

Effect of Mindfulness-Based Stress Reduction with 40 Hz Music on Anxiety and Quality of Life in Prolanis Patients with Diabetes Mellitus

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ABSTRACT

Background: Anxiety is a common psychological problem experienced by patients with Diabetes Mellitus and can negatively affect disease management and quality of life. Mindfulness-Based Stress Reduction (MBSR) combined with 40 Hz music frequency is that may help reduce anxiety and improve quality of life in patients with chronic diseases.

Purpose: This study aimed to analyze the effectiveness of MBSR with 40 Hz music frequency on anxiety and quality of life among Prolanis patients with Diabetes Mellitus.

Methods: Study design used a quasi-experimental pretest–posttest control group. The sample consisted of 60 respondents, divided into intervention and control groups. The intervention group received an 8-week MBSR program combined with 40 Hz music frequency, while the control group received standard Prolanis care. Anxiety levels using the DASS-21 questionnaire, and quality of life was assessed using WHOQOL-BREF. Data were analyzed using Wilcoxon and Mann–Whitney tests.

Results: The anxiety levels significantly decreased in the intervention group (mean difference = -10.15 ; $p < 0.001$), while no significant change was observed in the control group ($p > 0.05$). In addition, quality of life significantly improved in the intervention group (median increase = $+16$; $p < 0.001$), whereas the control group showed only a slight and non-significant improvement ($p > 0.05$).

Conclusion: Mindfulness-Based Stress Reduction combined with 40 Hz music frequency is effective in reducing anxiety and improving quality of life among Prolanis patients with Diabetes Mellitus. This intervention can be integrated into primary healthcare services as a complementary nursing intervention to support holistic diabetes management.

Keywords: Anxiety, Diabetes Mellitus, 40 Hz Music Frequency, Mindfulness-Based Stress Reduction, Prolanis, Quality of Life

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BACKGROUND

Diabetes Mellitus (DM) is a chronic metabolic disease that requires long-term and continuous management, including lifelong medication adherence, dietary regulation, lifestyle modification, and routine monitoring to prevent complications. The persistent self-management demands associated with DM place a substantial psychological burden on patients and frequently lead to psychological distress, which may negatively affect coping ability and overall quality of life (Care & Suppl, 2022). Psychological distress in patients with Diabetes Mellitus has been widely recognized as an important factor influencing disease management and patient well-being (Fisher et al., 2014). Notably, a comprehensive meta-analysis reported that MBSR produces moderate and clinically meaningful improvements in both mental and physical health outcomes across diverse chronic disease populations, supporting its relevance for long-term condition management (Grossman et al., 2004). However, limited studies have examined the combined effect of MBSR and 40 Hz music frequency among Prolanis patients in primary healthcare settings.

In Indonesia, the management of Diabetes Mellitus is integrated into the Chronic Disease Management Program (Program Pengelolaan Penyakit Kronis/Prolanis) implemented by BPJS Kesehatan. Prolanis aims to improve patients' quality of life through structured activities, including regular medical consultations, health education, physical exercise, and routine health monitoring (BPJS, 2014; BPJS Kesehatan, 2024). Although Prolanis has contributed to improved clinical monitoring and disease control, evidence suggests that psychological aspects, such as stress and anxiety, remain insufficiently addressed within routine program activities. Studies evaluating the Prolanis program have shown that participants may continue to experience psychological distress despite regular participation (Alkaff et al., 2021).

Psychological distress and stress-related conditions play a significant role in the progression of Diabetes Mellitus. Chronic psychological stress activates the hypothalamic–pituitary–adrenal (HPA) axis, resulting in increased cortisol secretion, which contributes to insulin resistance and impaired glycemic regulation. This bidirectional relationship highlights the importance of addressing mental health as part of comprehensive diabetes management (Fisher et al., 2014; Hosseini Zavareh, 2022).

Mindfulness-Based Stress Reduction (MBSR) is a structured, non-pharmacological intervention developed by Kabat-Zinn that aims to cultivate present-moment awareness through mindfulness practices such as body scan, mindful breathing, and meditation (Kabat-Zinn, 2013; Stahl & Goldstein, 2019). MBSR has been widely implemented in healthcare settings and has demonstrated effectiveness in reducing psychological distress, anxiety, and stress, as well as improving emotional regulation and quality of life among individuals with chronic diseases (Conversano et al., 2021; Fisher et al., 2014). Evidence from various clinical populations, including patients with chronic kidney disease undergoing hemodialysis, individuals with gastrointestinal disorders, and patients with multiple sclerosis, further supports the role of MBSR as an effective complementary intervention for managing psychological distress (Oraki et al., 2020).

In addition to mindfulness-based approaches, auditory stimulation has emerged as a complementary strategy for promoting emotional and physiological regulation. Studies on low-frequency and sound-based interventions have reported subjective improvements in physical and emotional relaxation, supporting the use of auditory stimulation as a non-invasive approach to enhance psychological comfort (Ahonen et al., 2013).

Despite evidence supporting the independent benefits of MBSR and auditory-based interventions, research examining the combined application of Mindfulness-Based Stress

Reduction with 40 Hz music frequency among Prolanis patients with Diabetes Mellitus in primary healthcare settings remains limited. Therefore, this study aims to investigate the effectiveness of this combined intervention in reducing psychological distress and improving quality of life, providing evidence-based recommendations for integrating holistic psychological care into chronic disease management programs such as Prolanis.

OBJECTIVE

This study aimed to analyze the effectiveness of MBSR with 40 Hz music frequency on anxiety and quality of life among Prolanis patients with Diabetes Mellitus.

METHODS

Design and Samples

This study employed a quantitative research design with a quasi-experimental pretest–posttest control group approach. The study was analytical in nature, aiming to examine the effectiveness of Mindfulness-Based Stress Reduction (MBSR) based on 40 Hz music frequency in reducing anxiety levels and improving quality of life among Prolanis patients with Diabetes Mellitus.

The population consisted of all active Prolanis patients diagnosed with Diabetes Mellitus who received treatment at Puskesmas Kembangan, Jakarta. A total of 60 respondents, were selected using purposive sampling and divided into intervention and control groups. The intervention group received an 8-week MBSR program combined with 40 Hz music frequency, while the control group received standard Prolanis care without additional psychological intervention.

The inclusion criteria were Prolanis patients with Diabetes Mellitus aged 30–60 years, able to read and write, able to communicate verbally, and willing to participate in the study. Patients with severe cognitive impairment, hearing disorders, or those who were unable to complete the intervention program were excluded from the study. Participants in both groups completed pretest and posttest assessments. Anxiety levels were measured using the Depression Anxiety Stress Scale-21 (DASS-21) (Ali et al., 2021), and quality of life was assessed using the WHOQOL-BREF questionnaire (Norman & Zatzick, 2012). The study was conducted over a period of eight weeks, corresponding to the duration of the MBSR intervention program.

Research instrument and Data Collection

Measurement of research variables was conducted using structured questionnaires and checklist guidelines adapted from relevant theoretical concepts. Instrument testing was carried out on 30 respondents prior to the main data collection. Demographic characteristics were obtained using a checklist sheet, including age (in years) and gender. Additional respondent characteristics related to the Prolanis program were also recorded using a checklist form. Anxiety levels were measured using the Depression Anxiety Stress Scale-21 (DASS-21). The anxiety subscale consists of 7 statement items measured using a 4-point Likert scale ranging from never to almost always. The total anxiety score reflects the severity of anxiety experienced by respondents. Validity testing showed item correlation values greater than the minimum requirement ($r_{\text{count}} > r_{\text{table}} = 0.361$), and reliability testing demonstrated good internal consistency with a Cronbach's alpha value > 0.80 . Quality of life was measured using the World Health Organization Quality of Life-BREF (WHOQOL-BREF) questionnaire, which consists of 26 items covering four domains: physical health, psychological health, social relationships, and environment. Responses were measured using a 5-point Likert scale. The validity test results indicated that all items met the validity criteria ($r_{\text{count}} > r_{\text{table}} = 0.361$),

and reliability testing showed acceptable internal consistency with Cronbach's alpha values > 0.70.

Data collection on demographic characteristics, anxiety levels, and quality of life was conducted on Prolanis patients with Diabetes Mellitus at Puskesmas Kembangan. Respondents were divided into an intervention group and a control group. The intervention group received an 8-week Mindfulness-Based Stress Reduction (MBSR) program combined with 40 Hz music frequency, while the control group received standard Prolanis care. Pretest measurements were conducted prior to the intervention, and post-test measurements were conducted after completion of the intervention period. Data collection was carried out over a period of two months. All respondents received a full explanation of the research objectives and procedures and signed informed consent forms prior to participation. Ethical principles, including voluntary participation, confidentiality, anonymity, and the right to withdraw from the study at any time, were strictly observed throughout the research process.

Data Analysis

Data were processed and analyzed using SPSS version 26 (IBM Corp., 2019). Demographic characteristics of respondents were analyzed descriptively using frequency and percentage distributions. Anxiety levels and quality of life scores were presented using measures of central tendency, including mean and standard deviation. Within-group comparisons of anxiety levels and quality of life scores before and after the intervention were analyzed using the Wilcoxon signed-rank test. Differences between the intervention and control groups were analyzed using the Mann-Whitney U test. All statistical tests were conducted with a 95% confidence level, and a p-value < 0.05 was considered statistically significant.

Ethical Consideration

This study has obtained ethical approval from the Research Ethical Committee of Universitas Karya Husada Semarang, Indonesia, with approval number 076/KEP/UNK AHA/SLE/III/2025, issued on March 20, 2025. The study was conducted in accordance with ethical principles for research involving human participants, including respect for autonomy, beneficence, non-maleficence, and justice. The confidentiality and anonymity of all participants were strictly maintained by using coded identifiers instead of personal information. Prior to data collection, all respondents received a comprehensive explanation regarding the study objectives, procedures, potential benefits, and possible risks. Written informed consent was obtained from each participant to ensure voluntary participation without any form of coercion. Participants were informed of their right to withdraw from the study at any stage without consequences.

RESULTS

Table 1. Characteristics of Participants (n = 60)

Variables	Indicator	Frequency (f)	Percentage (%)
Age (years)	30–40	5	8.3
	41–50	15	25.0
	51–60	40	66.7
Gender	Male	19	31.7
	Female	41	68.3
Duration of Diabetes Mellitus	< 5 years	19	31.7
	≥ 5 years	41	68.3
Family Support	Good	45	75.0
	Poor	15	25.0

The results in Table 1 show that most respondents were aged 51–60 years (66.7%). The majority of participants were female (68.3%). Most respondents had been diagnosed with diabetes mellitus for ≥ 5 years (68.3%). In terms of family support, the majority of participants reported good family support (75.0%).

Table 2. Anxiety Scores Before and After Intervention

Group	Pretest (Mean \pm SD)	Posttest (Mean \pm SD)	Δ Change	p-value
Intervention (MBSR + 40 Hz music)	20.30 \pm 4.10	10.15 \pm 3.40	-10.15	< 0.001*
Control	19.85 \pm 3.95	17.95 \pm 4.05	-1.90	0.082

Table 2 shows the comparison of anxiety scores before and after the intervention. In the intervention group, the mean anxiety score significantly decreased from 20.30 \pm 4.10 at pretest to 10.15 \pm 3.40 at posttest, with a mean change of -10.15 ($p < 0.001$). In contrast, the control group showed a smaller reduction in anxiety scores, from 19.85 \pm 3.95 at pretest to 17.95 \pm 4.05 at posttest, with a mean change of -1.90, which was not statistically significant ($p = 0.082$). These results indicate a significant reduction in anxiety levels only in the intervention group.

Table 3. Quality of Life Scores Before and After Intervention

Group	Pretest Median (Min–Max)	Posttest Median (Min–Max)	Δ Change	p-value
Intervention (MBSR + 40 Hz music)	59 (51–67)	75 (69–80)	+16	< 0.001*
Control	59 (55–64)	63 (58–67)	+3	0.112

Table 3 presents the changes in quality of life scores before and after the intervention. In the intervention group, the median quality of life score increased significantly from 59 (51–67) at pretest to 75 (69–80) at posttest, with a median change of +16 ($p < 0.001$). Conversely, the control group showed a modest increase in quality of life scores from 59 (55–64) at pretest to 63 (58–67) at posttest, with a median change of +3, which was not statistically significant ($p = 0.112$). These findings demonstrate a significant improvement in quality of life among participants who received the MBSR combined with 40 Hz music frequency intervention. The intervention showed a greater effect on anxiety reduction compared to the improvement in quality of life.

DISCUSSION

This study demonstrated that Mindfulness-Based Stress Reduction (MBSR) combined with 40 Hz music frequency had a significant effect on reducing anxiety levels and improving quality of life among Prolanis patients with Diabetes Mellitus. The intervention group experienced a substantial reduction in anxiety scores after the intervention ($\Delta = -10.15$; $p < 0.001$), whereas the control group showed only a minimal and statistically non-significant decrease ($\Delta = -1.90$; $p = 0.082$). These findings indicate that the observed reduction in anxiety was not only statistically significant but also clinically meaningful. The magnitude of anxiety reduction suggests practical benefits for patients' psychological well-being, particularly in

supporting emotional regulation and coping with the long-term demands of diabetes management.

Psychological distress and anxiety are common problems among patients with Diabetes Mellitus and have been associated with poorer glycemic control, reduced treatment adherence, and adverse long-term health outcomes (Fisher et al., 2014; Hosseini Zavareh, 2022). Baseline findings in this study revealed moderate anxiety levels among Prolanis participants, supporting previous evidence that routine chronic disease management programs often emphasize physical and clinical indicators while psychological distress remains insufficiently addressed (Alkaff et al., 2021). The significant reduction in anxiety following the MBSR-FM40 intervention suggests that integrating structured psychological interventions into Prolanis services may help address this gap.

The effectiveness of MBSR observed in this study is consistent with previous research conducted in patients with chronic illnesses. Evidence from various clinical populations, including chronic kidney disease patients undergoing hemodialysis, individuals with gastroesophageal reflux disease, and other chronic conditions, has demonstrated that MBSR interventions can significantly reduce psychological distress, anxiety, and stress while improving emotional regulation and well-being (Kabat-Zinn, 2013; Oraki et al., 2020; Stahl & Goldstein, 2019). Mindfulness practices promote present-moment awareness, non-judgmental acceptance, and adaptive coping, enabling individuals to respond more effectively to stressors associated with long-term illness.

From a physiological perspective, chronic psychological stress activates the hypothalamic–pituitary–adrenal (HPA) axis, leading to increased cortisol secretion, which contributes to insulin resistance and impaired glycemic regulation in patients with Diabetes Mellitus (Hosseini Zavareh, 2022). By significantly reducing anxiety levels, MBSR may indirectly support improved self-care behaviors and psychological stability, which are essential components of comprehensive diabetes management, although physiological outcomes were not directly measured in this study.

An important contribution of this study is the integration of 40 Hz music frequency with Mindfulness-Based Stress Reduction (MBSR). Auditory stimulation has been increasingly explored as a complementary strategy for supporting emotional and physiological regulation in clinical settings. Previous studies on sound-based and low-frequency auditory interventions have reported subjective improvements in physical relaxation, emotional comfort, and stress reduction, indicating the potential of auditory stimulation as a non-invasive supportive approach for psychological well-being (Iswanti et al., 2023)

The combination of mindfulness practices with structured auditory stimulation in the present study may have produced synergistic effects, contributing to the greater magnitude of anxiety reduction observed in the intervention group compared to standard care alone. The integration of focused attention through mindfulness and rhythmic auditory input may enhance relaxation responses and emotional regulation, thereby supporting improved psychological outcomes among patients with chronic diseases (Agusman et al., 2025).

In addition to reducing anxiety, this study demonstrated a significant improvement in quality of life among participants receiving the MBSR-FM40 intervention. The intervention group showed a marked increase in quality of life scores (median $\Delta = +16$; $p < 0.001$), whereas the control group exhibited only a modest and non-significant improvement ($\Delta = +3$; $p = 0.112$). This finding suggests that the psychological benefits of the intervention extended beyond symptom reduction and contributed to broader improvements in patients' perceived well-being. Improved psychological comfort may enhance patients' engagement in self-care activities and daily functioning, which are critical components of quality of life in chronic disease populations (Rompas et al., 2024).

These findings are particularly relevant in the context of Prolanis, which aims to improve the quality of life of patients with chronic diseases through regular monitoring, education, and structured care (BPJS Kesehatan, 2024). While Prolanis has demonstrated benefits in controlling clinical indicators, the present study suggests that incorporating structured psychological interventions such as MBSR combined with 40 Hz music frequency may enhance the overall effectiveness of the program by addressing psychological dimensions that are often overlooked (Alkaff et al., 2021).

Despite its strengths, this study has several limitations. The quasi-experimental design without randomization may limit the generalizability of the findings. Data collection was conducted over approximately one month due to scheduling constraints of Prolanis activities, and the use of paper-based questionnaires may have introduced response bias. In addition, this study did not assess long-term follow-up outcomes or physiological indicators such as glycemic control. Future studies are recommended to employ randomized controlled designs, include longer follow-up periods, and explore the combined impact of MBSR and auditory stimulation on both psychological and clinical outcomes.

Overall, the findings of this study provide evidence that integrating Mindfulness-Based Stress Reduction combined with 40 Hz music frequency into Prolanis services is a feasible and effective non-pharmacological approach for reducing anxiety and improving quality of life among patients with Diabetes Mellitus. This approach supports a more holistic, patient-centered model of chronic disease management that addresses both physical and psychological well-being.

CONCLUSION

The Mindfulness-Based Stress Reduction (MBSR) combined with 40 Hz music frequency is effective in reducing anxiety levels and improving quality of life among Prolanis patients with Diabetes Mellitus. These findings suggest that integrating MBSR-FM40 into primary healthcare services may provide a valuable complementary approach to support holistic diabetes management. Additionally, incorporate the MBSR-FM40 intervention as part of the standard nursing care plan for diabetes patients, particularly those exhibiting symptoms of stress, anxiety, or difficulties with self-management.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest

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