

Article

Family mentoring on diabetes mellitus dietary patterns using the Pro-DM Application at Kujangsari Primary Health Center, Bandung City

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Abstract

Background: Type 2 Diabetes Mellitus (DM) is a chronic metabolic disease that requires sustainable dietary management. Family involvement is essential to support dietary adherence; however, practical and accessible educational media for families remain limited.

Identification problems: A needs assessment conducted with Kujangsari Primary Health Center and Prolanis coordinators identified limited family knowledge of diabetic dietary management, inadequate skills in dietary monitoring, and limited use of digital educational media to support self-care.

Methods: This community service programme involved 37 family members of active Prolanis patients with Type 2 DM. The programme was implemented through three mentoring sessions consisting of a pre-test, dietary education using the PRO-DM Application, guidance on Food Record completion, participant monitoring, a post-test, and programme evaluation. Outcomes were evaluated descriptively based on participants' knowledge, application utilization, and Food Record completion.

Results: Participants' knowledge of diabetic dietary management increased by 18.9% after the intervention. Most participants (97%) were able to independently use the PRO-DM Application. Although 85% of participants showed low compliance in completing Food Records, the programme successfully introduced a practical digital tool to support family-based dietary education and monitoring.

Conclusion: The programme enhanced participants' knowledge and strengthened family capacity to support dietary management for individuals with Type 2 DM. The PRO-DM Application demonstrated good feasibility as a community-based educational medium, with continued mentoring recommended to improve dietary recording adherence and promote sustainable diabetes self-management.

Keywords: diabetes mellitus, dietary pattern, family, food record, PRO-DM application

1. Introduction

Type 2 Diabetes Mellitus (DM) is a chronic metabolic disease characterized by hyperglycemia resulting from impaired insulin secretion or insulin resistance, with unhealthy dietary patterns particularly excessive carbohydrate consumption among its primary contributing factors. According to the International Diabetes Federation, Indonesia ranked fifth globally in 2021 with an estimated 19.5 million adults living with diabetes, a figure projected to reach 28.6 million by 2050 (Sun et al., 2022). The Indonesian Health Survey (Survei Kesehatan Indonesia/SKI) 2023 further reported that the prevalence of DM in the population aged ≥ 15 years based on doctor's diagnosis increased from 2.0% to 2.2% compared to the 2018 Riskesdas, underscoring an ongoing upward trend driven by urbanization and lifestyle changes (Kemenkes RI, 2023). In West Java Province, a 2022 retrospective study reported a DM incidence rate of 4,761 cases in Bandung City, with diabetes mellitus affecting 1.8% of the West Java population (Sutriyawan et al., 2022).



Effective DM control requires comprehensive lifestyle changes, including dietary restrictions, increased physical activity, appropriate pharmacological regimens, regular medical check-ups, and periodic metabolic monitoring (Ananda et al., 2020). Dietary adherence plays a crucial role in maintaining normal body weight, reducing blood glucose levels, improving lipid profiles, and enhancing insulin receptor sensitivity (Ananda et al., 2020). Comprehensive and sustained dietary education is therefore an essential component of community-level DM management.

A community needs assessment conducted through collaboration with Kujangsari Primary Health Center served as the foundation for this program. Based on a review of Prolanis DM records, 68 DM participants are enrolled, of whom 22 experience unstable blood glucose levels. In-depth qualitative interviews with six Prolanis participants revealed a lack of knowledge regarding appropriate food types and meal timing, further indicating limited health literacy related to dietary self-management (Ananda et al., 2020). These issues were identified jointly with the DM Prolanis coordinator and the head of Kujangsari Primary Health Center during a preliminary assessment visit. Education at the health center is only provided during monthly visits, within a very limited time frame, and without adequate educational media for patients or their families. The family unit itself was identified as a critical but underutilized resource in DM self-management, with caregivers reporting difficulty accessing reliable, practical guidance on dietary planning.

Dietary management of DM must also actively involve the family as the primary care unit. Families hold the responsibility of providing care for sick members (Friedman et al., 2014). Research has shown a significant relationship between family support and the active participation of DM patients in Prolanis (Ananda et al., 2020). However, family involvement in dietary management remains suboptimal, underscoring the need for technology-based interventions that are independently accessible. Family-centered approaches to diabetes care have been shown to improve patient outcomes by strengthening social support, improving dietary adherence, and facilitating the adoption of healthier behaviors in the home environment (Friedman et al., 2014).

The selection of the PRO-DM Application as the primary intervention tool was made based on the results of the needs assessment. Given the identified gap in accessible, engaging educational media, a mobile application was considered appropriate due to the high smartphone ownership rate among Prolanis participants and their families. The PRO-DM Application (Program Rawat Orang dengan Diabetes Mellitus) is an Android smartphone-based innovation developed as an educational solution for DM management. Pilot testing showed that 58.6% of respondents found it easy to use and 32.1% found it very easy to use (Jamiat, 2022), supporting its feasibility in a community setting. Mobile health (mHealth) technologies have demonstrated significant potential in improving diabetes self-management behaviors, particularly in supporting dietary adherence and glycemic control (Pamungkas et al., 2022). The DM Food Record is used as an evaluation tool for implementing the 3J principle (type, quantity, and schedule) in daily dietary intake (Sholihah et al., 2023). This activity aimed to enhance families' ability to use the PRO-DM Application, manage DM diets, and document dietary intake through Food Records.

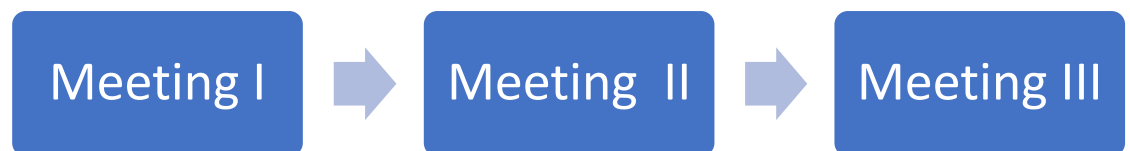
2. Identification problem

A preliminary needs assessment conducted in collaboration with Kujangsari Primary Health Center and the Prolanis coordinator identified several challenges in dietary management among patients with Type 2 Diabetes Mellitus and their families. Although 68 patients were enrolled in the Prolanis programme, 22 continued to experience unstable blood glucose levels. Interviews with Prolanis participants revealed limited knowledge regarding appropriate food selection, meal timing, and dietary planning, while family members reported difficulties accessing practical and reliable educational resources to support daily diabetes care. In addition, dietary education at the primary healthcare center was limited to monthly sessions with insufficient time and educational media to reinforce learning. These findings highlighted the need for a family-centered, technology-based educational programme that could strengthen dietary knowledge, support self-monitoring, and improve family involvement in diabetes management through the PRO-DM Application and Food Record mentoring.

3. Implementation methodology

This community service activity was conducted in the working area of Kujangsari Primary Health Center, Bandung City. The program was developed and implemented in close collaboration with key stakeholders, including the Head of Kujangsari Primary Health Center, the DM Prolanis coordinator, and the university community service team from Universitas Aisyiyah Bandung. Prior to implementation, a coordination meeting was held with the Prolanis coordinator to align the program objectives with the health center's existing services and to ensure the program complemented rather than disrupted routine Prolanis activities. The health center facilitated the recruitment of participants and provided the venue for all three sessions.

Participants consisted of 37 family members of active Prolanis DM patients. Family members were selected as the target population because of their central role in the daily care and dietary management of patients at home. Prolanis healthcare workers assisted in informing eligible participants and facilitating their involvement. The activity was implemented across three structured sessions using a mentoring approach that integrated the PRO-DM Application and Food Record instruments.



Session I covered: program orientation, dietary knowledge pre-test, introduction and guidance on the PRO-DM Application, and instructions for completing the DM Food Record. Application content included healthy eating tips, the 3J principle (type, quantity, schedule), Body Mass Index (BMI) calculation, caloric needs determination, and daily menu planning.

Session II focused on monitoring Food Record completion progress and assisting participants in identifying food categories (carbohydrates, proteins, fats, and vitamins). Prolanis healthcare workers participated in this session to provide supplementary guidance and strengthen the connection between the program and existing health services.

Session III consisted of a post-test and a comprehensive program evaluation. Participants, healthcare workers, and the Prolanis coordinator collectively reviewed the program outcomes and provided feedback to inform future activities.

Knowledge was measured using a validated questionnaire administered before and after the intervention (pre-test and post-test), categorized as Poor, Sufficient, and Good. Food Record compliance was categorized based on documentation completeness. Data were analyzed descriptively and analytically at a significance level of $\alpha = 0.05$.

4. Results and Discussion

Implementation Results



Figure 1. Pre-Test Activity on DM Dietary Pattern Knowledge among Family Mentoring Participants



Figure 2. Delivery of DM Dietary Pattern Education through Interactive Presentation

The mentoring program took place across three structured sessions in close partnership with Kujangsari Primary Health Center. The Prolanis coordinator played an active role in each session, facilitating participant engagement and ensuring continuity with the health center's existing DM management activities. The first session began with pre-test completion and program orientation, followed by dietary pattern education using the PRO-DM Application, which participants downloaded directly onto their smartphones. Documentation of the pre-test and questionnaire completion is presented in [Figure 1](#).

The first session continued with an interactive presentation and discussion on DM concepts and appropriate dietary patterns for DM patients. Participants demonstrated enthusiasm and active engagement throughout all educational sessions. Family members were encouraged to share their experiences in managing their relatives' diets at home, which provided valuable insights and fostered peer learning. Documentation of the material delivery session is shown in [Figure 2](#).

The PRO-DM Application is a free Android-based digital educational tool. Its main interface presents eight menus that users can access directly from the home screen, as shown in [Figure 3](#).



Figure 3. Main Interface of the PRO-DM Application on an Android Smartphone

Each menu within the PRO-DM Application contains structured and informative sub-menus. The complete diagram of the application's menu structure and features is presented in [Figure 4](#). The Diet menu includes the 3J principle, BMI calculation, daily caloric needs assessment, and sample healthy DM menus. In this activity, 97% of participants used the application independently an average of once per day, demonstrating its practical feasibility in a community setting. The high independent usage rate indicates that the PRO-DM Application is well-suited for self-directed learning among family caregivers of DM patients.

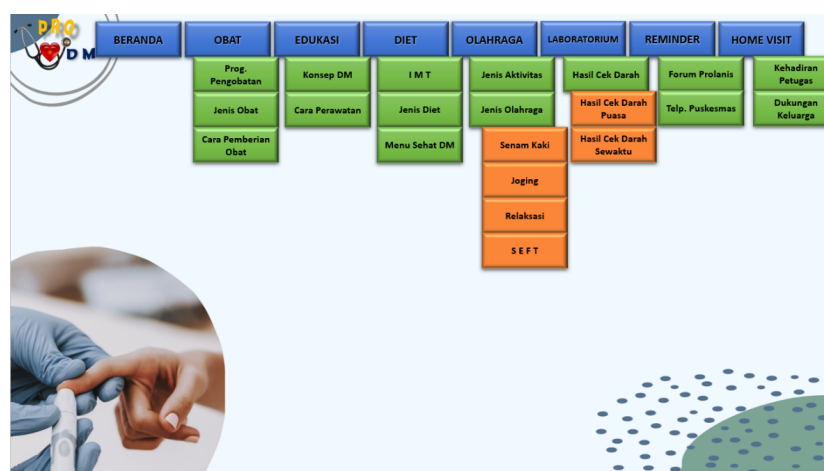


Figure 4. Complete Diagram of PRO-DM Application Menu Structure and Features

Table 1. Characteristics of programme participants (n = 37)

Sample	Value (($\pm$ SD)	n	p-value
Educational level	Senior high school	12	32.4
	Other educational levels*	25	67.6
Duration of caring for a family member with DM	1–5 years	21	56.8
	Other durations*	16	43.2
Android smartphone ownership	Yes	37	100.0
	No	0	0.0
Total		37	100.0

Table 1 presents the characteristics of the programme participants. Most participants were spouses or adult children of patients with Type 2 Diabetes Mellitus who regularly accompanied family members to Prolanis activities. Approximately one-third of participants had completed senior high school education (32.4%), while more than half had provided family care for 1–5 years (56.8%). All participants owned Android smartphones, demonstrating the feasibility of implementing the PRO-DM Application as a mobile health education tool in this community.

Knowledge measurement results before and after the intervention are presented in Table 2, along with mean scores and the scoring range of the knowledge questionnaire.

Table 2. Characteristics of programme participants (n = 37)

Category	Pre-Test (n)	Pre-Test (%)	Post-Test (n)	Post-Test (%)
Poor	1	2.7	0	0
Sufficient	6	16.2	0	0
Good	30	81.1	37	100
Mean Score $\pm$ SD	72.4 $\pm$ 8.3		86.1 $\pm$ 5.7	

Table 2 shows that at baseline, 81.1% of participants were already in the Good knowledge category, with a mean pre-test score of 72.4 $\pm$ 8.3. Following the PRO-DM Application-based educational intervention, all participants (100%) achieved the Good knowledge category, with a mean post-test score of 86.1 $\pm$ 5.7, representing an 18.9% increase ($p = 0.002$). These findings indicate that the mentoring program contributed to improved participant knowledge and demonstrated the practical feasibility of integrating the PRO-DM Application into community-based diabetes education. Health education plays a critical role in changing the behavior of Prolanis participants. Pamungkas et al. (2022) reported that mobile-based diabetes coaching consistently used emotional support and empowering communication to motivate patients toward optimal glycemic control, with significant improvements in self-management behaviors including dietary control. Sun et al. (2022) emphasized that over 10% of the world's adult population now live with diabetes, making scalable digital interventions critical for chronic disease self-management. Nurhayani (2022) demonstrated that targeted health interventions at

the primary care level significantly contribute to blood glucose stabilization in patients with diabetes mellitus.

Community Impact

The community service programme positively impacted family members of patients with Type 2 Diabetes Mellitus by improving their knowledge of dietary management and increasing their confidence in utilizing digital health education. Following the mentoring programme, all participants (100%) achieved a good level of dietary knowledge, with the mean knowledge score increasing from 72.4 ± 8.3 to 86.1 ± 5.7 . In addition, 97% of participants were able to independently operate the PRO-DM Application, demonstrating its practicality as a community-based educational tool.

Although participants showed substantial improvements in knowledge and digital application use, Food Record completion remained low, with 85% of participants demonstrating limited compliance. This finding indicates that while digital education effectively strengthens understanding, continuous mentoring and follow-up are still required to establish consistent dietary self-monitoring practices. Overall, integrating the PRO-DM Application with family mentoring provides a feasible approach to strengthening family empowerment and supporting sustainable dietary self-management among patients with Type 2 Diabetes Mellitus.

Discussion and Practical Reflection

The Food Record is an instrument used to identify the types and quantities of food and beverages consumed by DM patients within a 24-hour period. Activity results indicated that 85% of participants fell under the low compliance category, which is an important finding that warrants deeper examination. Several interrelated factors may account for this low compliance rate. First, many participants reported challenges in accurately estimating food portions and recording preparation methods in detail, reflecting limited familiarity with self-monitoring practices. Second, time constraints among family caregivers particularly those managing multiple household responsibilities reduced the regularity of Food Record completion. Third, the limited duration of the program (three sessions over a short period) may have been insufficient to establish consistent documentation habits among participants. Fourth, limited health literacy, particularly related to nutritional labeling and food categorization, contributed to participants' hesitancy in completing the records independently.

According to Sholihah et al. (2023), optimal Food Record implementation should span seven days. Limitations of this method include the high level of participant cooperation required, and data accuracy that depends on the ability to document food ingredients, preparation methods, and portion estimates. These challenges are consistent with broader findings in the mHealth literature, which highlight that digital self-monitoring tools require adequate user training, sustained motivation, and caregiver support to be effective (Pamungkas et al., 2022). Participants were assisted by facilitators in identifying food categories, calculating BMI and caloric needs, and distinguishing between foods appropriate and inappropriate for DM patients. The findings from this activity underscore the need for more intensive, step-by-step guidance on Food Record completion, potentially supported by visual aids or simplified recording templates that reduce the cognitive burden on caregivers. Future programs should consider extending the monitoring period and incorporating peer-group accountability mechanisms to improve long-term compliance.

The flexible nature of the PRO-DM Application enables users to access educational content at any time, supporting sustained self-directed learning. A combination of engaging digital media and structured in-person mentoring is expected to improve long-term DM dietary adherence and Food Record compliance.

5. Conclusion

The family mentoring activity on DM dietary patterns using the PRO-DM Application at Kujangsari Primary Health Center, Bandung City, contributed to improved participants' dietary knowledge by 18.9% and demonstrated the practical feasibility of integrating digital health tools into community-based diabetes education. While 97% of participants independently used the

PRO-DM Application, Food Record compliance remained in the low category (85%), highlighting areas that require more intensive follow-up and support.

In terms of sustainability, participants can continue using the PRO-DM Application independently following the conclusion of the program, as the application is freely available on Android devices. To support continued engagement, it is recommended that Kujangsari Primary Health Center integrate the PRO-DM Application into routine Prolanis monthly activities as a supplementary educational resource. The Prolanis coordinator can play a pivotal role in reminding and motivating participants to consistently use the application and maintain Food Records between monthly visits. Additionally, community health workers (kader kesehatan) can be trained to provide basic guidance and troubleshooting for the application at the neighborhood level, extending the program's reach beyond formal healthcare settings. Long-term monitoring could be facilitated through periodic review of Food Record documentation during Prolanis sessions and follow-up blood glucose measurements to assess the sustained impact of improved dietary knowledge on metabolic outcomes. Collaboration between the university team and the health center should be maintained through annual community service activities to reinforce and update program content in line with emerging evidence in digital diabetes education.

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Recommendations or sustainability plan

The PRO-DM Application is recommended to be integrated into routine Prolanis activities at Kujangsari Primary Health Center as a supplementary educational tool for patients with Type 2 Diabetes Mellitus and their families. Regular mentoring, periodic review of Food Records, and collaboration among healthcare professionals, community health volunteers, and universities are encouraged to strengthen long-term dietary self-management and support sustainable diabetes care in the community.

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