To elucidate the anatomical connection between foot reflex point and pancreatic function in T2DM (pilot study)

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Abstract: Introduction: Type 2 diabetes mellitus (T2DM) is a prevalent metabolic disorder characterized by hyperglycemia resulting from insulin resistance and inadequate insulin secretion. It is a significant global health concern with rising prevalence rates attributed to lifestyle changes, urbanization, and an aging population. Reflexology, a therapeutic method that’s been practiced for centuries involving the application of pressure to specific points on the bottom of the foot, is believed to influence various organs and systems in the body. The anatomical and physiological connection between foot reflex points and pancreatic function, particularly in the context of T2DM remains under explored. This pilot study aims to elucidate the potential link between foot reflex points and pancreatic function in T2DM patients.

Aim & Objectives: To investigate the hypothesis that foot massage therapy stimulates the pancreatic gland, enhancing insulin secretion and improving diabetes management.

Need: Polypharmacy poses health hazards, necessitating the exploration of safe and effective non-pharmacological alternatives. Therefore, exploring non-pharmacological interventions such as foot massage targeting pancreatic pressure points to enhance insulin secretion in diabetic management is essential.

Methodology: In a single-blind study of thirty participants aged between 40 to 60, split evenly into Group A and Group B. Group A didn’t receive any intervention apart from taking pharmacological drugs for Diabetes mellitus while Group B received self-administered foot massages for three months with Tennis Ball.

Outcome Measures: The pre and post intervention outcomes were measured through FGT- Fasting Glucose Test, PPT- Post Prandial Test, HBA1C – Hemoglobin A1C

Results: After three months of foot massage therapy on the pancreatic pressure point, significant improvement in the fasting glucose test (FGT), postprandial test (PPT), and HBA1C were observed in Group B compared to Group A.
Conclusion: This pilot study provides preliminary evidence that foot massage therapy targeting specific reflex points may enhance pancreatic function and reduce glucose levels in patients with T2DM. The observed improvements in glycemic control including reductions in fasting blood glucose and HbA1C levels, suggests that reflexology could be promising complementary therapeutic approach for managing T2DM. Despite the encouraging results, individual variations in response highlight the need for further research with larger samples and more rigorous methodologies to fully understand the efficacy and mechanisms underlying this intervention. Future studies should aim, to elucidate the precise anatomical and physiological connections between foot reflex points and pancreatic function to validate and optimize reflexology protocols for diabetic patients.

Keywords: Diabetes Mellitus, Foot Massage, Reflexology, Tennis Ball, Pancreas, Insulin, Pressure Points, PPT, FGT, HBA1C, T2DM, Pancreas.

I. INTRODUCTION

Diabetes mellitus presents a significant health challenge globally, characterized by irregulated insulin secretion and glucose metabolism. Pancreatic insulin secretion plays a pivotal role in controlling diabetes by regulating blood sugar levels. Insulin, a hormone produced by the pancreas, facilitates the absorption of glucose from the bloodstream into cells, where it is used for energy production or stored for future use.

To manage diabetes effectively, maintaining optimal insulin secretion is essential. This can be achieved through various means, including medication, dietary changes, exercise, and lifestyle modifications. Medications such as insulin injections or oral hypoglycemic agents help regulate blood sugar levels by either stimulating insulin production or enhancing its effectiveness in the body. While conventional treatments focus on medication and lifestyle modifications, complementary therapies such as foot roller stimulation offer promise in enhancing pancreatic function and insulin sensitivity.

This journal aims to investigate the effects of foot massage therapy on pancreatic secretion and its potential role in diabetes management.

AIM & OBJECTIVES OF THE STUDY: Is to investigate the hypothesis that foot massage therapy stimulates the pancreatic gland.

a) To assess the feasibility of incorporating foot reflexology into daily diabetes management practices.

b) To explore the potential effects of foot reflexology on blood sugar levels among individuals with diabetes.

c) To investigate the impact of foot reflexology on enhancing overall well-being in individuals with diabetes.

d) To determine the willingness of individuals with diabetes to participate in reflexology sessions as part of their daily management routine.

e) To evaluate the practicality of administering reflexology sessions within the context of individuals' daily schedules and commitments.

f) To document participants’ subjective experiences during reflexology sessions, including feelings of relaxation, stress reduction, and overall well-being.

g) To assess participants’ perceptions of the benefits and challenges of integrating reflexology into their diabetes management routines through qualitative interviews or surveys.

h) To identify any adverse effects or limitations associated with the implementation of reflexology in the context of diabetes management.

i) To explore participants’ willingness to continue reflexology sessions beyond the pilot study period and their interest in further research or interventions involving reflexology.

j) To compile and analyze data collected from participants’ experiences and feedback to inform the design and implementation of future studies on reflexology and diabetes management.

NEED OF THE STUDY:

Demand for Non-Pharmacological Interventions: With increasing awareness of the limitations and risks associated with pharmacological treatments, there is a growing demand for non-pharmacological interventions. These alternatives offer the potential to mitigate health hazards while providing effective symptom management for various health conditions.

Focus on Diabetes Management: Diabetes mellitus, particularly type 2 diabetes, is a prevalent chronic condition characterized by insulin resistance or inadequate insulin secretion. Given the global burden of diabetes and its associated complications, there is an urgent need to explore innovative approaches to diabetes management, including non-pharmacological interventions.
BACKGROUND:
“Venta Donec and Raimondas Kubilius” concluded that the Knee taping with Kinesio tex tape gold FP can safely relieve knee pain and reduce the need for pharmacological pain in knee osteoarthritis and the pain-relieving effect lasts for 4 weeks post the taping month. A specific KT technique is clinically more beneficial for knee pain alleviation in comparison with NT. [21]
“Ajeet Tiwari et al” concluded that, the present Pre-test – Post-test group study design concludes by rejecting the null hypothesis, the effectiveness of Kinesio taping along with Supervised Exercise Program may be significantly better as compared to Supervised Exercise Program only on pain, muscle strength, range of motion and physical function in subjects with Knee Osteoarthritis. [22]
“Zhijun Lu Xiaoming Li” concluded that, the Kinesio Taping is effective in improving pain and joint function in patients with knee OA. Due to the limited quality of the evidence currently available, the results of the meta-analysis should be treated with caution. [23]
“Mutlu EK et al” concluded that, significant differences in the improvement of pain during activities between the KT and sham-taping groups from the initial taping application to after the third, and until the 1-month follow up [24].
“Amin et al.” concluded that, the subjects having stronger quadriceps strength had less knee pain and better physical function as compared with those with the least strength. Strong muscles stabilize the joints in a proper alignment, attenuate shocks that are transmitted to the joints and minimize the effect of impact by spreading the forces out over a greater area so it may be hypothesized that improvement in muscle strength is one of the main causes of reduced pain and disability. [25]
In this study the efficacy of Kinesio taping in knee OA in the age group between 45 to 60 was analyzed. The measures used to assess the effectiveness of Kinesio tape were, Modified WOMAC index, a timed stair climbing task and VAS level of pain. The tests were conducted at baseline and after the application of tape.

HYPOTHESIS:
Foot Massage Stimulates Pancreatic Pressure Points: It is hypothesized that foot massage therapy, specifically targeting the pressure points associated with the pancreas located on the foot, will stimulate the pancreatic glands. The stimulation of these pressure points may trigger physiological responses that enhance the secretion of insulin, contributing to improved glucose regulation in individuals with diabetes.
Increased Insulin Secretion Improves Blood Sugar Control: Building on the first hypothesis, it is further hypothesized that the increased secretion of insulin resulting from foot massage therapy will lead to better blood sugar control among individuals with diabetes. By enhancing insulin secretion, foot massage therapy may help regulate blood glucose levels more effectively, reducing the reliance on pharmacological interventions and mitigating the health hazards associated with polypharmacy.
Foot Massage Enhances Overall Well-being: Additionally, it is hypothesized that foot massage therapy targeting pancreatic pressure points will not only improve physiological outcomes but also enhance overall well-being in individuals with diabetes. The relaxation and stress-reducing effects associated with foot massage may promote feelings of comfort, relaxation, and improved mood, contributing to a holistic approach to diabetes management.
Combining Foot Massage with Standard Care Improves Outcomes: Finally, it is hypothesized that integrating foot massage therapy into standard diabetes care protocols will result in better outcomes compared to standard care alone. By complementing existing pharmacological and lifestyle interventions with foot massage therapy, individuals with diabetes may experience synergistic effects that lead to improved glycemic control, enhanced quality of life, and reduced reliance on painkillers or polypharmacy.

II. METHODOLOGY
A total number of thirty subjects were selected in outpatient department of Swamy Vivekanandha institute of health sciences department of physiotherapy by purposive sampling method by who fulfilled the inclusion criteria. The study was pre-test and post- test for a single group experimental study in nature. The treatment was conducted for a period of three months.

Table 1

<table>
<thead>
<tr>
<th>SAMPLE SELECTION CRITERIA</th>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Individuals with Type 2 diabetes mellitus</td>
<td>• Individuals with Type 2 diabetes mellitus along with other comorbidities</td>
</tr>
<tr>
<td></td>
<td>• Age between 40 years to 60 years</td>
<td>• Individuals below 40 years and above 60 years</td>
</tr>
</tbody>
</table>
• No comorbidities other than diabetes mellitus
• People adhere to their prescribed drugs routinely
• Individuals who are not following the routine drugs
• Mentally challenged patients
• Drug addicts

OUTCOME MEASURES:
FGT: The fasting glucose test is a blood test used to measure the glucose levels in your blood after you have fasted for a certain period, usually overnight.
PPT: The postprandial glucose test, also known as a post-meal glucose test, measures blood sugar levels after a meal.
HBA1C: This test that provides an average of your blood sugar levels over the past three months.

III. PROCEDURE

In the single blind study, a total of 30 diabetic patients were picked aged between 40 and 60 according to the selection criteria and assigned into two groups. After being assigned the participants underwent fasting glucose tests, postprandial tests, and HbA1c tests. Group A didn’t receive any intervention while Group B received self-administered foot massage therapy using Tennis ball on their right foot, targeting the pressure point associated with the pancreas, in addition to their routine medications.

Prior to the commencement of the intervention, baseline measurements for Fasting Glucose Test (FGT), Postprandial Test (PPT), and Hemoglobin A1C (HBA1C) levels were meticulously recorded for each participant. Following the three-month intervention period, the same battery of tests – FGT, PPT, and HBA1C – was once again administered to all participants. The collected data was meticulously analyzed to discern any changes or improvements in the measured parameters between the two groups. This analysis aimed to evaluate the effectiveness of foot massage as a potential intervention for managing or improving glucose metabolism and overall glycemic control in individuals within the specified age group.

IV. DATA ANALYSIS

Table 2: Group A - Pre and Post values

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre test</td>
<td>Post test</td>
<td>Pre test</td>
<td>Post test</td>
</tr>
<tr>
<td>FGT</td>
<td>131.6</td>
<td>118.2</td>
<td>6.25</td>
<td>39.36</td>
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<tr>
<td>PPT</td>
<td>155.47</td>
<td>137.8</td>
<td>6.67</td>
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<tr>
<td>HbA1C</td>
<td>8.48</td>
<td>7.74</td>
<td>0.45</td>
<td>0.345</td>
</tr>
</tbody>
</table>
Graph 1: Group A - Pre and Post values

Table 3: Group B - Pre and Post values

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>Mean Pre test</th>
<th>Mean Post test</th>
<th>Standard Deviation Pre test</th>
<th>Standard Deviation Post test</th>
<th>t-value</th>
<th>p-value</th>
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<tbody>
<tr>
<td>FGT</td>
<td>209</td>
<td>124</td>
<td>21.52</td>
<td>8.355</td>
<td>-20.167</td>
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<td>PPT</td>
<td>344.33</td>
<td>261.7</td>
<td>35.64</td>
<td>8.719</td>
<td>-12.335</td>
<td>&lt;0.0001</td>
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<td>HbA1C</td>
<td>8.9</td>
<td>7.05</td>
<td>0.40</td>
<td>0.28</td>
<td>-20.753</td>
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</tbody>
</table>

Graph 2: Group B - Pre and Post values
Table 4: Comparison of effectiveness between Group A and Group B

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group A</td>
<td>Group B</td>
</tr>
<tr>
<td>FGT</td>
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<td>20.167</td>
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<tr>
<td>PPT</td>
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<td>12.335</td>
</tr>
<tr>
<td>HbA1C</td>
<td>7.148</td>
<td>20.753</td>
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</table>

Graph 3: Comparison of effectiveness between Group A and Group B

Result: After the intervention period, significant improvements were noted in Group B’s fasting glucose test (FGT), Postprandial test (PPT), and HbA1c levels compared to Group A.

Conclusion: Based on the observed significant improvements in the fasting glucose test (FGT), postprandial test (PPT), and HbA1c levels in Group B following three months of foot massage therapy on the pancreatic pressure point, it can be concluded that this therapy may have a positive impact on glycemic control. Further research with larger sample sizes and longer durations is warranted to validate these findings and assess the potential long-term benefits of foot massage therapy in managing diabetes.

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