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The Impact Of Multidisciplinary Lifestyle Interventions On The Health Of Patients With Diabetes Mellitus

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Abstract

Background of the Study: Diabetes mellitus is a growing global health problem, including in Indonesia, with a prevalence expected to reach 12% by the year 2025. This disease affects the quality of life and imposes a significant economic burden.
Objectives and Scope of the Paper: The present research investigates how integrated lifestyle modifications encompassing nutritional guidance, physical exercise, psychological counseling, and health literacy affect the well-being of diabetic individuals at the Kagok Public Health Center in Semarang
Methods: The research design used is a quasi-experimental design with two groups of pre-test and post-test. The sample consists of 60 patients with diabetes mellitus divided into an intervention group (n=30) and a control group (n=30). Evaluation was conducted over one month using a self-efficacy questionnaire and measurements of fasting blood glucose levels, blood pressure, and body mass index (BMI). Data analysis was performed using the Shapiro-Wilk normality test and the Mann-Whitney test for intergroup comparisons.
Results: The study results indicate a significant increase in self-efficacy scores, as well as a decrease in blood glucose levels and blood pressure in the intervention group compared to the control group, with a p-value of < 0.05.
Conclusion: Evidence from this study confirms that integrated lifestyle management significantly bolsters both clinical health outcomes and the perceived quality of life among diabetic populations. These insights serve as a cornerstone for designing specialized training curricula for clinicians and establishing enduring health intervention frameworks within the Indonesian context.

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INTRODUCTION

Diabetes mellitus (DM) has emerged as a critical global public health crisis, characterized by its escalating incidence and the intricate nature of its clinical management, which significantly burdens healthcare infrastructures and patient well-being. Statistics from the International Diabetes Federation (IDF) indicate an alarming trajectory, with the global diabetic population projected to surpass 500 million within the current decade. This epidemiological shift is particularly pronounced in emerging economies, notably Indonesia, where the disease burden continues to intensify. In Indonesia, diabetes mellitus ranks high as a cause of morbidity and mortality and contributes to the increasing burden of national health expenditures. (Manninda et al., 2021). Diabetes mellitus not only affects the physiological aspects of metabolic disorders but also impacts the psychological, social, and economic dimensions of patients. Chronic complications, such as cardiovascular disease, neuropathy, nephropathy, and vision impairment, frequently arise due to suboptimal glycemic

control. This situation deteriorates the quality of life for patients and increases their reliance on primary and referral health care services. (Purnamasari et al., 2023)

Efforts to manage diabetes mellitus cannot solely rely on pharmacological therapy. Various contemporary clinical guidelines emphasize the importance of lifestyle interventions as a key pillar in diabetes management. These interventions include nutritional regulation, regular physical activity, strengthening self-efficacy, and continuous psychosocial support. (Prabowo et al., 2022) The multidisciplinary approach is becoming increasingly relevant as diabetes is a chronic disease with multifactorial determinants that require the integrated involvement of various health professions, particularly in primary health care facilities such as community health centers (puskesmas). This collaborative model facilitates comprehensive patient care, ensuring that all aspects of the disease are addressed and that patients receive holistic support in managing their condition (Noviyanti et al., 2021). Extensive synthesized literature, including meta-analyses and systematic reviews, highlights that lifestyle modifications are pivotal in optimizing glucose regulation and mitigating the long-term sequelae of diabetes. Specifically, tailored nutritional adjustments and enhanced physical exertion have been proven to significantly attenuate HbA1c levels, stabilize blood pressure, and reduce adiposity (BMI) among those with type 2 diabetes. These clinical insights reaffirm that behavioral changes must remain an integral pillar of modern diabetic care frameworks. (Arania et al., 2021)

In addition to physical aspects, psychological factors such as self-efficacy play a crucial role in the successful management of diabetes. High levels of self-efficacy are associated with adherence to treatment, the adoption of healthy behavioral changes, and patients' abilities to engage in long-term self-care. This emphasizes the need to address psychological components alongside medical interventions to enhance overall diabetes management outcomes.(Wahyuni, 2021). Interventions that integrate health education and psychological support have been shown to be more effective than singular interventions that focus on only one behavioral aspect. A multidisciplinary approach, involving healthcare professionals from various fields such as nurses, physicians, nutritionists, and community health workers, has been reported to yield optimal outcomes in diabetes management. Recent research indicates that multidisciplinary team-based programs in primary care settings can enhance clinical outcomes as well as patient satisfaction with health services. However, the effectiveness of this approach is significantly influenced by local context, patient characteristics, and program sustainability. (Shi et al., 2025).

Despite the growing body of scientific evidence regarding the benefits of lifestyle interventions and multidisciplinary approaches in diabetes management, most studies have been conducted in developed countries or tertiary healthcare facilities. In Indonesia, particularly at the primary healthcare level, such as community health centers (puskesmas), research evaluating the effectiveness of comprehensive multidisciplinary lifestyle interventions remains limited. Furthermore, many previous studies have assessed only one or two clinical indicators, such as blood glucose levels or HbA1c, without integrating psychological aspects such as patient self-efficacy. Self-efficacy is a key factor influencing the sustainability of healthy behavior changes. Another gap lies in the lack of empirical evidence regarding the implementation of multidisciplinary lifestyle interventions within the context of local communities with limited resources, such as puskesmas in urban areas of Indonesia. This highlights the necessity for further research tailored to the unique challenges faced by these settings, addressing both clinical and psychological dimensions to foster more effective diabetes management strategies.

Based on the identified gaps, there is a critical need for research that can empirically evaluate the effects of multidisciplinary lifestyle interventions on various health indicators of individuals with diabetes mellitus in primary healthcare facilities. This research is essential to provide contextual evidence relevant to the health service system in Indonesia, particularly in the development of sustainable promotional and preventive programs. Furthermore, the findings from this study are expected to serve as a scientific basis for the preparation of educational modules for healthcare providers, as well as to strengthen the role of nurses in community-based diabetes management. Through a multidisciplinary approach, the interventions are anticipated not only to improve clinical parameters but also to enhance patients' self-efficacy and quality of life.

The aim of this research is to evaluate the impact of a multidisciplinary lifestyle intervention, which includes nutrition, physical activity, psychological support, and health education, on the health of individuals with diabetes mellitus at Puskesmas Kagok, Semarang. This study seeks to fill a significant gap in the existing literature and provide actionable insights for improving diabetes management in local primary health care settings.

METHODS

Study Design:
A quasi-experimental framework, utilizing a non-equivalent control group pre-test and post-test design, was employed to evaluate the efficacy of a multifaceted lifestyle intervention. Participants with diabetes mellitus were allocated into two cohorts: an intervention group receiving the comprehensive program and a control group maintained under standard conditions without additional lifestyle modification

Participants:
The study population comprised 60 individuals with a confirmed diagnosis of diabetes mellitus, equally distributed into an intervention cohort (n = 30) and a control cohort (n = 30). Participants were selected via a purposive sampling technique, adhering to specific inclusion criteria such as a type 2 diabetes diagnosis, an age range of 30 to 65 years, and a documented commitment to participate in the full duration of the research

Population and Sampling Method:
The population includes all patients with diabetes mellitus at Puskesmas Kagok Semarang. Purposive sampling was employed by selecting participants according to characteristics aligned with the study objectives. The inclusion criteria comprised patients who regularly attend the health center, have no severe comorbidities, and are able to communicate well.

Instrumentation:
Data collection utilizes several instruments:

1. Self-Efficacy Questionnaire: This instrument measures participants' confidence in managing diabetes. It has been validated and shows good reliability, with a Cronbach's alpha value of ≥ 0.85.
2. Fasting Blood Glucose Measurement: Used to evaluate blood glucose levels before and after the intervention.
3. Blood Pressure Measurement: Conducted to assess the effect of the intervention on cardiovascular status.
4. Body Mass Index (BMI): Measured to determine changes in participants' body weight during the study period.

Instruments:
The instruments used in this study consist of a blood glucose measuring device, an automatic blood pressure monitor, and a weighing scale for calculating Body Mass Index (BMI). The protocols for all measurements adhere to the standards set by health organizations.

Procedures and Timeline:
This four-week investigation commenced with baseline evaluations for all 60 participants, encompassing self-efficacy psychometrics alongside clinical measurements of glycemic status, arterial blood pressure, and body mass index (BMI). While the control group followed standard care, the intervention cohort underwent a month-long integrated program featuring dietary counseling, structured physical exertion, mental health advocacy, and health literacy workshops. Upon completion of the four-week cycle, identical diagnostic procedures were replicated to quantify the longitudinal changes across both groups

Analysis:
Statistical processing will be executed via SPSS software. The distributional characteristics of the data will first be evaluated using the Shapiro–Wilk normality test. Given that the data deviated from a normal distribution, the Mann–Whitney U test will be employed to analyze inter-group differences between the intervention and control cohorts. All analytical conclusions will be based on a significance threshold of $p < 0.05$

Scope and/or Methodological Limitations:
The scope of this research includes the evaluation of a multidisciplinary lifestyle intervention program implemented at Puskesmas Kagok Semarang. The study has several methodological limitations, including a relatively small sample size that may not adequately represent the broader population of individuals with diabetes mellitus in Indonesia. In addition, self-reported data may be subject to response bias. This study also does not consider other external factors that could affect patient outcomes, such as access to additional healthcare services and the level of family support.

RESULTS AND DISCUSSION

Results:

A. Frequency Distribution

Table 1.
Frequency Distribution of Respondent Characteristics (n = 60)

Category	Number of Respondents	Percentage (%)
Gender		
Intervention Group		
Male	5	8,3
Female	25	41,7
Control Group		
Male	9	15
Female	21	35
Age		
Intervention Group		
≤ 60 Years	12	20
> 60 Years	18	30
Control Group		
≤ 60 Years	8	13,3
> 60 Years	22	36,7

The demographic profile of the 60 diabetic participants is summarized in Table 1, categorized by gender and age across two equal cohorts (n = 30). Female participants predominated the study population, accounting for 76.7% (n = 46) of the total sample, while males represented 23.3% (n = 14). This trend was observed in both arms: the intervention group comprised 83.3% females and 16.7% males, whereas the control group included 70% females and 30% males. Despite these proportional differences, the gender distribution between the two groups remained statistically comparable

On the other hand, the age-based analysis revealed that the majority of respondents were elderly, evidenced by 40 individuals (66.7%) falling into the age group above 60 years. In contrast, only 20 individuals (33.3%) were aged 60 and below. This age distribution was also uniform across both groups, where in the intervention group, 60% of respondents (18 individuals) were over 60 years old, and 40% (12 individuals) were in the category of 60 years and below. In the control group, the proportion of participants over 60 years was higher, reaching 73.3% (22 individuals), while 26.7% (8 individuals) were aged 60 years and below.

The findings of this study indicate significant demographic characteristics among respondents with diabetes mellitus, with the majority of participants being females aged over 60 years. With a proportion of females reaching 76.7%, or 46 out of 60 respondents, these results are consistent with previous findings that emphasize females tend to have a higher risk of developing diabetes mellitus compared to males. The study suggests that biological and hormonal differences between genders may influence the prevalence of diabetes, which accounts for the predominance of female participants. (Dini et al., 2023)

From the aspect of age, the elderly population over 60 years old dominated the respondents, reaching 66.7%. This finding is consistent with previous research, which highlights that increasing age is often associated with a higher risk of developing diabetes

mellitus due to physiological and metabolic changes that occur with aging. Elderly individuals are often linked to a reduced ability of the body to regulate blood sugar, contributing to the development of diabetes. In this study, the even age distribution between both groups (intervention and control) indicates that the age factor remains relevant in the management of diabetes. (Ilmi & Puspitasari, 2023)

Despite the proportions of females and age distribution indicating certain trends, further analysis revealed that there were no significant differences between the intervention and control groups. This aligns with analyses conducted in other studies, which show that demographic differences do not always lead to significant variations in health outcomes in the management of diabetes, especially when respondent groups are well-randomized. This study emphasizes the importance of designing lifestyle interventions that focus on quality of life and comprehensive disease management, without neglecting the underlying demographic factors. (Celli et al., 2022)

The results of this study highlight the relevance of demographic characteristics, particularly gender and age, in the context of diabetes mellitus. These findings not only provide insights into the population involved in the research but also offer opportunities for the development of more targeted intervention programs, especially for the high-risk elderly group. Therefore, it is crucial to continue further research to understand the complex interactions between demographic factors and their influence on diabetes mellitus management. (Cahyoajibroto et al., 2023)

B. Self-efficacy of diabetes mellitus patients

Table 2.
Data of Pre-Test and Post-Test Results for Intervention and Control Groups

No	Group	*n*	SD ± Median	*Tes Mann withney* (sig.)
1	Intervention Pre - Test	30	2,133 ± 0,345	0.328
	Control Pre - Test	30	2,033 ± 0,413	
2	Intervention Post - Test	30	2.600 ± 0.498	0.000
	Control Post - Test	30	2.100 ± 0.305	

Deskripsi: Signifikan kurang dari (<) 0,05 berarti ada perbedaan yang signifikan

The analysis of self-efficacy among patients with diabetes mellitus shows that at the pre-test stage, there were no significant differences between the two groups. This is reflected in the nearly similar mean self-efficacy scores, namely 2.133 ± 0.345 in the intervention group and 2.033 ± 0.413 in the control group. The Mann-Whitney test produced a p-value of 0.328, which is greater than 0.05, indicating that both groups were equivalent before the intervention was conducted.

ollowing participation in the multidisciplinary lifestyle intervention, the intervention group demonstrated a marked increase in self-efficacy, with the mean score rising to 2.600 ± 0.498. In contrast, the control group showed only a minimal change, reaching 2.100 ± 0.305. Post-test analysis using the Mann-Whitney test yielded a significance value of $p < 0.001$, which is well below 0.05, confirming a highly significant difference between the two groups. These results suggest that the integrated and innovative intervention program effectively enhanced self-efficacy among patients with diabetes mellitus, an essential component in successful disease management and lifestyle modification. The observed improvement in self-efficacy reflects not only the effectiveness of the program but also positive changes in patients' confidence and beliefs regarding their ability to manage their health. (Noviyanti et al., 2021) Self-efficacy refers to an individual's confidence in their capacity to cope with and overcome challenges and plays an important role in diabetes management. Previous research has demonstrated that higher self-efficacy is associated with better treatment adherence, healthier lifestyle behaviors, and improved glycemic control. (Lee et al., 2025)

The multidisciplinary lifestyle program implemented in this study combines various components, such as education about diabetes, social support, and self-management strategies, all of which contribute to enhancing patients' self-efficacy. This aligns with previous research,

which emphasizes that a holistic approach to diabetes management can yield better outcomes in terms of disease control and patients' quality of life. (Runtukahu et al., 2025) While the control group that did not participate in the intervention only experienced a small increase, this highlights the importance of active support and health education in the diabetes management process. The variation in self-efficacy changes between the two groups indicates that without appropriate interventions, patients may feel less informed and less capable of taking the necessary actions in managing their condition.

Evaluating these results is not only significant from a scientific perspective but also has practical implications. The increase in patients' self-efficacy can facilitate better behavioral changes, leading to a reduction in the risk of diabetes complications and an overall improvement in quality of life. Innovative and integrated intervention programs, such as those conducted in this study, can serve as a model that can be applied across various healthcare settings to enhance diabetes mellitus management among a broader population. (Komalasari & Pristianto, 2023)

Considering the existing results, it is crucial for future research to further elaborate on the mechanisms underlying the increase in self-efficacy and to identify the factors that may influence intervention outcomes. Additionally, exploring ways to sustain and enhance patients' self-efficacy in the long term will also be an important step in the ongoing efforts to improve diabetes management. (Wahyuni, 2021)

C. Health Parameters of Diabetes Mellitus Patients

Clinical parameters recorded in this research—including stature, body mass, BMI, blood glucose concentration, and arterial blood pressure—were analyzed as continuous numerical data. The analytical workflow began with descriptive statistics to characterize the sample, followed by non-parametric inferential testing. Specifically, the Mann–Whitney U test was employed to examine disparities between the intervention and control cohorts, while the Wilcoxon signed-rank test was utilized to evaluate longitudinal changes within each group. Given the application of non-parametric methods, the analysis focused on rank-based comparisons rather than assuming normal distribution or homogeneity (Sophiyudin, 2014).

Table 3.
Data on the parameters of the intervention and control groups.

No	Parameter	Treatment Group	*n*	SD ± Median	*Min-Maks*	*Mann Withney (Sig.)*
1	Fasting Blood Sugar Post-Treatment	Intervention	30	132.667 ± 16.227	93.0 - 301.0	0.001
		Control	30	173.133 ± 54.779	104.0 - 372.0	
2	Systolic Blood Pressure Post-Treatment	Intervention	30	136.633 ± 41.409	93.0 - 180.0	0.000
		Control	30	155.533 ± 21.731	119.0 - 219.0	
3	Diastolic Blood Pressure Post-Treatment	Intervention	30	79.400 ± 11.282	54.0 - 98.0	0.005
		Control	30	83.033 ± 24.275	25.0 - 99.0	
4	Nutritional Status (BMI) Post-Treatment	Intervention	30	26.167 ± 4.800	19.0 - 43.0	0.900
		Control	30	26.233 ± 5.309	18.0 - 36.0	

Description: A significance level of less than (<) 0.05 indicates that there is a significant difference.

Table 3 presents a comparison of several health parameters, including fasting blood sugar levels, systolic and diastolic blood pressure, and Body Mass Index (BMI) between the intervention group and the control group following treatment. The Mann-Whitney test was employed for data analysis to identify significant differences between the two groups.

a. The results of the Mann-Whitney test analysis indicate a significant difference in fasting blood sugar (FBS) levels between the intervention group and the control group, with p=0.001. The average FBS in the intervention group was 132.667±16.227 mg/dL, while in the control group it was 173.133±54.779 mg/dL This suggests that the multidisciplinary lifestyle intervention

program is effective in reducing fasting blood sugar levels, and it can be recommended for patients with diabetes mellitus to achieve better blood sugar control.

b. Furthermore, the analysis also revealed significant differences in systolic blood pressure (p=0.000) and diastolic blood pressure (p=0.005) between the two groups. The average systolic blood pressure in the intervention group was 136.633±41.409 mmHg, compared to 155.533±21.731 mmHg in the control group. For diastolic blood pressure, the intervention group also demonstrated better outcomes with an average of 79.400±11.282 mmHg compared to 83.033±24.275 mmHg in the control group. These findings indicate that the intervention program is effective not only in lowering blood sugar levels but also in improving blood pressure control, which is important for reducing the risk of heart complications.

c. On the other hand, no significant difference was found in BMI between the intervention and control groups (p=0.900). The average BMI for the intervention group was 26.167±4.800, while for the control group it was 26.233±5.309, indicating similar values. This suggests that one month of the intervention program may not be sufficient to produce significant changes in patients' BMI. Although lifestyle interventions can assist in weight management, such changes typically take longer to manifest. Therefore, this data does not support the conclusion that the program is effective in managing patients' nutritional status.

d.

Table 4.
Results of Non-Parametric Statistical Analysis using the Wilcoxon Test

Parameter	Group	n	SD ± Median	Min-Maks	Wilcoxon (sig.)
Post-Treatment Systolic Blood Pressure	Intervention	30	132.667 ± 16.227	93.0 - 180.0	0.040
Pre-Treatment Systolic Blood Pressure	Intervention	30	141.000 ± 24.731	92.0 - 209.0	
Post-Treatment Diastolic Blood Pressure	Intervention	30	79.400 ± 11.282	54.0 - 98.0	0.249
Pre-Treatment Diastolic Blood Pressure	Intervention	30	78.467 ± 11.382	54.0 - 100.0	
Post-Treatment Fasting Blood Sugar	Intervention	30	136.633 ± 41.409	93.0 - 301.0	0.001
Pre-Treatment Fasting Blood Sugar	Intervention	30	156,80 ± 50.303	85.0 - 322.0	
Post-Treatment Nutritional Status (BMI)	Intervention	30	26.167 ± 4.800	19.0 - 43.0	0.784
Pre-Treatment Nutritional Status (BMI)	Intervention	30	27.070 ± 4.382	18.0 - 39.4	

Description: A value less than (<) 0.05 indicates a significant effect.

The longitudinal outcomes for the intervention group are detailed in Table 4, based on the Wilcoxon signed-rank test. This non-parametric analysis was specifically employed to evaluate the significance of intra-group health improvements by comparing baseline data with post-intervention results within the experimental cohort

1. **Systolic Blood Pressure**
   The study observed a notable reduction in mean systolic blood pressure, decreasing from 141.000 mmHg at baseline to 132.667 mmHg post-intervention. Wilcoxon analysis yielded a p-value of 0.040, confirming a statistically significant improvement. Conversely, diastolic blood pressure showed a marginal, non-significant increase from 78.467 mmHg to 79.400 mmHg (p = 0.249). These results suggest that while the multidisciplinary program effectively modulated systolic pressure, it had limited impact on diastolic markers. This divergence aligns with prior literature suggesting that diastolic fluctuations often remain independent of systolic changes and may necessitate more specialized therapeutic approaches (Fadlilah et al., 2021)
2. **Fasting Blood Glucose (FBG)**
   The mean fasting blood glucose level decreased significantly from 156.80 mg/dL before the intervention to 136.633 mg/dL afterward. The Wilcoxon test yielded a p-value of 0.001. Since this value is less than 0.05, it indicates that the intervention program had a highly significant effect on lowering fasting blood glucose levels. This reduction suggests that the intervention contributed

to improved glycemic control in patients with diabetes. This result supports earlier studies demonstrating significant decreases in fasting blood glucose following multidisciplinary lifestyle intervention programs..

4. **Nutritional Status (BMI)**
   The average Body Mass Index (BMI) prior to the intervention was 27.070, which decreased to 26.167 after the intervention. The Wilcoxon test showed a significance value of p = 0.784. As the p-value was greater than 0.05, it can be concluded that the intervention did not significantly affect nutritional status as measured by BMI. Although a reduction in mean BMI was observed, the change was not statistically significant. Previous studies indicate that lifestyle interventions need to emphasize weight management more strongly to achieve meaningful BMI reductions in individuals with diabetes**.** (Gao et al., 2025)

Discussion

The results of this study indicate that multidisciplinary lifestyle intervention has a significant impact on health parameters in patients with diabetes mellitus, such as increased self-efficacy and better control over fasting blood glucose levels. Previous research supports these findings, where intervention programs that include dietary education and increased physical activity successfully reduced blood glucose levels and blood pressure in patients with type 2 diabetes. (Susanti et al., 2023) This indicates that good glycemic control is vital, as it can slow down or prevent the development of diabetes complications. Previous research has noted that diabetes management through a multidisciplinary approach yields positive results across many health parameters.(Gerard, 2025)

However, this study found no significant changes in Body Mass Index (BMI) after a one-month intervention period, highlighting the need for a long-term approach to address this aspect. Other research has revealed that while patient self-efficacy may improve, changes in weight often require longer periods and consistency in lifestyle modifications to achieve the desired outcomes.(Oikarinen et al., 2023). In this context, it is important to understand that sustainable changes in diet and physical activity are necessary to address the challenges of weight management in patients with diabetes. Previous studies have indicated that good glycemic control does not always correlate with significant changes in BMI in the short term.(Matsushita et al., 2022)

Therefore, this study emphasizes the importance of interventions that not only focus on improving glycemic control and blood pressure but also on developing programs that support long-term lifestyle changes. Other research indicates that the integration of self-management education in diabetes management can contribute to improved health outcomes. Thus, greater efforts are needed to provide ongoing support for patients as they undertake lifestyle changes, which are expected to have a positive impact on diabetes control. This also opens up opportunities for further research to explore the barriers affecting the success of long-term lifestyle changes in patients with diabetes mellitus. (Nor et al., 2020)

Implications

The implications of the findings from this study are highly significant for the development of intervention programs for patients with diabetes mellitus. The implementation of a healthy lifestyle through a combination of nutritional education, increased physical activity, and psychological support has proven to enhance health outcomes for patients. With research findings demonstrating the effectiveness of these interventions in controlling blood glucose and blood pressure levels, this program can serve as a model for other community health centers (Puskesmas) across Indonesia. The implementation of multidisciplinary lifestyle programs may be proposed as a more comprehensive strategy for diabetes management, focusing on the prevention of cardiovascular complications.

Contribution of the Research

This research makes a significant contribution to the understanding of diabetes mellitus management in Indonesia, particularly in the context of lifestyle interventions. The study adds empirical evidence regarding the importance of a multidisciplinary approach in enhancing self-efficacy and metabolic control among diabetes patients. Supported by findings showing a significant difference between intervention and control groups, this research underscores the necessity of

integrating various healthy lifestyle elements as part of an effective diabetes management strategy. Furthermore, this study opens opportunities for the enhancement of educational modules for healthcare professionals and for the formulation of policies that support similar intervention programs.

By providing a robust framework for lifestyle modification within diabetes care, the study not only addresses immediate health outcomes but also promotes long-term patient engagement and empowerment in managing their condition. This holistic approach may serve as a catalyst for broader systemic changes in healthcare practices surrounding diabetes management in Indonesia.

Limitations

There are several limitations in this research that need to be acknowledged. Firstly, the relatively small sample size of 60 participants may not adequately represent the entire population of diabetes mellitus patients in Indonesia. Secondly, the intervention duration of only one month may serve as a limiting factor in assessing the long-term effects of the implemented program, particularly concerning variables such as BMI. Additionally, this study did not consider other external factors, such as the influence of family support and environment, which could affect the success of lifestyle interventions. Finally, the quasi-experimental design of this research limits the ability to establish causal relationships with a high level of certainty.

Suggestions

Based on the findings and limitations of this study, several suggestions can be proposed for future research. Firstly, subsequent studies should involve a larger and more diverse sample to achieve more generalizable results. Secondly, it is advisable to conduct further research with a longer intervention duration to evaluate more substantial changes in health parameters, including BMI. In addition, integrating an analysis of external and social factors that influence patients' lifestyles could enrich our understanding of the effectiveness of intervention programs. Lastly, it is critical to place greater emphasis on psychological aspects and social support within intervention programs, as these factors may significantly contribute to patients' success in achieving sustainable lifestyle changes.

By addressing these limitations and incorporating these suggestions, future research could substantially enhance our insight into effective diabetes management strategies and promote better health outcomes for individuals living with diabetes mellitus.

CONCLUSION

This study has successfully demonstrated that multidisciplinary lifestyle interventions have a significant impact on the health parameters of patients with diabetes mellitus, such as increased self-efficacy and better control over fasting blood glucose and blood pressure levels. In line with the expectations outlined in the "Introduction" chapter, this research ultimately produces information that supports the conclusions presented in the "Results and Discussion" chapter. This compatibility indicates that the objectives set forth in this study can be achieved through the appropriate approach to diabetes management.

The prospects for developing the results of this research are very promising, with the potential for implementing multidisciplinary lifestyle interventions in various public health settings. This indicates that well-designed programs can sustainably improve the quality of life for patients with diabetes mellitus. Furthermore, the findings of this study encourage further research to explore the factors influencing the success of lifestyle interventions and to evaluate the long-term effectiveness of these programs. Thus, this research not only contributes to the scientific understanding of diabetes management but also provides a foundation for health policies and clinical practices that can enhance overall public health outcomes.

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