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ORIGINAL ARTICLE

The Role of Progressive Muscle Relaxation Therapy in Mitigating Diabetes Distress and Anxiety in People with Type 2 Diabetes, A Randomized Controlled Study at Independent University Hospital (IUH), Faisalabad, Pakistan

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ABSTRACT

Background & Objectives: Depression and anxiety are common in type 2 diabetics. Diabetes distress (DD) and anxiety are symptoms. These problems greatly affect their blood glucose control and quality of life. Jacobson's Progressive Muscle Relaxation (PMR) therapy was tested for its efficacy in treating diabetic dyslipidaemia (T2DM), anxiety, glycaemic control, haemodynamic parameters, and lipid profiles in people with both types of diabetes.

Methods: A prospective randomised controlled experiment was undertaken at the Independent University Hospital (IUH) in Faisalabad, Pakistan. After recruiting 80 type 2 diabetics, they were randomly assigned to two groups: the control group (n=40) received general stress counselling, while the intervention group (n=40) received PMR treatment and general counselling. Both groups received equal counselling. The Diabetes Distress Scale (DDS) and Generalised Anxiety Disorder (GAD-7) scores were assessed at the start and three months of the trial. Anthropometry, haemodynamics, and biochemistry were also assessed.

Results: A substantial decrease in DDS (4.1 vs. 1.6, p<0.0001) and GAD-7 (18.1 vs. 7.1, p<0.0001) was observed in the intervention group. The control of glycaemic levels improved significantly, with HbA1c (9.2% vs. 7.6%), fasting glucose (195.5 mg/dL vs. 143.3 mg/dL), and postprandial glucose (267.2vs. 174.5 mg/dL) reduced (p = 0.001). Both intervention and control groups showed lipid profile improvements. However, the control group showed no improvement and significantly worsened blood sugar management.

Conclusion: PMR therapy improved blood glucose and cholesterol management in type 2 diabetic patients and reduced pain and anxiety. Based on these findings, PMR therapy may be an effective type 2 diabetes treatment.

Keywords: Progressive Muscle Relaxation (PMR),Type 2 Diabetes Mellitus (T2DM),Diabetes Distress, Anxiety, Glycemic Control.

INTRODUCTION

Insulin resistance and decreased insulin production indicate type 2 diabetes. Type 2 diabetes is metabolic. Diabetes sufferers typically experience this prolonged problem. Estimated adult diabetes prevalence in Pakistan is 17.1%[1]. Thus, this burdens the planet. In many countries, this harms public health. Type 2 diabetes patients' quality of life and ability to control their condition are greatly affected by depression and anxiety[2]. Diabetes distress (DD) and anxiety are linked to type 2 diabetes. These issues are linked to type 2 diabetes symptoms.

Diabetic distress (DD) is a psychological ailment particular to diabetics. This disorder causes emotions of inadequacy, frustration with therapy, and concern about illness consequences[3]. It involves emotional burdens from disease management. DD is directly linked to diabetic difficulties, unlike clinical depression. Different from clinical depression. According to research, 20-40% of type 2 diabetics have DD, which is linked to poor glycaemic control, lower therapy adherence, and higher complications. A higher risk of problems is linked to DD.

Another common comorbidity of type 2 diabetes is generalised anxiety disorder (GAD), which affects 14–20% of patients. Fear of hypoglycemia, disease progression, and self-care often cause anxiety in type 2 diabetics. Dysregulation of stress hormones including cortisol and catecholamines by diabetes and anxiety worsens hyperglycemia and insulin resistance[6]. Both disorders are linked to anxiety.

Edmund Jacobson developed a drug-free therapy in the 1920s. Progressive Muscle Relaxation is used. This treatment involves systematically tensing and relaxing muscle groups to relieve physical and psychological stress[7]. Cancer, cardiovascular, and pulmonary patients have found PMR to reduce concern, stress, and depression[8]. Clinical trials proved this. However, whether this treatment reduces anxiety and sadness in type 2 diabetics is unclear. This is especially true in low- and middle-income nations like Pakistan.

This study examined how PMR therapy affected glucose control, anxiety, glycaemic control, haemodynamic parameters, and lipid profiles in type 2 diabetics. The Independent University Hospital (IUH) in Faisalabad, Pakistan, conducted the study. This study may illuminate the use of non-pharmacological therapy in diabetic care.

MATERIALS AND METHODS

Study Design and Setting: This prospective randomised controlled trial was conducted at the Independent University Hospital (IUH) in Faisalabad, Pakistan, from January to March 2023. The experiment was in Pakistan. The hospital's institutional review board was consulted to get ethical approval for the study, and all participants gave written informed consent.

Participants: The study included 25–60-year-old adults with type 2 diabetes, HbA1c levels between 8% and 10%, and no PMR medication experience. Patients with advanced nephropathy, retinopathy, or other major disorders were excluded from the study.

Sample Size and Randomization: Based on a power analysis, 80 participants were selected assuming a 20% dropout rate. Participants were randomly assigned to two groups using computer-generated numbers:

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In addition to counselling, 40 intervention group members received PMR therapy.
Control Group (n=40): Received general counseling for stress reduction.
Intervention Group (n=40): Received PMR therapy alongside general counseling.
Intervention: A fifteen-minute PMR therapy session involved sequentially tensing and relaxing sixteen muscle groups. Participants were given audio recordings to guide them and told to do PMR daily. Compliance was monitored weekly via phone calls and WhatsApp messages.
Outcome Measures: The main goals were DDS and GAD-7 changes in diabetes-related distress and anxiety. Secondary outcomes included changes in HbA1c, fasting and postprandial glucose, blood pressure, and lipid profiles.
Statistical Analysis: Data were analyzed using SPSS version 25. Paired t-tests were used to compare pre- and post-intervention scores within groups, while independent t-tests were used for between-group comparisons. A p-value of <0.05 was considered statistically significant.

RESULTS

Primary Outcomes
Diabetes Distress: The intervention group showed a significant reduction in DDS scores (4.1 vs. 1.6, p<0.0001), while the control group exhibited a slight increase (3.9 vs. 4.2, p=0.001) (Table 2).
Anxiety: The intervention group demonstrated a significant reduction in GAD-7 scores (18.1 vs. 7.1, p<0.0001), whereas the control group showed a slight increase (17.4 vs. 18.6, p=0.015) (Table 3).
Secondary Outcomes
Glycemic Control: The intervention group showed significant improvements in HbA1c (9.2% vs. 7.6%), fasting glucose (195.5 mg/dL vs. 143.3 mg/dL), and postprandial glucose (267.2mg/dL vs. 175.9 mg/dL) (p=0.001). In contrast, the control group exhibited worsening glycemic control (Table 4).
Lipid Profiles: The intervention group showed significant improvements in triglycerides, total cholesterol, and LDL cholesterol, while HDL cholesterol increased (p=0.005). No significant changes were observed in the control group.

Table 1: Baseline Characteristics of Study Participants

Variable	Control Group (n=36)	Intervention Group (n=36)	p-value
Age (years)	50.9 ± 6.9	50.1 ± 7.1	0.627
Gender (Male:Female)	25:11	24:12	0.800
Duration of Diabetes	6.7 ± 3.6	6.9 ± 4.3	0.847

Data presented as mean ± SD or counts. p-values derived from independent t-tests (continuous) or chi-square tests (categorical).

Table 2: Changes in Psychological Outcomes (DDS and GAD-7 Scores)

Group	Baseline (Mean ± SD)	Follow-up (Mean ± SD)	Mean Difference (95% CI)	Within-Group p-value	Between-Group p-value
DDS Scores					
Control	3.9 ± 0.6	4.4 ± 0.7	+0.5 (0.2, 0.8)	0.001	<0.0001*
Intervention	4.1 ± 0.6	1.6 ± 0.5	-2.2 (-2.5, -1.9)	<0.0001	
GAD-7 Scores					
Control	17.4 ± 3.0	18.6 ± 2.6	+1.2 (0.4, 2.0)	0.015	<0.0001*
Intervention	18.1 ± 2.6	7.1 ± 3.3	-11.6 (-13.0, -10.2)	<0.0001	

Between-group p-values compare post-intervention scores using independent t-tests.
DDS: Diabetes Distress Scale; GAD-7: Generalized Anxiety Disorder-7.

Table 3: Changes in Glycemic Control

Parameter	Control Group	Intervention Group	Mean Difference (95% CI)	p-value
HbA1c (%)	9.0 ± 0.8 → 9.4 ± 1.3 (+0.4)	9.2 ± 0.5 → 7.6 ± 1.1 (-1.6)	-2.0 (-2.5, -1.5)	0.001
Fasting Glucose (mg/dL)	164.6 ± 52.3 → 175.3 ± 51.4	195.5 ± 47.8 → 143.3 ± 45.7	-52.1 (-70.3, -33.9)	0.001
Postprandial Glucose (mg/dL)	220.5 ± 60.1 → 235.0 ± 55.2	267.2± 50.0 → 174.5 ± 45.0	-91.0 (-110.2, -71.8)	<0.0001

Data presented as baseline → follow-up (mean ± SD). Mean difference reflects intervention vs. control post-intervention changes.

Table 4: Changes in Lipid Profiles

Parameter	Control Group	Intervention Group	Mean Difference (95% CI)	p-value
Triglycerides (mg/dL)	185.4 ± 35.2 → 192.1 ± 40.6	190.5 ± 38.4 → 150.2 ± 30.5	-42.3 (-55.0, -29.6)	0.001
Total Cholesterol (mg/dL)	210.6 ± 42.3 → 218.9 ± 45.7	215.8 ± 39.1 → 180.3 ± 35.2	-38.6 (-50.1, -27.1)	0.001
LDL Cholesterol (mg/dL)	135.5 ± 30.1 → 140.2 ± 32.5	138.6 ± 28.7 → 110.4 ± 25.3	-29.8 (-38.4, -21.2)	<0.0001
HDL Cholesterol (mg/dL)	46.2 ± 6.9 → 44.1 ± 9.5	48.1 ± 7.5 → 50.6 ± 7.7	+6.8 (3.2, 10.4)	0.005

Mean difference reflects intervention vs. control post-intervention changes.

DISCUSSION

This study found that PMS treatment reduces diabetes-related anxiety and discomfort in type 2 diabetics. The remarkable improvements in glycaemic control and lipid profiles show that polymerase chain reaction (PMR) may be a promising alternative diabetes treatment.It supports previous research showing that relaxing practices improve mental health[9]. This result is expected. Intervention group members had lower anxiety and DD. Reduced stress hormones, which enhance insulin resistance and hyperglycemia[10], may explain the improvement in glycaemic management over this time. This has been noted several times. Diabetes control is important in Pakistan, because mental health care is scarce. This research has major diabetes management implications. PMR is a non-invasive, cheap, and easy-to-use diabetes treatment.

A randomised and controlled study was conducted at the Independent University Hospital (IUH) in Faisalabad, Pakistan, on type 2 diabetic patients. This clinical investigation demonstrated that Progressive Muscle Relaxation (PMR) therapy reduced diabetes-related distress (DD), anxiety, glycaemic management, and lipid profiles. PMR is a non-pharmacological treatment that costs less and may enhance type 2 diabetes patients' mental and physical health. The research shows that PMR can help resource-poor countries like Pakistan. The intervention group showed significant reductions in diabetes distress (DDS scores: 4.1 vs 1.6, p<0.0001) and anxiety (GAD-7 scores: 18.1 vs 7.1, p<0.0001). In contrast, the control group increased both measures slightly. This study supports earlier findings that relaxing strategies reduce psychological distress in chronic illness patients[1]. Consistent with previous research. Diabetes-related stress, which can cause

emotional disorders, hinders self-care and glycaemic control[2]. The researchers believe PMR's calming properties, which help diabetics manage stress and emotional turbulence, reduced DD in this trial.

DD cases dropped significantly. The study's significant anxiety decrease supports PMR's therapeutic potential. Type 2 diabetics often worry about hypoglycemia, disease progression, and self-care[3]. PMR may reduce these anxieties by relaxing and lowering physiological arousal, improving mental health. Similar studies have shown that PMR reduces anxiety in patients with cancer and cardiovascular disorders[4]. These studies suggest PMR reduces patient anxiety. The intervention group had significant improvements in glycaemic management, as seen by reductions in HbA1c (9.2% vs. 7.6%), fasting glucose (195.5 mg/dL vs. 142.4 mg/dL), and postprandial glucose (267.2vs. 174.5 mg/dL) (p = The intervention group had considerably decreased HbA1c, supporting our findings. In contrast, the control group showed signs of blood sugar control deterioration. Based on these findings, PMR treatment may directly affect glucose metabolism. Reducing cortisol and catecholamines, which worsen insulin resistance and hyperglycemia, is presumably how this is done[5]. It is also well known that these hormones affect glucose metabolism.

This study's improvement in glycaemic management is consistent with prior research on relaxation techniques' effects on blood glucose levels. Relaxation helps manage blood glucose, according to this study. A research in Indonesia indicated that PMR dramatically lowered stress and hyperglycemia in type 2 diabetics[6]. A similar randomised controlled trial in Egypt found that PMR therapy improved glycaemic control and psychological discomfort in type 2 diabetics[7]. These results suggest that PMR may help type 2 diabetics control their blood sugar.

In addition, the intervention group had lower triglycerides, total cholesterol, and LDL cholesterol and higher HDL cholesterol (p = 0.005). These modifications occurred during the research. These alterations are therapeutically significant since dyslipidaemia is a major cardiovascular risk factor in type 2 diabetics[8]. This is because dyslipidaemia increases cardiovascular risk. Reducing stress and anxiety, which activate the sympathetic nervous system and release stress hormones, may improve lipid profiles[9]. The decrease in tension and anxiety may explain this improvement.

Previous research have demonstrated that relaxation techniques lower cardiovascular risk factors, supporting PMR's positive effect on lipid profiles. Research shows that relaxation practices are beneficial. These studies show that PMR has these benefits. One Indian trial found that PMR medication significantly reduced total and LDL cholesterol in type 2 diabetics[10]. These findings imply that PMR medication may reduce cardiovascular issues in type 2 diabetics. This study found several ways to explain PMR therapy's advantages. First, pre-mortem relaxation (PMR) reduces physiological alertness and muscle tension to encourage relaxation. This lowers cortisol and catecholamine levels[11]. These hormones are clearly involved in insulin resistance, hyperglycemia, and dyslipidaemia, which are hallmarks of type 2 diabetes[12]. PMR may enhance glycaemic management and lipid profiles by lowering hormone levels. PMR also increases parasympathetic activity and decreases sympathetic activity, resulting in physiological relaxation[13]. Variations in autonomic balance may improve insulin sensitivity and glucose metabolism, which may improve glycaemic management. PMR may promote diabetes self-care adherence by reducing worry and tension. Limiting diet, exercising, and taking medication as advised improve outcomes[14].This study found significant implications for type 2 diabetes management, especially in low-resource countries like Pakistan, where mental health services and advanced diabetic care are scarce. PMR therapy is a non-invasive, affordable, and easy-to-integrate diabetes treatment. It requires no particular equipment or training, so many individuals can perform it. It is therefore accessible to many. Healthcare practitioners can incorporate PMR therapy into diabetes control by giving patients audio or written instructions for home PMR. This is possible. Regular follow-up and monitoring can maximise therapeutic benefits and ensure compliance. This ensures therapy compliance. Group PMR sessions in community settings can reach a larger audience and provide social support, which has been shown to improve behavioural treatments[15]. This can be done by scheduling these sessions together. This study gives valuable information on PMR therapy for type 2 diabetes, however it has several drawbacks. The small sample size may limit the extrapolation of the findings to a larger population. Future research with larger study populations is needed to validate these findings. The trial's three-month follow-up may not have been long enough to determine if PMR therapy's advantages may be sustained. The study's second flaw. Long-term research is needed to see if the effects are permanent.

Because the study was conducted in one location, its conclusions may not be generalisable to other people and places. The study has this limitation. Validating these conclusions requires study with a wide range of groups and numerous centres. The study also used self-reported diabetes-related anxiety and distress, which may be biassed. Not the least research flaw. Future research will evaluate whether objective indicators like stress and anxiety biomarkers will supplement self-reported data.

Future studies should examine PMR therapy's advantages' mechanisms. This investigation must be thorough. Researching PMR's effects on stress hormones, autonomic function, and inflammatory markers may help explain how it affects glycaemic control and lipid profiles. This would help understand PMR's impact. Research could also examine how combining PMR with other non-pharmacological therapies like mindfulness-based stress reduction or cognitive-behavioral therapy improves its efficacy. This would boost PMR effectiveness. Future studies should also assess PMR therapy's cost-effectiveness in treating type 2 diabetes. Diabetes is expensive, and efficient, cost-effective treatments like PMR could improve public health. In conclusion, PMR therapy should be studied for its potential to treat a number of chronic conditions, including hypertension, obesity, and cardiovascular disease, to dramatically expand its use. Due to the limited sample size and short follow-up duration, this study's conclusions cannot be generalised. Further study with bigger sample sizes and longer follow-up periods is needed to confirm these findings.

CONCLUSION

PMR therapy reduces diabetes-related pain and anxiety and improves blood glucose and lipid profiles in type 2 diabetics. These findings highlight the importance of non-pharmacological diabetic treatment. This strategy aims to enhance diabetics' health and disease outcomes. This study found that PMR therapy reduces diabetes-related distress and anxiety, improves glycaemic management, and improves lipid profiles in type 2 diabetics. PMR, a low-cost non-pharmacological strategy, can improve psychological and physiological outcomes in diabetic treatment. The findings suggest PMR could be effective intervention. PMR therapy may improve type 2 diabetes patients' quality of life and disease outcomes in countries like Pakistan, where mental health and advanced diabetes care are scarce.

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