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EARLY THERAPEUTIC IMPACT OF ACUPUNCTURE ON BLOOD GLUCOSE LEVELS IN ELDERLY WITH TYPE 2 DIABETES MELLITUS

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ABSTRACT

Background: The global prevalence of Diabetes Mellitus continues to rise, with projections indicating that by 2045, 12.3% of the world's population will be affected. In Indonesia, the 2018 Basic Health Research (Riskesdas) reported that the highest prevalence of Diabetes Mellitus in Bali Province occurs among the elderly population. Management of Diabetes Mellitus encompasses not only conventional medical treatment but also complementary and alternative medicine (CAM), such as acupuncture. This study aims to examine the direct impact of single-session acupuncture therapy on random blood glucose levels in elderly patients with Diabetes Mellitus in Melinggih Village, Gianyar Regency, Bali. **Methods:** A quasi-experimental, one-group pretest-post test design was employed. All elderly participants diagnosed with Diabetes Mellitus underwent measurement of random blood glucose levels before and after receiving a single 25-minute acupuncture treatment at points ST 36 and SP 6. **Results:** The results showed a statistically significant decrease in random blood glucose levels following the therapy ($p < 0.05$) indicating that acupuncture may serve as an effective supportive therapy for glycemic control in elderly diabetic patients. **Conclusion:** In conclusion, acupuncture at ST 36 and SP 6 can help lower blood glucose, supporting diabetes management in the elderly.

Keywords : Acupuncture, Diabetes Mellitus, Random Blood Glucose

INTRODUCTION

Diabetes Mellitus is a serious and chronic disease that is currently one of the most common health issues. This condition can lead to complications and reduce the life expectancy of those affected. The International Diabetes Federation reported a global diabetes prevalence of 10.5% (536.6 million people) in 2021, and this figure is expected to increase to 12.2% (783.2 million) by 2045. The highest prevalence of diabetes is found in elderly individuals aged 75–79 years.[1] According to the 2018 Basic Health Research (Riskesdas) report for Bali Province, the percentage of elderly individuals diagnosed with Diabetes Mellitus was relatively high: 6.10% among those aged 55–64 years, 5.35% among those aged 65–74 years, and 2.35% in those aged ≥75 years.[2] Type 2 Diabetes Mellitus (T2DM) is a group of heterogeneous disorders characterized by insulin resistance, abnormal fat metabolism, excessive hepatic glucose production, and varied degrees of insulin secretion disorders.[3] The most important intervention to prevent the progression of this disease is glycemic management.[4]

Treatment for Diabetes Mellitus encompasses many aspects, not only medical care but also the incorporation of complementary and alternative medicine (CAM), which also offers benefits for diabetes patients. Acupuncture is a CAM modality that has been widely used, with minimal side effects when performed by qualified practitioners. This therapy involves inserting fine needles at specific acupuncture points to stimulate and regulate the balance of Qi and blood in the body.[5]

The mechanism of acupuncture in the management of Diabetes Mellitus includes hypoglycemic effects, increased insulin sensitivity, and regulation of lipid metabolism.[6] Several studies have investigated acupuncture as a complementary treatment for Diabetes Mellitus and have shown significant results in lowering blood glucose levels in diabetes patients.[7–9] However, there are still few studies that demonstrate a direct reduction in blood glucose levels immediately following a single acupuncture treatment. Therefore, this study aims to determine the immediate effect of a single acupuncture therapy session on random blood glucose levels in elderly patients with Diabetes Mellitus in Melinggih Village, Gianyar Regency, Bali Province.

Diabetes Mellitus and Acupuncture

Diabetes mellitus (DM) is a chronic metabolic disease characterized by elevated blood glucose levels due to impaired insulin secretion, insulin resistance, or a combination of both. It is a major global health problem associated with significant morbidity, mortality, and economic burden.[1] Persistent hyperglycemia can cause long-term damage to various organs, particularly the heart, kidneys, eyes, and nerves. Current management strategies include lifestyle modification, oral hypoglycemic agents, and insulin therapy.[10] However, these approaches may not

always achieve optimal glycemic control or alleviate diabetes-related complications, leading to growing interest in complementary and alternative therapies.

Acupuncture, an essential component of Traditional Chinese Medicine (TCM), involves inserting fine needles at specific acupoints to regulate the flow of Qi (vital energy) and restore physiological balance. In recent years, acupuncture has been investigated for its potential role in improving glycemic control and mitigating complications associated with diabetes mellitus. Research findings suggest that acupuncture may enhance insulin sensitivity, promote glucose metabolism, and modulate neuroendocrine and inflammatory pathways. Moreover, it has shown benefits in relieving symptoms such as diabetic neuropathy, fatigue, and stress, thereby improving patients' quality of life. Although more rigorous clinical studies are needed, acupuncture represents a promising adjunctive therapy in the management of diabetes mellitus.[8,9]

METHOD

Research Design

This study uses a quasi-experimental design: a one-group pretest-posttest design to determine the direct effect of single-session acupuncture therapy on random blood glucose levels in patients with Diabetes Mellitus before and after treatment.

Location and Time of Research

Data collection will be conducted in October 2024 in Melinggih Village, located in Gianyar Regency.

Population and Time of Research

The population in this study consists of elderly in Melinggih Village who have been diagnosed with Diabetes Mellitus by a doctor. The sampling technique used is purposive sampling, in which every elderly who attends the elderly health post (posyandu lansia), has been diagnosed with Diabetes Mellitus, and meets the inclusion criteria will be included as a sample in this study. The inclusion criteria for this study are: individuals diagnosed with Diabetes Mellitus; having random blood glucose levels ≥200 mg/dl; and willing to sign the informed consent. The exclusion criteria are individuals with Diabetes Mellitus who are afraid of needle insertion.

Research Instrument

This study uses a data collection form consisting of respondent identity, results of vital signs examination, and blood glucose levels. Tools and materials used for data collection include a blood glucose meter and for acupuncture therapy are acupuncture needles (0.25 x 25 mm), alcohol pad, dry cotton ball and hand gloves.

Research Implementation

Data collection on random blood glucose levels is conducted before and after the intervention. The intervention provided to the subjects involves acupuncture needle insertion at two acupuncture points, namely ST36 (Zusanli) and SP6 (Sanyinjiao), for 25 minutes. Subjects are given information about the acupuncture procedure, the sensation of needling, and the DeQi sensation. The acupuncture needles used are 0.25 x 25 mm filiform needles by Zhongyang Taihe. Prior to needle insertion, the acupuncture points are disinfected using alcohol swabs. Each research subject receives only one session of acupuncture therapy. The therapy is administered by a licensed acupuncture practitioner with a minimum of two years of experience in acupuncture service.

Ethical Clearance and Data Analysis

This study receive approval from the Ethics Committee of Institute Technology and Health of Bali with an ethical approval letter number (No. 04.0356/KEPITEKES-BALI/X/2024). The subjects were asked to give consent to be participants in the study before the research began. All collected data, both before and after the intervention will be analyzed using SPSS version 26. Univariate analysis will be used to identify demographic data. Blood glucose levels before and after the intervention will be analyzed using bivariate analysis with the Wilcoxon test.

RESULTS

A total of 36 subjects participated in this study and completed all stages from beginning to end. The following are the data obtained from this study:

Respondent Characteristic

Table 1. Characteristics of Respondents (n=36)

Characteristic	$\bar{x}$ ± SD / n (%)
Age	64.89 ± 7.513
Gender	
Female	25 (69.40 %)
Male	11 (30.60 %)

Based on table above the average age of the research subjects was 64.89 years with the majority being female (69.40%) and male (30.60%).

Difference in Random Blood Glucose Levels Before and After Acupuncture in Elderly Patients with Diabetes Mellitus

Table 2. Effect of Acupuncture Therapy on Radom Blood Glucose Levels of Subjects (n=36)

	Median	Z	P-value
Before Acupuncture	216.50	-4.06	0.001*
After Acupuncture	207.00		

Note: * ($p < 0.05$)

Based on the analysis results, a significant decrease ($p < 0.05$) was found in the random blood glucose levels of elderly with Diabetes Mellitus. Before acupuncture, the median random blood glucose level was 216.50 mg/dL and after acupuncture was 207.00 mg/dL.

DISCUSSION

Based on the results of this study, it was found that the subjects experienced a significant decrease ($p < 0.05$) in random blood glucose levels after receiving acupuncture therapy compared to their condition before the therapy. ST36 is an acupuncture point reported to have a positive effect on the pancreas, which secretes insulin.[11] Insufficient insulin secretion is one of the causes of the development of type 2 Diabetes Mellitus.[12] The results of several previous studies on ST36 point stimulation using electroacupuncture in diabetic rats,[13,14] as well as studies on acupressure in diabetic patients,[11] support the findings of this study. Based on that previous research the stimulation at the ST36 point can lower blood glucose levels.

Neuropeptide-Y is a sympathetic peptide synthesized and released by sympathetic neurons both centrally and peripherally. This substance increases in response to stress and plays a role in the adverse effects of chronic stress.[15] Stress that stimulates the hypothalamic-pituitary-adrenal (HPA) axis is a major risk factor involved in the pathogenesis of Diabetes Mellitus.[12,15] Acupuncture at the ST36 point has been shown to effectively reduce blood glucose levels by inhibiting stress that can induce the HPA axis and by reducing stress-induced circulation of neuropeptide-Y in diabetic rats.[15]

ST36 stimulation lowers blood glucose levels not only by preventing the sympathetic pathway components activated during chronic stress but also by stimulating the cholinergic nervous pathway.[14] Cholinergic nerve stimulation via acupuncture triggers the release of insulin-like growth factor and β-endorphin (proteins involved in insulin signalling), which reduce blood glucose levels by increasing insulin production and enhancing insulin sensitivity.[14]

Bilateral needling of ST36 and SP6, together with other acupuncture points, has been proven to increase insulin receptor substrate-1 (IRS-1), IRS-2, and glucose transporter-4 (GluT-4), thereby overcoming insulin resistance in rats with type 2 Diabetes Mellitus.[16] Acupuncture therapy regulates protein expression, neuronal excitation, and signalling pathways that enhance insulin sensitivity. SP6 is an acupuncture point used in Diabetes Mellitus management, and studies have reported that acupuncture at SP6 can increase insulin sensitivity.[17] Acupuncture at SP6 can increase nitric oxide levels and vascular permeability, thereby helping to lower blood glucose levels by enhancing glucose utilization.[18]

Chronic glucocorticoid exposure (via glucocorticoid receptors) has a diabetogenic effect by increasing gluconeogenesis, impairing glucose uptake in muscles, and increasing circulating fatty acid levels which lead to insulin resistance.[19] The production of adrenal glucocorticoid receptors is regulated by the function of the hypothalamic-pituitary-adrenal axis (HPAA).[20] Acupuncture at the SP6 point can modulate the HPAA and regulate circulating glucocorticoid receptor levels, so stimulation at SP6 can reduce insulin resistance (IR) and lower blood glucose levels.[21] Thus, acupuncture at the SP6 point can reduce blood glucose levels through enhanced regulation of IRS-1, IRS-2, and GLUT-4 in muscle tissue, by improving insulin sensitivity, increasing nitric oxide and vascular permeability, or through regulation of HPAA function.[18]

CONCLUSION

Based on the results of this study, acupuncture at the ST36 and SP6 points for 25 minutes can be used as a supportive therapy in lowering random blood glucose levels in patients with type 2 Diabetes Mellitus. Therefore, acupuncture therapy is suitable to be applied as a complementary therapy in the management of diabetes mellitus, especially in the elderly.

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