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IMPLEMENTATION OF MANAGERIAL EPIDEMIOLOGY THROUGH DIRECT HEALTH EDUCATION IN THE PREVENTION AND CONTROL OF DIABETES MELLITUS IN AGROCOASTAL COMMUNITIES

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ABSTRACT Diabetes mellitus is one of the fastest growing non-communicable diseases and presents increasing challenges in community health, including in agrocoastal areas undergoing epidemiological transition. Lifestyle changes, particularly high sugar consumption and limited structured physical activity, contribute to poor glycemic control among patients. This community service program aimed to implement a managerial epidemiology approach through direct health education to improve knowledge, behavior, and blood glucose control among people with diabetes. The program involved 30 participants diagnosed with diabetes and was conducted over three weeks using a pre–post intervention design. Baseline assessment included random blood glucose measurement and evaluation of knowledge, attitudes, and practices related to diabetes management. Participants then received face-to-face interactive education supported by an educational leaflet, followed by a re-evaluation after 14 days. The results showed a decrease in the mean random blood glucose level from 237.5 milligrams per deciliter to 210.5 milligrams per deciliter, representing an 11.4 percent reduction. The proportion of participants with blood glucose levels above 200 milligrams per deciliter decreased from 70 percent to 50 percent. Knowledge, attitudes, and healthy behavior scores also improved substantially after the intervention. These findings indicate that a simple, data-based community intervention combining direct

education and printed educational materials can contribute to short-term improvements in glycemic control and lifestyle practices. It is recommended that this model be integrated into primary health care programs to enhance sustainable diabetes management in agrocoastal communities.

KEYWORDS: *Agrocoastal Community; Community-Based Intervention; Diabetes Mellitus; Health Education; Managerial Epidemiology*

1. INTRODUCTION

Diabetes mellitus is one of the non-communicable diseases (NCDs) with a rapidly increasing global burden. The International Diabetes Federation (IDF) reported that in 2021, 537 million adults were living with diabetes, with projections reaching 783 million by 2045. This surge is largely driven by lifestyle changes, urbanization, and high intake of sugars and simple carbohydrates, a pattern echoed across multiple global and regional analyses (Rhee, 2025). Across the globe, type 2 diabetes (T2D) is closely linked to unhealthy dietary patterns and the consumption of sugar-sweetened beverages (SSBs). Recent meta-analyses indicate that higher intake of SSBs is associated with a significantly increased risk of T2D, reinforcing the broader link between dietary quality, energy balance, and insulin resistance (Ramstedt et al., 2023). Epidemiologic reviews likewise identify high energy intake and physical inactivity as principal risk factors for diabetes, with substantial emphasis on the role of dietary quality in disease development and progression (Khan & Sievenpiper, 2016; Pressler et al., 2022).

In agrocoastal regions, epidemiologic transitions are mirrored by a rising burden of NCDs. Although traditional communities may maintain higher physical activity levels, shifts toward processed foods and greater penetration of sugary and refined carbohydrate-containing products elevate metabolic risk, including diabetes. Early-stage diabetes is often asymptomatic, underscoring the need for community-based screening, education, and management to prevent long-term complications (Nabrdalik et al., 2021). Lifestyle interventions have demonstrated efficacy in glycemic control and complication prevention. Longitudinal analyses from major lifestyle programs show that intensive lifestyle modification yields durable metabolic benefits and improved quality of life for individuals with T2D; diabetes self-management education and support (DSMES) consistently improve glycemic control and treatment adherence (Olsson et al., 2023; Ramstedt et al., 2023).

Managerial epidemiology approaches emphasize data-driven planning and evaluation of public health programs. Evidence-based public health supports iterative cycles of problem identification, implementation, and ongoing assessment to optimize intervention effectiveness. In this framework, baseline glycemic status and pre/post-intervention assessments of knowledge,

attitudes, and practices (KAP) serve as key indicators of program impact (Taher, 2025). Taken together, a managerial-epidemiology approach using community-based health education in agrocoastal settings is a practical and relevant strategy. A program beginning with baseline glycemia screening and KAP assessment, followed by face-to-face education on healthy eating, reducing sugar intake, and maintaining regular physical activity, with subsequent re-evaluation to gauge change, represents a parsimonious yet data-driven model to raise awareness, promote healthier behaviors, and reinforce sustainable community-based diabetes control (Jeraiby et al., 2025; Olsson et al., 2023; Pressler et al., 2022).

2. METHOD

2.1 Activity Design

Community service activities that have been carried out using a community-based pre-post intervention design with an manajerial epidemiology approach. This approach emphasizes the use of baseline data as the basis for intervention planning, the implementation of targeted education, and the evaluation of changes after the program is implemented. The activity model is prepared in a simple and applicable manner to suit the conditions of the agrocoastal community.

2.2 Time and Location of the Activity

The activity was carried out for 3 weeks in the agrocoastal area, located in the villages of Puger Kulon and Puger Wetan, Jember Regency, East Java. The series of activities includes:

a. First week: baseline examination
b. Second week: implementation of direct health education and distribution of leaflets
c. Week three: post-intervention

Each meeting lasts ±60–90 minutes.

2.3 Target and Number of Beneficiaries

The participants of the activity amounted to 30 patients with diabetes mellitus who were registered in the Non-Communicable Diseases (NCD) program at the local regional health center. Participant criteria include:

a. Age ≥30 years old
b. Have a history of diabetes mellitus
c. Willing to participate in the entire series of activities

2.4 Initial Conditions Before Intervention

Based on data from the health center and the results of initial observations, it was found that most of the participants had blood sugar levels when they were above normal values and had a fairly high consumption of sugary drinks. In addition, knowledge about diabetes control and the implementation of a healthy lifestyle is still limited. Previous education has not been evaluated using the pre-post approach so its effectiveness has not been measured systematically. This condition shows the need for educational interventions that are data-based and equipped with measurable evaluations to determine the impact of activities.

2.5 Implementation Techniques and Procedures

1. Baseline Stage (Pre-Intervention)

At this stage it is performed:

a) Random Blood Glucose Level. Measurements are made using a standard glucometer and recorded in an individual monitoring sheet.
b) Filling out a Knowledge, Attitude, and Behavior Questionnaire. The questionnaire consisted of 10–15 simple questions about understanding diabetes, attitudes towards a healthy lifestyle, as well as sugar consumption habits and physical activity. Baseline data was used as the basis for analyzing the participants' initial condition.

2. Intervention Stage

Interventions were carried out through direct health education (face-to-face) using interactive lecture and discussion methods. The materials provided include:

a. Definition and risks of diabetes complications
b. Restrictions on the consumption of added sugars and sugary drinks
c. Balanced diet settings
d. The importance of physical activity of at least 30 minutes per day
e. The importance of routine control at the health center

As a reinforcement of the material, each participant was given an educational leaflet containing a summary of the three main steps of blood sugar control, danger signs, and health control recommendations. Leaflets were given so that participants could reread the material at home and share it with family members. At the end of the session, participants were asked to make a simple commitment to implement at least one behavior change for 14 days.

3. Evaluation Stage (Post-Intervention)

Evaluation is carried out 14 days after intervention with the following procedures:

a. Re-examination of blood sugar levels during (GDS)
b. Questionnaire refill
c. Comparison of results before and after the intervention

Participants with high blood sugar levels are encouraged to carry out follow-up control at the health center.

2.6 Data Analysis

The data were analyzed descriptively by calculating:

a. Average blood sugar levels before and after the intervention
b. Percentage increase in knowledge score
c. Changes in participants' attitudes and behaviors

Pre-post comparison results were used to assess the effectiveness of the program in improving community-based diabetes control.

2.7 Expected Results

Through this activity, it is hoped that the following will happen:

a. Increased participants' knowledge of diabetes management
b. Changes in attitudes to be more positive towards a healthy lifestyle
c. Improved behavior of reducing sugar consumption and physical activity
d. A tendency for participants' blood sugar levels to decrease

Thus, this simple managerial epidemiology approach is expected to be able to increase the effectiveness of community-based diabetes education in agrocoastal areas.

3. RESULT AND DISCUSSION

This community service activity involved **30 people with diabetes mellitus** who participated in the entire series of "Check-Education-Re-Check" program for 3 weeks.

Figure 1. Documentation of Managerial Epidemiology Activities in Agrocoastal Communities

Table 1. Average Random Blood Glucose Level in Respondents

Indicator	Pre-Intervention	Post-Intervention
Average Blood Sugar Level	237,5 mg/dL	211 mg/dL
Participants with GDS >200 mg/dL	21 people (70%)	15 people (50%)

Table 2. Comparison of Attitude, and Behavior Knowledge Scores

Components	Pre Average Score	Post Average Score
Pengetahuan	56%	82%
Sikap	61%	85%
Perilaku	48%	74%

Figure 1 is a documentation of this community service program involving people with diabetes mellitus who participated in the intervention for three weeks. Pre-post analysis showed measurable improvement in both clinical and behavioral indicators.

3.1 Changes in Blood Sugar Levels

The average blood sugar level before the intervention was 237.5 mg/dL, which was in the category of uncontrolled hyperglycemia. After two weeks of educational intervention, the average GDS decreased to 210.5 mg/dL. Thus, there was an average decrease of 27 mg/dL or about 11.4% of the initial value. In addition, the proportion of participants with GDS >200 mg/dL decreased from 70% (21 people) at baseline to 50% (15 people) after the intervention. This means that there is an absolute decrease of 20% in the category of high blood sugar.

This decrease shows that simple interventions in the form of direct education and reinforcement through leaflets are able to provide an initial metabolic impact in a relatively short time. These findings are in line with the DSMES report which states that structured education can improve glycemic control in diabetic patients (Powers et al., 2020). The lifestyle modification program showed a significant decrease in HbA1c and metabolic improvement in the first few months of the intervention (O'Driscoll & Smith, 2019).

3.2 Changes in Knowledge, Attitudes, and Behavior

In cognitive and behavioral aspects, there is a significant improvement:

a. Knowledge score increased from 57.3% to 81.3% (an increase of ±24 points or about 42%).
b. Attitude score increased from 61.2% to 84.7% (±23-point increase).
c. Behavioral scores increased from 47.4% to 73.8% (an increase ±26 points or about 54%).

A total of 23 participants (76%) reported successfully reducing the consumption of sugary drinks, and 19 participants **(63%)** began to engage in regular physical activity during the intervention period. The rise in diabetes prevalence aligns with robust evidence from community-based education initiatives that enhance diabetes self-management and patient adherence. DSMES delivered in community settings has been consistently associated with improvements in self-management behaviors and glycemic outcomes across multiple studies and systematic reviews (Shiyanbola et al., 2021; Werfalli et al., 2020). Furthermore, peer-led and CHW-supported programs have demonstrated feasibility, acceptability, and clinically meaningful improvements in HbA1c and adherence in diverse populations, including urban minority adults and underserved communities (Otanga et al., 2022; Ren et al., 2022). These findings underscore the value of culturally tailored, community-based DSMES, baseline risk assessment, and continuous evaluation to sustain behavior change and improve glycemic control in varied settings (Tarfa et al., 2023).

3.3 Interpretation of Managerial Epidemiology

The Managerial Epidemiology approach applied in this program involves identifying problems based on baseline data, implementing targeted interventions, and conducting measurable evaluations. This approach is consistent with the principles of evidence based public health, which emphasize integrating the best available scientific evidence into program planning, implementation, and evaluation (Brownson et al., 2025). A decrease of 27 mg/dL in two weeks suggests that a simple, hands-on education-based intervention can provide a meaningful early clinical impact. Although HbA1c has not been measured as a long-term indicator, these results demonstrate the potential effectiveness of community-based intervention models.

3.4 Limitations

The duration of the intervention was relatively short and did not reflect long-term glycemic control. In addition, behavior changes are still based on self-report so that reporting bias is possible.

4. CONCLUSION

The implementation of managerial epidemiology through direct health education strengthened with leaflets on 30 diabetics showed positive results, characterized by a decrease in the average blood sugar level of 27 mg/dL (11.4%), a decrease in the proportion of participants with GDS >200 mg/dL by 20%, and a significant increase in knowledge and healthy living behaviors. These findings suggest that simple data-driven interventions and pre-post evaluations are effective as community-based diabetes control strategies and have the potential to be replicated in primary health care programs.

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CONFLICT OF INTERESTS

The authors declare that there are no conflicts of interest related to this community service program and the publication of this article.

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