

RESEARCH ARTICLE

# Caring-Based Psychosocial Intervention Associated with Reduced Diabetes Burnout Among Older Adults with Type 2 Diabetes

Ummu Muntamah<sup>1\*</sup>, Maksum<sup>2</sup>, Wulansari<sup>3</sup>

<sup>1</sup>Postgraduate Program, Universitas Ngudi Waluyo, Semarang, Indonesia

<sup>2</sup>Faculty of Health, Universitas Ngudi Waluyo, Semarang, Indonesia

<sup>3</sup>Faculty of Health, Universitas Ngudi Waluyo, Semarang, Indonesia

**Correspondence:** Ummu Muntamah Email: [ummumuntamah@unw.ac.id](mailto:ummumuntamah@unw.ac.id)

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## ABSTRACT

**Introduction:** Diabetes burnout is a significant psychosocial challenge among older adults with type 2 diabetes, contributing to emotional exhaustion, maladaptive coping, and reduced quality of life. Conventional diabetes management programmes often emphasise biomedical outcomes while insufficiently addressing psychosocial needs. This study examined whether a caring-based psychosocial approach integrated into a community diabetes programme was associated with reduced diabetes burnout and improved coping mechanisms and quality of life among older adults with type 2 diabetes.

**Methods:** A quasi-experimental pretest-post-test control-group study was conducted among 176 older adults with type 2 diabetes enrolled in PROLANIS at primary healthcare centres in Semarang Regency, Indonesia. The intervention group received a four-week caring-based psychosocial programme delivered weekly by trained healthcare providers, focusing on empathetic communication, emotional support, autonomy support, coping-skills training, and family involvement. The control group received standard PROLANIS education. Diabetes burnout, a coping composite score, and quality of life were assessed using the study instruments. Between-group differences were analysed using comparative tests and analysis of covariance (ANCOVA), with adjustment for baseline scores.

**Results:** Participants receiving the caring-based psychosocial intervention demonstrated significantly greater reductions in diabetes burnout and greater increases in the recorded coping composite score and quality-of-life score than participants in the control group (all  $p < 0.001$ ). Mean burnout scores decreased more in the intervention group (Delta = -16.88 vs -11.73), while the coping composite score (Delta = 38.28 vs 22.41) and quality-of-life score (Delta = 40.20 vs 11.77) increased more substantially. ANCOVA confirmed significant between-group differences after adjustment for baseline values.

**Conclusion:** Integration of a caring-based psychosocial intervention into community diabetes management was associated with reduced diabetes burnout and improved psychosocial outcomes among older adults with type 2 diabetes. Empathetic communication, emotional support, coping facilitation, autonomy support, and family involvement may enhance psychosocial adaptation and well-being in ageing populations. Further randomised longitudinal studies are needed to confirm long-term effectiveness and underlying mechanisms.

**Keywords:** Caring-Based Intervention; Diabetes Burnout; Coping Mechanisms; Quality of Life; Older Adults with Type 2 Diabetes

## INTRODUCTION

Type 2 diabetes mellitus is an important chronic disease affecting older adults worldwide. Population ageing has contributed to an increasing number of people living with diabetes and its long-term complications (1). Older adults frequently experience multimorbidity, declining functional capacity, and prolonged dependence on healthcare services, making diabetes management increasingly complex (2,3). The burden of diabetes extends beyond metabolic abnormalities and physical complications. Continuous self-management demands, including medication adherence, dietary regulation, physical activity, and glucose monitoring, may create substantial emotional and psychological strain. Diabetes burnout is characterised by persistent emotional exhaustion, reduced motivation, and disengagement from diabetes-related self-care (4). Unlike diabetes distress, which generally reflects frustration and emotional concerns associated with diabetes management, diabetes burnout represents a more profound and enduring state of psychological fatigue that may interfere with sustained self-management and treatment adherence (5,6). Older adults may be particularly vulnerable because of social isolation, limited family or community support, declining physical function, financial constraints, and lower health literacy (7,8). These factors may reduce coping capacity and increase the emotional burden of chronic illness. Addressing psychosocial adaptation is therefore an important component of type 2 diabetes management in older adults.

Despite growing recognition of psychosocial factors in diabetes care, conventional management programmes continue to emphasise biomedical targets and educational interventions (9). Structured standard PROLANIS education may improve knowledge and some aspects of self-care; however, increased knowledge does not necessarily produce sustained behavioural change, particularly among people experiencing emotional exhaustion or reduced self-efficacy. Older adults facing persistent psychological and social burdens may require support beyond routine education (10). Person-centred and psychosocial approaches that incorporate emotional support, empowerment, autonomy support, and supportive relationships may improve chronic-disease management. Nurse-led, family-centred, empowerment-based, and community-based diabetes interventions have been associated with improved self-care, treatment adherence, emotional well-being, and quality of life (9). Reviews also suggest that combining education with social support and continuity of care may benefit older adults with diabetes (11). Nevertheless, important evidence gaps remain. Previous studies have focused mainly on glycaemic control, treatment adherence, diabetes distress, or general self-management outcomes, while diabetes burnout has received less attention as a distinct psychosocial outcome (12). Few studies have evaluated integrated caring-based psychosocial interventions specifically for older adults with type 2 diabetes in community-based chronic-disease programmes such as PROLANIS (11).

The present study was informed by principles of person-centred care, self-efficacy theory, and the stress-and-coping framework proposed by Lazarus and Folkman. Emotional support, empathetic communication, autonomy support, coping-skills enhancement, and family involvement were expected to strengthen adaptive coping capacity, improve perceived self-efficacy, and reduce the emotional exhaustion associated with diabetes burnout. Integrating these psychosocial components into routine community diabetes services may therefore help older adults maintain adaptive self-management behaviours and improve psychosocial well-being.

Accordingly, this study aimed to evaluate the association between a caring-based psychosocial intervention integrated into the PROLANIS community programme and diabetes burnout, coping mechanisms, and quality of life among older adults with type 2 diabetes. By combining emotional support, autonomy support, coping facilitation, and family involvement within a community-based framework, the study sought to contribute evidence for more holistic and contextually relevant diabetes-management strategies for ageing populations.

## METHODS

### Study Design

This study used a quasi-experimental pretest-post-test control-group design to investigate whether a caring-based psychosocial intervention was associated with changes in diabetes burnout, coping mechanisms, and quality of life among older adults with type 2 diabetes participating in the PROLANIS programme.

A randomised controlled trial was not considered feasible within routine community healthcare services. Participants were already enrolled in ongoing PROLANIS activities at specific community health centres, and random reassignment across service areas could have disrupted scheduled care, reduced programme continuity, and increased the risk of contamination between participants receiving different interventions. Allocation therefore followed the existing organisational structure of the participating health centres.

This approach allowed the intervention to be implemented under real-world community healthcare conditions while maintaining the ecological validity of the study. The design was considered appropriate for evaluating the potential psychosocial effects of the intervention in routine primary healthcare practice and for comparing outcome changes between participants receiving the caring-based psychosocial programme and those receiving standard PROLANIS education.

### Participants and Sample

The target population comprised older adults diagnosed with type 2 diabetes who were registered as active participants in the Indonesian Chronic Disease Management Program (*Program Pengelolaan Penyakit Kronis/PROLANIS*) in participating community health centres in Semarang Regency, Central Java, Indonesia.

The participants in the present intervention study were drawn from the same PROLANIS older-adult cohort of 176 participants previously described in an earlier publication by the first author. That earlier study used a cross-sectional analytic design to describe diabetes burnout and associated factors, whereas the present study used a quasi-experimental pretest-post-test control-group design to evaluate a caring-based psychosocial intervention. The intervention procedures, pretest-post-test assessments, coping and quality-of-life outcomes, and longitudinal comparative analyses reported here were not included in the earlier publication; the present study represents a distinct intervention phase of the broader research programme (13). Participants were recruited using purposive sampling. The inclusion criteria were: (1) age  $\geq 60$  years; (2) a confirmed diagnosis of type 2 diabetes; (3) registration as an active PROLANIS participant; (4) ability to communicate verbally; and (5) willingness to participate and provide written informed consent. The exclusion criteria were: (1) severe cognitive impairment; (2) acute medical complications requiring hospitalisation; and (3) inability to complete the intervention or outcome assessment procedures.

The sample size was determined manually using the standard formula for comparing two independent group means with equal allocation. The calculation assumed a two-sided significance level of  $\alpha = 0.05$ , 80% statistical power ( $1 - \beta = 0.80$ ), and a moderate expected effect size (approximately equivalent to Cohen's  $d = 0.50$ ) for the primary outcome of diabetes burnout. Under these assumptions, the minimum required sample size was 64 participants per group (128 participants in total). To anticipate potential attrition, incomplete questionnaire responses, and other follow-up-related losses during the four-week intervention period, the recruitment target was increased by 37.5%, resulting in a final target sample of 176 participants (88 participants per group). All enrolled participants completed the intervention and post-test assessment, and no participants were excluded from the final analysis.

### Participant Allocation Procedures

Four community health centres (Puskesmas) implementing active PROLANIS services participated in this study. To maintain routine healthcare delivery and minimise contamination between participants, allocation was conducted at the community health centre level.

Two health centres (Puskesmas Lerep and Puskesmas Ungaran) Semarang Regency were assigned to the intervention group because they met the operational requirements for implementing the caring-based psychosocial programme, including administrative approval from the health-centre management, availability of nurses who could participate in facilitator training, compatible PROLANIS schedules for four consecutive weekly sessions, and adequate facilities for small-group psychosocial activities.

The remaining two health centres (Puskesmas Bergas and Puskesmas Kalongan) Semarang Regency were assigned to the control group and continued providing routine PROLANIS education without additional psychosocial intervention components. These centres represented the standard community-based diabetes-management services normally available in the local primary healthcare system.

Allocation was therefore based on programme implementation feasibility and service-delivery considerations rather than differences in participant clinical or psychosocial characteristics. Eligible older adults with type 2 diabetes were subsequently recruited from each participating health centre using purposive sampling. The intervention group included 88 participants recruited from two intervention centres, and the control group included 88 participants recruited from two control centres. All participants completed the intervention period and post-test assessment, and no loss to follow-up occurred during the study period.

### Intervention Procedures

Participants assigned to the intervention group received a structured four-week caring-based psychosocial intervention integrated into routine PROLANIS activities. The programme was developed to address psychosocial problems commonly experienced by older adults with type 2 diabetes, particularly emotional exhaustion, reduced motivation for self-care, ineffective coping responses, and limited social support.

The intervention was delivered in weekly face-to-face group sessions by trained nurses and community healthcare providers. Before implementation, all facilitators participated in a standardised training session covering the intervention objectives, empathetic communication techniques, emotional-support strategies, autonomy-support principles, coping-facilitation methods, and procedures for maintaining participant engagement and intervention consistency.

Each session included approximately 8-12 participants and lasted 60-90 minutes. Educational leaflets, facilitator manuals, structured discussion guides, and session checklists were used to standardise content and delivery across intervention groups. Family members or informal caregivers were invited to selected sessions to strengthen emotional support and promote continuity of diabetes self-management at home.

The intervention protocol comprised the following weekly components:

#### Week 1: Empathetic assessment and diabetes-burnout awareness

Participants were encouraged to discuss their experiences of long-term diabetes management, express emotional concerns, and identify psychosocial challenges related to treatment fatigue, daily self-care demands, and perceived support needs.

**Week 2: Emotional and autonomy support**

This session focused on empathetic communication, self-reflection, confidence-building, and encouragement of active participation in diabetes-related decision-making. Participants were supported in identifying personal strengths and realistic self-management goals.

**Week 3: Coping-skills training and problem-solving strategies**

Participants received training in stress-management techniques, adaptive coping strategies, problem-solving approaches, and methods for overcoming barriers to medication adherence, dietary regulation, physical activity, and other diabetes self-management behaviours.

**Week 4: Family involvement and supportive-care planning**

Collaborative discussions were conducted with participants and family members or caregivers to strengthen emotional support, improve communication about diabetes care, and develop practical plans for sustaining supportive self-management behaviours after the intervention.

Attendance was recorded for each intervention session, and intervention fidelity was monitored through weekly review of standardised facilitator checklists. These procedures were implemented to support consistent delivery of the intervention across participating community health centres. Attendance and fidelity data were used for implementation-monitoring purposes and were not formally summarised or analysed quantitatively; therefore, numerical attendance and adherence results are not reported in this study.

**Control Procedures**

The control group participated in the standard educational programme provided as an integral component of PROLANIS. During these weekly sessions, participants attended 45-60-minute presentations delivered by healthcare professionals. The content covered medication use, dietary guidance, physical activity, and regular blood-glucose monitoring. The approach was informational and did not include emotional counselling, stress-management training, autonomy-support strategies, or structured family involvement.

**Setting and Study Period**

The study was conducted at several community health centres (Puskesmas) in Semarang Regency, Central Java, Indonesia, from January to March 2025. These centres were purposively selected because they actively implemented PROLANIS, the national Chronic Disease Management Programme, which provides structured routine care for people with type 2 diabetes.

**Variables and Measurement Instruments**

Data were collected using three study instruments: a study-adapted Indonesian 18-item form derived from the Diabetes Burnout Scale development work, an Indonesian Brief COPE-based coping measure, and the Indonesian WHOQOL-OLD. Diabetes burnout was assessed using the 18-item candidate form described during development of the Diabetes Burnout Scale (DBS) by Abdoli et al. The published development study administered an 18-item candidate measure before psychometric refinement. In the present study, the 18 administered items were retained for consistency with the original study data. Each item was scored on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree), and item scores were summed to a total ranging from 18 to 90, with higher scores indicating greater diabetes burnout (5).

The published validation ultimately retained a 12-item DBS and evaluated it in adults with type 1 diabetes. Accordingly, the 18-item form used in the present study is described here as a study-adapted form rather than as a previously validated DBS for older adults with type 2 diabetes.

For this study, the 18-item form was translated into Indonesian using a forward-backward translation procedure conducted by the research team. The translated version was reviewed by experts in community nursing, health promotion, and diabetes care for conceptual equivalence, linguistic clarity, and cultural appropriateness, and pilot-tested for comprehensibility among community-dwelling older adults participating in PROLANIS.

In the present sample, the study-adapted Indonesian 18-item form demonstrated high internal consistency (Cronbach's  $\alpha = 0.91$ ). This reliability estimate describes consistency within the present sample and should not be interpreted as evidence of full construct validation of the 18-item form in older adults with type 2 diabetes.

Coping-related responses were assessed using an Indonesian Brief COPE-based measure. The cited Indonesian study evaluated discriminant content validity and reported 21 retained items spanning problem-focused, emotion-focused, and dysfunctional coping dimensions; it did not establish a single unidirectional total score in which higher values necessarily represent better adaptive coping (8).

The present analyses used the coping composite score recorded in the study dataset. Because the exact administered item set and scoring key require verification against the original questionnaire and item-level data, the composite is reported descriptively and is not interpreted here as a uniformly adaptive or maladaptive coping score.

No theoretical total-score range is stated in this revision because the score construction in the source dataset must first be reconciled with the original administered Brief COPE item set and scoring key. The numerical values in the Results tables have not been altered.

The recorded coping composite demonstrated good internal consistency in the present sample (Cronbach's alpha = 0.88). Domain-level interpretation and any distinction between adaptive and maladaptive coping should be based on the verified original scoring key.

Quality of life was measured using the Indonesian version of the World Health Organization Quality of Life-Older Adults Module (WHOQOL-OLD). A published Indonesian validation study using Rasch modelling has reported evidence supporting the reliability and validity of the Indonesian WHOQOL-OLD.

The WHOQOL-OLD consists of 24 items grouped into six domains (facets): Sensory Abilities, Autonomy, Past-Present-Future Activities, Social Participation, Death and Dying, and Intimacy, with four items in each domain. Participants responded to each item using a 5-point Likert scale, with response categories ranging from 1 to 5 according to the item content.

In the present study, scoring followed the WHOQOL-OLD raw-score approach. Negatively oriented items 1, 2, 6, 7, 8, 9, and 10 were reverse-coded before summation so that higher values consistently represented better quality of life. The 24 item scores were summed to obtain a raw total score ranging from 24 to 120; each four-item facet yielded a raw score ranging from 4 to 20.

The published Indonesian validation supports use of the WHOQOL-OLD in Indonesian older-adult populations. In the present study, the Indonesian WHOQOL-OLD demonstrated good internal consistency (Cronbach's alpha = 0.83) (14).

### Data Collection and Quality Control

Administrative approval and ethical clearance were obtained before recruitment. Research assistants and enumerators were trained in the study procedures, ethical requirements, and questionnaire administration. Eligible participants were recruited and provided written informed consent. Baseline assessments were completed using structured questionnaires. The intervention group then received the four-week caring-based psychosocial programme, while the control group continued standard PROLANIS education. Post-test assessments were conducted immediately after the intervention using the same instruments.

To minimise measurement bias, data collectors were separated from intervention facilitators whenever possible. Participants were encouraged to respond honestly, and response confidentiality was emphasised to reduce social-desirability bias. All data were anonymised and stored securely.

### Statistical Analysis

Data were analysed using SPSS version 25. Descriptive statistics were used to summarise participant characteristics. Distributional normality was assessed using the Shapiro-Wilk test.

Baseline between-group comparisons used independent-samples t-tests or Mann-Whitney U tests for continuous variables and chi-square tests or Fisher's exact tests for categorical variables, as appropriate. Within-group pretest-post-test comparisons used paired-samples t-tests or Wilcoxon signed-rank tests.

ANCOVA was performed separately for diabetes burnout, the recorded coping composite score, and quality of life, with post-test scores entered as dependent variables, study group as the fixed factor, and baseline scores as covariates. Adjusted mean differences, 95% confidence intervals (CIs), and associated p values were reported. A two-sided significance level of  $p < 0.05$  was used for all analyses.

### Ethical Considerations

The study received ethical approval from the Health Research Ethics Committee of Ngudi Waluyo University, Semarang, Indonesia (No. 60/KEP/UNW/2025). Permission was obtained from the Semarang District Health Office and participating community health centres. All participants provided written informed consent, and the study was conducted in accordance with ethical principles for research involving human participants.

### Data Availability

The datasets generated and analysed during the current study are not publicly deposited because they contain sensitive health and psychosocial information from older adults with type 2 diabetes. De-identified data may be made available by the corresponding author upon reasonable request for legitimate academic or scientific purposes, subject to approval by the relevant institutional authority at Universitas Ngudi Waluyo and applicable ethical and data-protection requirements. No public repository identifier is currently available.

## RESULTS

### Participant Characteristics

The baseline characteristics of the intervention and control groups are presented in Table 1.

**Table 1.** Baseline Characteristics of Participants

| Variable        | Category | Intervention (n = 88) | Control (n = 88) | p value            |
|-----------------|----------|-----------------------|------------------|--------------------|
| Age (years)     | < 70     | 84 (95.5%)            | 85 (96.6%)       | 1.000 <sup>a</sup> |
|                 | ≥ 70     | 4 (4.5%)              | 3 (3.4%)         |                    |
| Education level | Low      | 70 (79.5%)            | 75 (85.2%)       | 0.429 <sup>b</sup> |
|                 | High     | 18 (20.5%)            | 13 (14.8%)       |                    |
| Gender          | Female   | 30 (34.1%)            | 36 (40.9%)       | 0.436 <sup>b</sup> |

| Variable                           | Category   | Intervention (n = 88) | Control (n = 88) | p value            |
|------------------------------------|------------|-----------------------|------------------|--------------------|
| Employment status                  | Male       | 58 (65.9%)            | 52 (59.1%)       | 0.763 <sup>b</sup> |
|                                    | Unemployed | 48 (54.5%)            | 45 (51.1%)       |                    |
|                                    | Employed   | 40 (45.5%)            | 43 (48.9%)       |                    |
| Duration of DM                     | < 5 years  | 52 (59.1%)            | 44 (50.0%)       | 0.289 <sup>b</sup> |
|                                    | ≥ 5 years  | 36 (40.9%)            | 44 (50.0%)       |                    |
| Burnout score (mean ± SD)          |            | 46.36 ± 15.33         | 42.06 ± 15.31    | 0.846 <sup>b</sup> |
| Coping composite score (mean ± SD) |            | 54.82 ± 12.70         | 53.81 ± 8.94     | 0.845 <sup>a</sup> |
| Quality of life (mean ± SD)        |            | 55.30 ± 10.94         | 53.48 ± 9.75     | 0.667 <sup>a</sup> |

a Fisher's exact test; b chi-square test with continuity correction; c Mann-Whitney U test.

A total of 176 participants were included: 88 in the intervention group and 88 in the control group. No statistically significant between-group differences were reported for age, education level, sex, employment status, diabetes duration, baseline burnout, the recorded coping composite score, or quality-of-life scores (Table 1). Baseline comparability between groups was subsequently evaluated using demographic and psychosocial variables, and no statistically significant differences were identified, supporting the appropriateness of the operational allocation approach.

### Data Normality

The normality of the study variables was assessed using the Shapiro-Wilk test to guide selection of the inferential tests. The results are presented in Table 2.

**Table 2.** Normality Test Results

| Variable                      | Intervention (p-value) | Control (p-value) |
|-------------------------------|------------------------|-------------------|
| Burnout score (pre)           | 0.003                  | 0.001             |
| Burnout score (post)          | 0.001                  | 0.001             |
| Coping composite score (pre)  | 0.001                  | 0.001             |
| Coping composite score (post) | 0.001                  | 0.114             |
| Quality of life (pre)         | 0.001                  | 0.001             |
| Quality of life (post)        | 0.001                  | 0.001             |
| Δ Burnout                     | 0.001                  | 0.001             |
| Δ Coping composite score      | 0.001                  | 0.119             |
| Δ QoL                         | 0.001                  | 0.001             |

Most study variables showed evidence of non-normal distributions in both groups. Post-intervention coping composite scores and changes in the coping composite score in the control group did not show evidence of departure from normality. Non-parametric tests were therefore used for the principal unadjusted comparisons. ANCOVA assumptions were assessed using residual diagnostics and tests of homogeneity; the residual distributions were considered approximately normal, and the sample size was considered adequate for the adjusted analyses.

### Within-Group Changes in Outcomes

Pretest-post-test changes in diabetes burnout, the recorded coping composite score, and quality of life within each group are presented in Table 3.

**Table 3.** Within-Group Changes in Outcomes Before and After the Intervention

| Variable               | Group        | Pre (Mean ± SD) | Post (Mean ± SD) | p value |
|------------------------|--------------|-----------------|------------------|---------|
| Burnout score          | Intervention | 46.36 ± 15.33   | 29.49 ± 7.64     | <0.001  |
|                        | Control      | 42.06 ± 15.31   | 30.33 ± 9.95     | <0.001  |
| Coping composite score | Intervention | 54.82 ± 12.70   | 93.10 ± 5.86     | <0.001  |
|                        | Control      | 53.81 ± 8.94    | 76.22 ± 9.92     | <0.001  |
| Quality of life        | Intervention | 55.30 ± 10.94   | 95.50 ± 4.65     | <0.001  |
|                        | Control      | 53.48 ± 9.75    | 65.25 ± 11.34    | <0.001  |

Wilcoxon signed-rank test.

Both groups showed statistically significant pretest-post-test reductions in diabetes burnout and increases in the recorded coping composite score and quality-of-life score (all  $p < 0.001$ ). Because within-group analyses do not account for temporal or contextual influences, between-group comparisons were conducted to evaluate differential changes.

### Between-Group Differences in Outcome Changes

Between-group differences in changes (Delta) in diabetes burnout, the recorded coping composite score, and quality of life are presented in Table 4.

**Table 4.** Between-Group Differences in Outcome Changes

| Variable                 | Intervention (Mean ± SD) | Control (Mean ± SD) | p value |
|--------------------------|--------------------------|---------------------|---------|
| Δ Burnout score          | -16.88 ± 11.08           | -11.73 ± 10.15      | <0.001  |
| Δ Coping composite score | 38.28 ± 10.91            | 22.41 ± 10.65       | <0.001  |
| Δ Quality of life        | 40.20 ± 10.96            | 11.77 ± 10.57       | <0.001  |

Δ = post-test score - pretest score. Mann-Whitney U test.

Participants in the intervention group showed significantly greater changes than those in the control group for all outcomes (all  $p < 0.001$ ). The intervention group had a larger reduction in diabetes burnout and larger increases in the recorded coping composite score and quality-of-life score. The coping result is reported as a composite-score difference and should not be interpreted as a uniformly more adaptive coping pattern until the original scoring key is verified.

### Adjusted Between-Group Analysis

The ANCOVA results adjusted for baseline scores are presented in Table 5.

**Table 5.** Adjusted Between-Group Analysis (ANCOVA)

| Outcome                | Adjusted mean difference | 95% CI         | p value |
|------------------------|--------------------------|----------------|---------|
| Burnout score          | -5.12                    | -7.88 to -2.36 | <0.001  |
| Coping composite score | 14.62                    | 9.44 to 19.88  | <0.001  |
| Quality of life        | 18.25                    | 12.90 to 23.60 | <0.001  |

Adjusted mean differences represent the intervention group minus the control group after adjustment for baseline scores; positive values indicate higher post-intervention scores in the intervention group.

## DISCUSSION

Among older adults with type 2 diabetes, the caring-based psychosocial intervention was associated with greater short-term reductions in diabetes burnout and greater increases in the recorded coping composite score and quality of life compared with standard PROLANIS education. These findings suggest that integrating emotional support, autonomy support, coping facilitation, and family involvement into community-based diabetes programmes may offer additional psychosocial benefits beyond routine educational approaches. The present study extends previous observational research on diabetes burnout among older PROLANIS participants by evaluating a structured caring-based psychosocial intervention.

The reduction in burnout may be related to the intervention's focus on emotional fatigue and psychological disengagement associated with long-term diabetes management (15). Empathetic communication and emotional support may reduce perceived burden and isolation, while autonomy-supportive interaction may encourage engagement in self-care (6). Because these potential mediators were not measured directly, the proposed mechanisms remain hypothetical (6,16).

The intervention group also showed a greater increase in the recorded coping composite score than the control group. Because the Brief COPE contains conceptually distinct coping dimensions and the scoring key used for the present composite requires verification against the original item-level data, this between-group difference should not be interpreted as evidence that all coping responses became more adaptive. The intervention included coping-skills training and supportive interaction, but domain-specific conclusions require a verified scoring framework (17,18).

The improvement in quality of life may represent a downstream psychosocial change associated with reduced emotional burden and improved coping (18,19). For older adults with diabetes, quality of life reflects not only clinical status but also emotional well-being, social relationships, autonomy, and psychological adaptation. Participants receiving the caring-based programme reported higher post-intervention quality-of-life scores than those receiving standard education. Nevertheless, behavioural and clinical outcomes such as treatment adherence, HbA1c, physical activity, and glucose monitoring were not measured; the findings should therefore be interpreted as psychosocial rather than metabolic or behavioural improvements (20).

The findings are consistent with evidence supporting person-centred and psychosocial models of diabetes care. Nurse-led, empowerment-based, family-centred, and community-based interventions may improve self-management capacity, emotional well-being, and quality of life in people with chronic disease (20,21). Whereas much previous research has focused on glycaemic control, adherence, or diabetes distress, the present study examined diabetes burnout among older adults in a community-based PROLANIS setting (22,23). From a theoretical perspective, person-centred care, self-efficacy theory, and stress-and-coping frameworks may help explain the findings. Emotional support may reduce perceived burden; autonomy support may strengthen confidence; and family involvement may enhance social support and adaptive coping (24). These pathways were not directly measured and should be regarded as proposed explanations.

The findings have potential implications for primary care and community diabetes programmes. Integrating caring-based psychosocial components into PROLANIS may help address emotional and relational needs that routine diabetes education does not fully meet. Implementation could require structured facilitator training, standardised manuals, psychosocial screening for diabetes burnout, and greater family or caregiver involvement. Broader implementation should proceed cautiously because the study did not assess long-term sustainability, feasibility, scalability, or cost-effectiveness (25–27).

Several limitations warrant consideration. The non-randomised quasi-experimental design may have introduced selection bias and limits causal inference. Reliance on self-reported instruments may have introduced recall and social-desirability bias. The brief intervention and immediate post-test assessment do not establish whether the observed changes were sustained. Behavioural and metabolic outcomes, including HbA1c, medication adherence, diet, physical activity, and blood-glucose monitoring, were not measured. Finally, the study was conducted in selected community health centres in Indonesia, which may limit generalisability to other healthcare systems and cultural settings.

Overall, the intervention was associated with short-term reductions in diabetes burnout, higher recorded coping composite scores, and improved quality of life. Further randomised and longitudinal studies are needed to confirm these findings and to clarify the interpretation of coping-domain changes.

## Strengths, Limitations, and Cautions

The findings should be interpreted in light of the following methodological considerations:

**Study design and causal inference:** The non-randomised quasi-experimental design limits causal inference and leaves the possibility of selection bias. Although measured baseline characteristics were reported as comparable, unmeasured confounders such as motivation, psychosocial readiness, existing family support, or general engagement with healthcare may have influenced the outcomes. The findings therefore indicate an association rather than proof of causation.

**Measurement constraints:** Reliance on self-reported instruments may have introduced reporting, expectancy, and social-desirability bias. Participants in the intervention group may have reported more favourable outcomes because of increased interpersonal attention, empathetic interaction, or perceived facilitator expectations.

**Intervention timeline:** The four-week intervention and immediate follow-up do not establish whether the observed benefits were sustained. Diabetes burnout, coping-related responses, and quality of life are dynamic and may change with health status, life events, and the availability of family or community support.

**Multicomponent intervention:** Because the programme combined emotional support, autonomy support, coping training, and family involvement, the contribution of each component cannot be isolated. Future mediation analyses, process evaluations, or factorial designs could examine component-specific effects.

**Risk of contamination:** Recruitment from community health centres within the same regional system may have allowed informal information sharing between participants in the intervention and control groups, potentially attenuating or otherwise distorting between-group differences.

**Context and generalisability:** Participants were older adults actively enrolled in Indonesia's PROLANIS programme and generally had stable functional health and access to healthcare. Generalisation to people with severe frailty, cognitive impairment, structural barriers to care, or different cultural expectations concerning family and autonomy requires caution.

## Recommendations for Future Research

Future randomised controlled trials should recruit larger and more diverse samples and include extended follow-up to evaluate whether changes in burnout, coping-related outcomes, and quality of life are sustained. Before further analyses of Brief COPE outcomes, future work should pre-specify and report domain-specific scoring and distinguish adaptive from maladaptive coping constructs.

Future studies should also assess behavioural and clinical outcomes, such as HbA1c, medication adherence, diet, physical activity, and blood-glucose monitoring, to determine whether psychosocial improvements are accompanied by changes in health behaviour or metabolic outcomes. Implementation feasibility, cost-effectiveness, and scalability should also be evaluated before routine large-scale adoption.

Because the intervention combined several supportive components, factorial designs, mediation analyses, or process evaluations may help identify the contributions of emotional support, autonomy support, coping training, and family involvement. Research involving frail older adults, people with cognitive decline, and diverse sociocultural groups would further clarify adaptability across healthcare settings.

## CONCLUSION

Among older adults with type 2 diabetes, the caring-based psychosocial intervention was associated with greater short-term reductions in diabetes burnout, higher recorded coping composite scores, and better quality of life than standard PROLANIS education. The findings support further evaluation of caring-based psychosocial support while recognising that the Brief COPE composite requires verification against the original item-level scoring framework.

The findings should be interpreted cautiously because the study used a non-randomised quasi-experimental design, relied on self-reported outcomes, and included only an immediate post-intervention assessment. They should not be interpreted as evidence of long-term behavioural or metabolic improvement.

Implementation in primary healthcare would require standardised facilitator training, intervention manuals, routine screening for diabetes burnout, and strategies for family engagement. Large-scale implementation should await evidence on sustainability, feasibility, scalability, and cost-effectiveness.

This study provides preliminary evidence supporting further evaluation of caring-based psychosocial support in community diabetes care. Longitudinal randomised controlled trials are needed to assess long-term psychosocial and clinical effectiveness, operational scalability, and the mechanisms underlying the observed changes.

## DECLARATIONS

**Author contributions:** Ummu: Conceptualisation, methodology, intervention development, study supervision, writing - original draft, and manuscript finalisation. Maksum: Clinical methodology validation, medical-surgical nursing protocol oversight, data interpretation, and critical revision of the manuscript for clinical accuracy. Wulansari: Community data-collection coordination, participant and family engagement, data-analysis support, and manuscript revision. All authors reviewed and approved the final version of the manuscript and accept responsibility for all aspects of the work.

**Conflicts of interest:** The authors declare no potential conflicts of interest concerning the research, authorship, or publication of this article.

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