IMPLEMENTATION OF EVIDENCE-BASED NURSING PRACTICE THROUGH THE EDUCATION AND AEROBIC MOVEMENT TO BURN BLOOD SUGAR (GEROBAK BALADA) INTERVENTION IN CLIENTS WITH DIABETES MELLITUS AND OBESITY

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ABSTRACT
Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disease whose prevalence continues to increase both globally and nationally, and is commonly experienced by women with obesity. Community-based non-pharmacological interventions that focus on education and physical activity are needed to support the management of this disease. One approach used is the implementation of Evidence-Based Nursing Practice (EBNP) through the Education and Aerobic Movement to Burn Blood Sugar (Gerobak Balada) program. This study aims to analyze the effect of the Gerobak Balada intervention on reducing blood glucose levels in clients with diabetes mellitus and obesity. This is a quasi-experimental pre-post study with an intervention group. The intervention was delivered over 12 sessions between October and December 2024 to 31 DM clients in Rawasari Subdistrict using purposive sampling technique. Data were collected using instruments including random blood glucose (RBG) measurements with Codefree test strips, questionnaires on knowledge, behavior, and frequency of treatment visits. Data were analyzed using paired t-tests. A significant reduction was observed in RBG levels from 304.39 ± 68.10 mg/dL to 236.45 ± 60.72 mg/dL ($p < 0.001$). There were also significant increases in knowledge scores (from 69.90 to 85.68; $p < 0.001$), behavior scores (from 66.81 to 77.03; $p < 0.001$), and treatment visit frequency (from 1.68 to 2.16 times; $p = 0.023$). The implementation of Gerobak Balada proved effective in lowering blood glucose levels and improving knowledge, healthy behavior, and medication adherence in clients with diabetes and obesity. This intervention supports the EBNP approach and has the potential to be integrated into community-based DM prevention programs.

Keywords: aerobics; education; evidence-based nursing practice; gerobak balada; obesity; type 2 diabetes mellitus

INTRODUCTION
Type 2 diabetes mellitus (T2DM) is a chronic metabolic disease characterized by insulin resistance and elevated blood glucose levels that are poorly controlled, posing a high risk of serious complications and reducing patients' quality of life (Magliano & Boyko, 2021). The latest report from the International Diabetes Federation (IDF) Diabetes Atlas (2025) states that 11.1% of adults aged 20–79 years are living with diabetes. By 2050, the IDF projects that 1 in 8 adults—approximately 853 million people—will have diabetes, representing a 46% increase. Indonesia ranks fifth globally in terms of the number of people with diabetes, with 20.4 million cases reported in 2024, and this figure is expected to rise to 28.6 million by 2050.The Indonesian Ministry of Health reported an increase in the prevalence of diabetes from 10.9% in 2018 to 11.7% in 2023 (Ministry of Health RI, 2023). In addition to the high prevalence, there is a significant gap between the number of diagnosed cases and those receiving regular treatment, particularly among productive age and elderly groups. One of the main risk factors for type 2 diabetes is obesity, which

can increase the risk by 80–85% through mechanisms involving insulin resistance and metabolic dysfunction (Klein et al., 2022).

Various efforts have been made by the government, including the issuance of Minister of Health Regulation No. 71 of 2015 on the Control of Non-Communicable Diseases (NCDs) and the strengthening of the Prolanis program at community health centers. However, implementation on the ground remains suboptimal, including the utilization of community health workers as strategic partners in health education and promotion.In the context of community nursing care, the application of Evidence-Based Nursing Practice (EBNP) is a critical foundation for increasing the effectiveness of interventions. EBNP emphasizes the use of the best available scientific evidence, combined with nurses' clinical expertise and patients' preferences, to guide accurate and effective nursing decisions (Roe-Prior, 2022). In the community setting, EBNP supports the development of evidence-based non-pharmacological interventions—such as lifestyle promotion and behavior modification—that can significantly reduce the risk and impact of T2DM (Darmawan et al., 2025).

In Rawasari Subdistrict, there were 4,802 clients with diabetes in 2023, of whom 1,666 were classified as obese based on waist circumference measurements. This situation highlights the need for structured promotive and preventive interventions. Community-based and evidence-driven interventions are essential and form the basis for developing primary, secondary, and tertiary prevention efforts. One such innovation is the Gerobak Balada (Education and Aerobic Movement to Burn Blood Sugar) program—an education and physical activity initiative targeting people with diabetes and obesity, conducted at the community level.Nursing residents, as trained health professionals, play a crucial role in developing innovations and non-pharmacological intervention methods in managing obesity and diabetes. Their main focus is on promotive and preventive efforts, particularly by raising public awareness to prevent obesity and diabetes through healthy lifestyle adoption, regular physical activity, and nutritious diet practices. The resident's role as an educator within the community is strategic in delivering information to high-risk groups. Effective education contributes to improved dietary regulation, increased physical activity, and better adherence to treatment, ultimately leading to more stable blood glucose levels and enhanced quality of life for patients (Putri & Isfandiari, 2013).This study aims to analyze the effect of the Gerobak Balada intervention on reducing blood glucose levels in clients with diabetes mellitus and obesity.

METHOD
This study began with an evidence search using the PICOS method (Population, Intervention, Comparison, Outcome, and Study Design), focusing on articles in English published between 2023 and 2024 that addressed similar topics. The researchers searched for systematic review or meta-analysis articles to serve as references for implementing the intervention. Searches were conducted through MEDLINE, CINAHL, Scopus, and Web of Science databases. Articles were screened using the PRISMA flow diagram. Keywords and Boolean operators (AND, OR) were used to broaden or narrow the search, making it easier to determine relevant articles or journals. The quality of the evidence sources was assessed using the AMSTAR 2 tool.This research employed a quasi-experimental design with a one-group pretest-posttest design in the intervention group. The study was conducted in Rawasari Subdistrict, within the working area of the Rawasari Auxiliary Community Health Center, during October to December 2024. The target population consisted of adult patients with type 2 diabetes mellitus (T2DM) in the working area of the auxiliary health center.

A purposive sampling technique was used with the following inclusion criteria: patients with T2DM and obesity who were undergoing outpatient treatment at the Rawasari Auxiliary Health Center, had a Body Mass Index (BMI) ≥ 25, and were willing to participate as respondents. Exclusion criteria included: patients in critical condition, decreased consciousness, confusion (unable to follow instructions), or pregnancy. The total sample size for this study was 31 respondents.The variables measured included respondent characteristics such as age, sex, occupation, education, marital status, random blood glucose level, body mass index, knowledge, attitude, healthcare service visits, and medication adherence. The instruments used in this study included a questionnaire containing information about respondent characteristics. The tools and materials used during data collection included simple laboratory equipment for blood glucose testing. Random Blood Glucose (RBG) was measured using a Codefree test strip, which is calibrated according to ISO 15197:2015 standards—581 out of 600 results (96.8%) met the criteria. Additional tools included waist circumference measuring tape, weighing scales, microtoise, flipcharts for education, and educational aids for promoting a balanced diet (My Plate/"Isi Piringku").

The intervention was conducted over a period of 8 weeks, consisting of six sessions with intervals of 3 to 6 weeks. Each session lasted between 15 and 45 minutes, with a total contact time of approximately 2.5 hours. At each session, participants received written information. The sessions focused on general information about diabetes, reinforcement of medication adherence, the importance of physical exercise and weight loss, and nutritional advice. All clients were also trained to monitor their blood glucose levels at home using Glucotouch (Lifescan Benelux, Beerse, Belgium) and were provided with the necessary materials (reagent strips and lancets).Univariate analysis was used to observe the frequency distribution of respondent characteristics. Bivariate analysis using a paired t-test was conducted to determine the effect of the Gerobak Balada intervention on blood glucose levels in patients with diabetes mellitus.This study received ethical approval from the Nursing Research Ethics Committee of the Faculty of Nursing, Universitas Muhammadiyah Jakarta, with number 049/F.9-UMJ/IV/2025. Participants provided informed consent. The authors ensured that all procedures adhered to the appropriate guidelines and regulations.

RESULT

Table 1.
Respondent characteristics (n= 31)

Respondent characteristics	f	%
Age (mean±SD)	54.13±7.957	
Gender		
Men	3	9.7
Women	28	90.3
Occupation		
Trader	6	19.4
Doesn't work	25	80.6
Education		
Elementary-middle school Senior	3	9.7
high school	22	71.0
College	6	19.4
Marital status		
Married	23	74.2
Widow/widower	8	25.8
Random Blood Glucose (mean±SD)	304.39±68.096	
BMI (mean±SD)	25.32±3.876	
Knowledge (mean±SD)	69.90±9.775	
Behavior (mean±SD)	66.81±9.673	
Medication Visits (mean±SD)	1.68±1.222	

The results of the study involving 31 clients with type 2 diabetes mellitus (DM) and obesity showed that the average age of the clients was 54.13 years. The majority were female (90.3%), unemployed (80.6%), had senior high school education (71.0%), and were married (74.2%).Before the Gerobak Balada intervention was implemented, the average random blood glucose level of the clients was 304.39 ± 68.096 mg/dL, with an average Body Mass Index (BMI) of 25.32 ± 3.876. The average knowledge score about diabetes mellitus was 69.90 ± 9.775, the average behavior score was 66.81 ± 9.673, and the average number of medical visits was 1.68 ± 1.222 times (Table 1).

Table 2 shows that the intervention significantly reduced the average random blood glucose level from 304.39 ± 68.096 mg/dL before the intervention to 236.45 ± 60.723 mg/dL after the intervention, with a mean difference of 67.94 (95% CI: 55.925–79.946; $p < 0.001$). Conversely, there was a significant improvement in knowledge, which increased from a mean score of 69.90 ± 9.775 to 85.68 ± 5.969 (mean difference: 15.78; 95% CI: –19.695 to –11.854; $p < 0.001$).Behavior scores also significantly improved, rising from 66.81 ± 9.673 to 77.03 ± 3.449 (mean difference: 10.22; 95% CI: –14.289 to –6.162; $p < 0.001$). In addition, the number of medical visits significantly increased from 1.68 ± 1.222 to 2.16 ± 1.440 (mean difference: –0.48; 95% CI: –0.895 to –0.072; $p = 0.023$). However, there was no significant change in Body Mass Index (BMI) ($p = 0.645$).

Table 2.
Pre- and Post-Intervention Comparison in the Intervention Group

Respondent characteristics	Intervention group Mean ± SD		Mean different (95% CI)	p*
	Pre	Post		
Random Blood Glucose	304.39 ± 68.096	236.45 ± 60.723	67.94 (55.925 – 79.946)	<0.001
BMI	25.32 ± 3.876	25.56 ± 4.066	-0.06 (-0.348 – 0.219)	0.645
Knowledge	69.90 ± 9.775	85.68 ± 5.969	15.78 (-19.695 – 11.854)	<0.001
Behavior	66.81 ± 9.673	77.03 ± 3.449	10.22 (-14.289 – 6.162)	<0.001
Medication Visits	1.68 ± 1.222	2.16 ± 1.440	-0.48 (-0.895 – 0.072)	0.023

DISCUSSION
Most of the respondents in this study were women who were unemployed, had completed senior high school education, and were married. These findings are consistent with those of Srikartika et al. (2016), who stated that type 2 diabetes mellitus (DM) is more prevalent among women. Risk factors that make women more susceptible to type 2 DM include higher levels of stress, pregnancy history, the use of hormonal contraceptives, and a tendency toward obesity obesitas (Kautzky-Willer et al., 2023). Previous research also supports these results, showing that most DM patients had a senior high school education (Aprilio et al., 2024). Having senior high school as the predominant education level among respondents is relevant, as individuals at this level typically have a moderate understanding of health concepts and the importance of diabetes management, thereby highlighting the need for educational interventions.In this study, the majority of clients were unemployed, which aligns with research conducted among the elderly in Blimbing Village, Central Java (Prakoso et al., 2024). The respondents' unemployment status strongly supports the selection of accessible, affordable, and flexible intervention media such as educational sessions and community aerobics. Besides facilitating engagement, this condition allowed participants more time to regularly attend the 12-session program from October to December 2024.

The intervention through the Gerakan Edukasi dan Aerobik Bakar Gula Darah (Gerobak Balada, or "Education and Aerobic Movement to Burn Blood Sugar") program showed significant results in reducing random blood glucose levels (RBG), improving knowledge, changing behaviors, and increasing the frequency of medical visits. RBG was measured using the Codefree test strip, which is considered practical, cost-effective, and convenient for respondents. The average RBG decreased from 304.39 mg/dL to 236.45 mg/dL ($p < 0.001$). Although the glucose level had not yet reached the normal range (70–120 mg/dL), this reduction indicates a meaningful improvement in glucose control (American Diabetes Association Professional Practice Committee, 2023). This result is in line with previous studies, where the average fasting blood glucose level decreased from 145.00 mg/dL before low-impact aerobic exercise to 106.70 mg/dL afterward. The study found a significant effect of low-impact aerobic exercise on fasting blood glucose levels in DM clients (Evangeline et al., 2018).The decrease in blood glucose is also supported by evidence from the literature. Based on 10 previous studies, blood glucose levels in intervention groups involving physical exercise decreased by 25.36–76 mg/dL, 0.3–0.4 mmol/L, and 0.02–0.9% (Istiqomah & Yuliyani, 2022). Other studies also reported reductions in blood glucose levels following aerobic physical exercise (Almeida et al., 2020; Dewi & Susilawaty, 2019; Miranda-Tueros et al., 2024; Zheng et al., 2020). Another study that closely resembles this one noted that Diabetes Self-Management Education (DSME)—a program designed to equip people with DM with knowledge, skills, and the ability for self-care—proved effective in increasing knowledge, improving attitudes, and reducing blood sugar levels (Astuti, 2024; Ernawati et al., 2021).

Although the random blood glucose (RBG) level had not yet reached the normal range, the 3-month intervention duration was considered insufficient to produce maximum effects on blood glucose control. Literature suggests that physical activity interventions are most effective when conducted for a minimum of six months to achieve optimal results in obese DM populations with fewer than 200 participants (Miranda-Tueros et al., 2024).There was also a significant increase in knowledge, from 69.90 to 85.68 ($p < 0.001$), followed by an increase in behavior scores from 66.81 to 77.03 ($p < 0.001$). These findings support the study by Astuti (2024), which stated that improved knowledge contributes to greater awareness and more positive attitudes among DM clients in managing their illness. Respondents who had more free time (due to being unemployed) were able to participate actively in the learning process, which supported behavior change. An audiovisual-based DSME intervention showed increased knowledge and self-care skills after five sessions over five weeks (Sari et al., 2022). Another study found improvements in knowledge and adherence to dietary recommendations as well as foot care following DSME interventions (Hailu et al., 2019).The frequency of treatment visits also increased, from 1.68 times to 2.16 times during the intervention period ($p = 0.023$). This indicates a positive impact of the educational program on clients' awareness of the need for regular treatment, which is one of the five pillars of DM management according to the Indonesian Society of Endocrinology (PERKENI, 2015). These five pillars—diet, pharmacological treatment, physical activity, education, and blood glucose monitoring—have been shown to significantly affect the quality of life of DM patients (Suciana et al., 2019).

This study highlights the importance of improving the quality of nursing care for diabetes mellitus patients through the application of nursing theories to enhance patient independence in disease management (Katuuk et al., 2020). Overall, the Gerobak Balada intervention had a positive impact on both clinical indicators and client behavior. This underscores the importance of community-based intervention programs that apply Evidence-Based Nursing

Practice (EBNP) principles as an effective approach to diabetes management at the primary care level.

CONCLUSION
The implementation of the community-based Educational and Blood Sugar-Burning Aerobics Movement (Gerobak Balada) to stabilize blood glucose levels in obese diabetes mellitus clients had a significant effect on reducing blood glucose levels.

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