrease in glucocorticoid and cortisol levels which regulate the inflammatory response, immune response, and blood sugar levels. These internal factors are very influential in managing depression, so blood sugar

levels are controlled. The application of physical exercise to families with diabetes mellitus who are depressed with blood sugar levels above normal has decreased, which means it has a significant effect based on existing evidence-based.

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