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EFFECTIVENESS OF STRESS MANAGEMENT EDUCATION IN REDUCING CAREGIVER BURDEN AMONG FAMILY CAREGIVERS OF HEMODIALYSIS PATIENTS: A QUASI-EXPERIMENTAL STUDY

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ABSTRACT
Family caregivers of patients undergoing hemodialysis often experience psychological stress and fatique, which may increase caregiver burden and affect both family well-being and the quality of care provided to patients; therefore, stress management education may offer a practical approach to help caregivers manage these challenges. This study aimed to determine the effect of stress management education on caregiver burden among family caregivers of hemodialysis patients at Islamic Hospital Surabaya Jemursari. A quasi-experimental study with a pretest-posttest control group design was conducted among 36 family caregivers, with 18 participants assigned to the intervention group and 18 to the control group. Caregiver burden was assessed using the Zarit Burden Interview (ZBI). Within-group changes in caregiver in caregiver burden were analyzed using the Wilcoxon Signed-Rank Test, while differences between the intervention and control groups were examined using the Mann-Whitney U test. Caregiver burden decreased significantly in the intervention group following stress management education (p=0.002), whereas No. significant change was observed in the control group (p=0.089). The between-group analysis also showed a significant difference in caregiver burden (p=0.042). These findings indicate that stress management education was effective in reducing caregiver burden among family caregivers of hemodialysis patients. Integrating stress management education into family nursing interventions may help support caregivers, although further studies with larger samples and longer follow-up periods are needed to evaluate its sustained effects.

Keywords: Stress management education; caregiver burden; hemodialysis

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INTRODUCTION

Chronic kidney disease (CKD) is a growing public health concern worldwide and contributes substantially to morbidity, mortality, and healthcare expenditure. Approximately 13.4% of the global population is estimated to have CKD, and its contribution to premature mortality is projected to continue increasing over the coming decades (Kovesdy, 2022; Ulasi et al., 2022; Xie et al., 2025). As kidney function progressively declines, some patients develop end-stage

kidney disease (ESKD) and require renal replacement therapy. Globally, an estimated 4.9–7.08 million people with ESKD require dialysis or kidney transplantation (Lv & Zhang, 2019). Although kidney transplantation is generally considered the preferred renal replacement therapy for eligible patients, hemodialysis remains the most widely used dialysis modality worldwide (Himmelfarb et al., 2020; Sułkowski et al., 2024). In Indonesia, the increasing demand for hemodialysis has implications not only for healthcare services but also for families who provide continuing support throughout treatment. At the local level, the burden of hemodialysis is also evident at Islamic Hospital Surabaya Jemursari, where 235 patients received hemodialysis treatment between January and March 2025, highlighting the substantial demand for long-term renal care and family caregiver support in the study setting. The long-term and repetitive nature of maintenance hemodialysis places family caregivers in an important position in supporting patients throughout treatment.

Family caregivers of patients undergoing maintenance hemodialysis provide assistance that extends beyond accompanying patients to dialysis sessions. Their responsibilities may include medication supervision, dietary and fluid management, transportation, assistance with daily activities, emotional support, and management of treatment-related needs. Sustaining these responsibilities over time can place considerable physical and psychological demands on caregivers. Previous studies have reported stress, anxiety, depressive symptoms, and impaired quality of life among family caregivers of patients receiving hemodialysis (Al Maqbali et al., 2025; Bahall et al., 2025). Within the Transactional Model of Stress and Coping proposed by Lazarus and Folkman, stress arises when individuals appraise environmental demands as exceeding the resources available to manage them. Applied to long-term caregiving, repeated demands combined with inadequate coping resources may contribute to caregiver burden. Prolonged caregiving stress may also affect caregivers' physical and psychological well-being and their capacity to provide sustained support to patients (Arabadjian et al., 2025; Syarif et al., 2025). Caregiver burden is therefore the primary outcome of interest in the present study.

Interventions that strengthen caregivers' ability to manage stress may help reduce the burden associated with long-term caregiving. Among these approaches, stress management education combines information about stress with practical strategies that caregivers can apply when responding to caregiving demands. Psychoeducational interventions have been associated with improvements in caregivers' psychological well-being, resilience, and quality of life, as well as reductions in perceived caregiving burden (Li et al., 2025; Mirhosseini et al., 2022). Stress management programs may incorporate relaxation, problem-solving, cognitive coping strategies, mindfulness, and emotional regulation to strengthen caregivers' responses to stressful situations (Bahari et al., 2025; Shaabna et al., 2025). This approach is consistent with the Transactional Model of Stress and Coping, in which coping resources and responses influence how individuals manage demands perceived as stressful. In the present study, structured stress management education is used as the intervention specifically to address caregiver burden among family caregivers of patients undergoing maintenance hemodialysis.

Despite increasing attention to caregiver support, evidence specifically addressing structured stress management education for family caregivers of patients undergoing maintenance hemodialysis remains limited. Previous research has examined various psychoeducational and supportive approaches, but these interventions have differed in their target populations, intervention components, and measured outcomes (Li et al., 2025; Zhou et al., 2025). Consequently, evidence from broader caregiver interventions cannot necessarily establish whether structured stress management education reduces caregiver burden in family members who provide ongoing care to patients receiving maintenance hemodialysis. Evidence from the Indonesian context is particularly limited, despite the substantial involvement of family members in supporting patients during long-term treatment. This creates a specific research gap concerning whether structured stress management education can reduce caregiver burden among Indonesian family caregivers of patients undergoing maintenance hemodialysis.

The novelty of this study lies in evaluating a structured, nurse-led stress management education program with caregiver burden as the primary outcome in family caregivers of patients undergoing maintenance hemodialysis in an Indonesian hospital setting. Rather than focusing solely on disease-related information, the intervention incorporates stress management strategies, emotional support, relaxation exercises, and adaptive coping approaches intended to help caregivers manage the demands associated with long-term caregiving. By examining this intervention within the context of family caregiving for maintenance hemodialysis, the study provides setting-specific evidence on a practical family-centered nursing approach to caregiver support.

Therefore, this study aimed to determine the effectiveness of stress management education in reducing caregiver burden among family caregivers of patients undergoing maintenance hemodialysis. It was hypothesized that family caregivers who received structured stress management education would show a greater reduction in caregiver burden than those who received routine care.

METHODS

Study Design

This study used a quasi-experimental pretest–posttest control group design. Two groups were included: an intervention group that received a structured stress management education program and a control group that received routine nursing care. Caregiver burden was measured before and after the intervention to evaluate the effectiveness of the educational program by comparing changes within groups and between groups.

Setting

The study was conducted from July to August 2025 at the hemodialysis unit of Islamic Hospital Surabaya Jemursari, East Java, Indonesia. The hospital provides routine maintenance hemodialysis services for patients with chronic kidney disease. Data collection and intervention activities were scheduled in accordance with the patients' regular hemodialysis sessions to facilitate caregiver participation and minimize disruption to their caregiving responsibilities.

Research Subject

The study population consisted of family caregivers of patients undergoing maintenance hemodialysis at Islamic Hospital Surabaya Jemursari. Eligible caregivers were recruited according to the patients' scheduled hemodialysis sessions. To minimize contamination between participants, dialysis schedules were used as clusters for group allocation, with caregivers attending designated schedules assigned to either the intervention or control group. The intervention group received structured stress management education in addition to routine care, whereas the control group received routine nursing care. Each group consisted of 18 participants.

The inclusion criteria were family members who served as the primary caregiver of patients receiving maintenance hemodialysis, were aged 18–60 years, were able to read and communicate in Indonesian, and were willing to participate by providing written informed consent. Caregivers diagnosed with mental disorders that could interfere with study participation and those who did not complete all intervention sessions or post-intervention assessments were excluded.

Participants were recruited using a cluster sampling approach based on the patients' scheduled hemodialysis sessions. Dialysis schedules were used as clusters to minimize potential contamination between study groups, with eligible family caregivers attending designated schedules allocated to either the intervention or control group.

The sample size was calculated manually for two independent groups using $\alpha = 0.05$, 80% power, and an anticipated difference in proportions of 0.50, yielding 16 participants per group.

A finite population correction was applied because the accessible population was limited (N = 200), resulting in 15 participants per group. After adding a 20% allowance for potential attrition, the final sample was 18 participants per group, or 36 participants in total.

Instruments

Caregiver burden was assessed using the Indonesian version of the 22-item Zarit Burden Interview (ZBI), originally developed by Zarit et al. The instrument assesses four components of caregiver burden: emotional burden (15 items), physical health (2 items), social burden (3 items), and financial burden (2 items). The total score ranges from 0 to 88, with higher scores indicating greater caregiver burden. Scores were interpreted as no burden (0–20), mild burden (21–40), moderate burden (41–60), and severe burden (61–88). The Indonesian version of the ZBI has demonstrated good validity and reliability, with a reported Cronbach's alpha of 0.931 (Maria et al., 2022). The validated Indonesian version was used in the present study without modification.

Intervention

Participants in the intervention group (n = 18) received a structured stress management education program delivered in small groups at the hospital's hemodialysis unit over a two-week period. The educational program was specifically developed by the researchers, guided by the Transactional Model of Stress and Coping (Lazarus & Folkman, 1987) and tailored to the unique caregiving context validity, the standardized educational materials and protocol were reviewed under the supervision of an experienced nursing faculty member.

The intervention comprised three structured educational sessions, each lasting approximately 45–60 minutes, as summarized in Table 1. The first session provided education on chronic kidney disease and hemodialysis through lectures, interactive discussions, and a booklet. The second session focused on stress and stress management, including the identification of caregiving stressors, factors influencing stress, adaptive coping strategies, and the role of relaxation in stress management. The third session focused on deep-breathing relaxation, during which participants received instruction and practiced the technique under the guidance of the principal investigator. The intervention was delivered by the principal investigator using standardized educational materials to ensure consistent content across participants. All participants received the same intervention content and duration. Pretest assessment was conducted before the educational intervention, and post-test assessment was completed after the final session. The control group (n = 18) did not receive additional stress management education from the research team and continued to receive routine hospital-based health education, which was provided every three months using leaflets.

Table 1. Overview and Stages of the Stress Management Education Intervention

Session	Topic	Objectives	Core Activities & Methods	Duration & Setting	Media / Materials
Session 1	Chronic Kidney Disease (CKD) & Hemodialysis Overview	Increase caregiver understanding of the patient's illness, treatment process, and care requirements	Brief lecture on CKD and maintenance hemodialysis Interactive group discussion addressing common care challenges	45–60 mins (Small groups, HD unit)	Educational booklet, presentation

Session 2	Stress & Adaptive Coping Strategies	Identify specific caregiving stressors and explore effective cognitive and behavioral coping responses	Discussion on adaptive coping mechanisms Overview of the role of relaxation in stress reduction	45–60 mins (Small groups, HD unit)	Educational booklet, presentation
Session 3	Practical Relaxation Skill: Deep-Breathing Technique	Equip caregivers with practical self-regulation skills to reduce physiological and emotional tension	Supervised participant return-demonstration and practice	45–60 mins (Small groups, HD unit)	Educational booklet, presentation
Control group	Routine Care	Provide standard institutional support	Hospital-based routine health education	Every 3 months	Informational leaflets

Data Analysis

The collected data were analyzed using IBM SPSS Statistics version 26. Descriptive statistics, including frequencies and percentages, were used to summarize participants' demographic characteristics and caregiving burden categories (Liu et al., 2020) . Prior to inferential statistical analysis, the assumption of normality was assessed using the Shapiro-Wilk test, which is recommended for small sample sizes (n = 18 per group). Because the caregiver burden data were categorized on an ordinal scale and significantly violated the assumption of normal distribution ($p < 0.05$), non-parametric statistical tests were applied. The Wilcoxon signed-rank test was utilized to evaluate within-group differences between pre-test and post-test caregiver burden scores for both the intervention and control groups (Kurniawati, 2023) . In addition, the Mann–Whitney U test was performed to compare post-test caregiver burden distributions between the two groups. A two-tailed p-value < 0.05 was established as the threshold for statistical significance.

Ethical Consideration

This study was conducted in accordance with ethical principles for research involving human participants. Prior to data collection, informed consent was obtained from all participants. The purpose, procedures, potential risks, and benefits of the study were clearly explained, and participants were assured of their right to withdraw at any time without penalty. Confidentiality and anonymity were strictly maintained by assigning codes to all respondents and securely storing the data (Naryati et al., 2023). The research protocol was reviewed and approved by the Health Research Ethics Committee of Surabaya Jemursari islamic Hospital, with reference number No.082/KEPK-RSISJS/VII/2025. All procedures adhered to the Declaration of Helsinki and national regulations concerning ethical research on human subjects.

RESULTS

This section presents the main findings of the study regarding the effect of stress management education on caregiver burden among families of hemodialysis patients at Rumah Sakit Islam Surabaya Jemursari. The results are summarized to highlight the key outcomes without providing excessive detail. Tables are used to present the distribution of caregiver burden before and after the intervention, as well as the statistical analysis results. All tables are single-

spaced, systematically numbered, and include concise titles. Footnotes are provided to explain any non-standard information contained in the tables (Noverial & Putri, 2023).

Characteristics of Respondents

Table 2. Characteristics of Respondents

Characteristics	Intervention Group (n = 18)		Control Group (n = 18)	
	n	%	n	%
Age (Years)				
18-25	1	5.6	4	22.2
26-35	3	16.7	3	16.7
36-45	5	27.8	3	16.7
46-55	8	44.4	7	38.9
56-60	1	5.6	1	5.6
Work				
Unemployed	2	11.1	0	0.0
Housewife	10	55.6	7	38.9
Retired	0	0.0	0	0.0
Civil Servant	1	5.6	1	5.6
Private Employee	0	0.0	4	22.2
Self-Employed	2	11.1	3	16.7
Other	3	16.7	3	16.7
Relationship With Patients				
Children	5	27.8	7	38.9
Husband	5	27.8	6	33.3
Wife	7	38.9	4	22.2
Siblings	0	0.0	1	5.6
Others	1	5.6	0	0.0
Length of Patient Care				
<1 Year	7	38.9	7	38.9
1-3 Years	4	22.2	4	22.2
>3 Years	7	38.9	7	38.9
Other Family Members Who Help Care for the Patient				
There isn't any	6	33.3	7	38.9
There is	12	66.7	11	61.1
Other family Members Being Cared For				
There isn't any	16	88.9	17	94.4
There is	2	11.1	1	5.6
Number of Family Members Who Become a Burden				
3	15	83.3	16	88.9
4	2	11.1	2	11.1
5	1	5.6	0	0.0
6	0	0.0	0	0.0
>6	0	0.0	0	0.0
Financing Facilities				
BPJS	18	100.0	18	100.0
Other health insurance	0	0.0	0	0.0

Table 2 shows the demographic and caregiving characteristics of the respondents in both the intervention and control groups. The majority of caregivers were aged 46–55 years, predominantly female, and had a close emotional relationship with the patient (as spouse or child). Most were housewives and received support from other family members in caregiving tasks. All respondents utilized BPJS health coverage, and most had three family members as dependents. These characteristics may act as both protective and risk factors influencing caregiver burden (Sivasankar et al., 2025).

Table 3. Characteristics of Respondents Based on Family Caregiving Burden in the Intervention Group at the Hemodialysis Unit

No	Family Caregiving Burden	Pre-Test		Post-Test	
		n	%	n	%
1.	No Burden	11	61.1	17	94.4
2.	Mild Burden	7	38.9	1	5.6
3.	Moderate Burden	0	0.0	0	0.0
4.	Severe Burden	0	0.0	0	0.0
	Total	18	100	18	100

Source: Primary Data, July 2025

Prior to receiving stress management education, most respondents in the intervention group reported no caregiving burden, although a smaller proportion experienced a mild burden. After the intervention, the number of respondents with no caregiving burden increased substantially, demonstrating a clear improvement in their caregiving experience following the educational sessions (Sosialita & Hamidah, 2021).

Before the intervention, most respondents (61.1%) reported having no caregiving burden, while 38.9% experienced a mild burden. After receiving stress management education, nearly all respondents (94.4%) reported no caregiving burden, indicating that the educational program effectively reduced perceived stress and improved coping abilities among family caregivers.

Table 4. Characteristics of Respondents Based on Family Caregiving Burden in the Control Group

No	Family Caregiving Burden	Pre-Test		Post-Test	
		n	%	n	%
1.	No Burden	10	55.6	15	83.3
2.	Mild Burden	7	38.9	3	16.7
3.	Moderate Burden	1	5.6	0	0.0
4.	Servere Burden	0	0.0	0	0.0
	Total	18	100	18	100

Source: Primary Data, July 2025

Before the intervention, the majority of respondents in the control group also reported no caregiving burden, with a few experiencing mild to moderate levels. Following standard hospital care without additional educational intervention, a moderate improvement was observed, though not as prominent as in the intervention group (Sudhan & Jahira Parveen, 2025). Prior to the observation, most control respondents (55.6%) reported no caregiving burden. After receiving only the standard hospital procedure, 83.3% reported no burden, indicating a slight improvement possibly related to routine care support, though without the structured benefit of the stress management education program.

Table 5. Analysis of Family Caregiving Burden in the Intervention and Control Groups at the Hemodialysis Unit

Indicator		Intervention Group (n=18)		p-value[a]	Control Group (n=18)		p-value[a]	Between-group p-value[b]
		Pre-Test n(%)	Post-Test n(%)		Pre-Test n(%)	Post-Test n(%)		
Family Caregiving Burden	No Burden	11(61.1)	17(94.4)	0.002	10(55.6)	15(83.3)	0.089	0.042
	Mild Burden	7(38.9)	1(5.6)		7(38.9)	3(16.7)		
	Moderate Burden	0(0.0)	0(0.0)		1(5.6)	0(0.0)		
	Severe Burden	0(0.0)	0(0.0)		0(0.0)	0(0.0)		

Normality testing via the Shapiro-Wilk test confirmed that caregiver burden scores in both the intervention and control groups deviated significantly from a normal distribution at both baseline and post-intervention evaluations ($p < 0.05$). Consequently, non-parametric analyses were conducted.

The distribution of family caregiving burden before and after the intervention is summarized in Table 4. At baseline, the majority of caregivers in both groups experienced no burden (intervention: 61.1%, n = 11; control: 55.6%, n = 10) or mild burden (38.9%, n = 7 in each group), with one participant (5.6%) in the control group reporting moderate burden. Following the intervention, the proportion of participants with no burden in the intervention group increased to 94.4% (n = 17), with only 5.6% (n = 1) reporting mild burden. The Wilcoxon signed-rank test confirmed a statistically significant reduction in caregiver burden in the intervention group ($p = 0.002$). In contrast, while the control group showed a slight shift toward lower burden categories at post-test, this within-group change was not statistically significant ($p = 0.089$). Furthermore, between-group comparison using the Mann–Whitney U test demonstrated a statistically significant difference in post-test caregiver burden between the intervention and control groups ($p = 0.042$), indicating that structured stress management education was significantly more effective than standard hospital care in alleviating caregiver burden.

DISCUSSION

This study examined whether stress management education was associated with changes in caregiver burden among family caregivers of patients undergoing hemodialysis. Caregiver burden decreased significantly within the intervention group, and the post-intervention comparison showed a significant difference between the intervention and control groups. These findings suggest that structured stress management education may contribute to reducing caregiver burden. However, given the quasi-experimental design, small sample size, and single-center setting, the findings should be interpreted as evidence of an association rather than definitive evidence of a causal effect.

The sociodemographic characteristics showed that most caregivers were middle-aged adults, predominantly between 36 and 55 years of age. This age distribution is consistent with findings reported by (Sajadi et al., 2021), indicating that caregiving responsibilities are frequently assumed by adults in middle age. Women also represented a substantial proportion of the caregivers, with housewives accounting for 55.6% of the participants. Similar patterns have been reported in previous studies, in which women frequently assumed family caregiving responsibilities and experienced psychological demands associated with prolonged caregiving (Pacheco Barzallo et al., 2024; Sharma et al., 2016). These characteristics provide important context for understanding the caregiver population included in the present study.

Most caregivers were either spouses or children of the patients, indicating that caregiving responsibilities were primarily undertaken by close family members. Previous research has shown that spousal caregivers may experience emotional distress while supporting partners with chronic illness (Monin et al., 2019). In addition, nearly 40% of the participants had provided care for more than three years, indicating prolonged exposure to caregiving responsibilities. (Yi et al., 2021) similarly reported an association between longer caregiving duration and cumulative stress and reduced quality of life. Although these characteristics may be relevant to caregiver burden, the present study did not specifically examine whether caregiver relationship or duration of caregiving modified the response to the intervention.

The main finding was a reduction in caregiver burden following the intervention. In the intervention group, the proportion of caregivers classified as having no burden increased from 61.1% before the intervention to 94.4% afterward, while the proportion with mild burden decreased from 38.9% to 5.6%. The within-group analysis showed a statistically significant change in the intervention group (Wilcoxon Signed-Rank Test, $p = 0.002$), and the between-group comparison using the Mann–Whitney U test also showed a statistically significant

difference (p = 0.042). These results suggest that stress management education may contribute to reducing perceived caregiver burden among family caregivers of patients undergoing hemodialysis.

Importantly, improvement was also observed in the control group, where the proportion of participants classified as having no burden increased from 55.6% at baseline to 83.3% at follow-up, although the within-group change was not statistically significant (p = 0.089). This finding indicates that the improvement observed during the study period cannot be attributed exclusively to the structured intervention. Routine care, repeated assessment, regression to the mean, or other contextual factors may have contributed to changes in caregiver burden in both groups. Because these potential influences were not directly measured, their individual contributions cannot be determined from the present data. The greater improvement observed in the intervention group nevertheless provides preliminary evidence supporting further evaluation of structured stress management education in this caregiver population.

The findings can be interpreted within the Transactional Model of Stress and Coping proposed by Lazarus and Folkman (1984), which conceptualizes stress as arising from the appraisal of environmental demands in relation to available coping resources. Stress management education is conceptually consistent with this framework because it provides caregivers with strategies for responding to stressful caregiving situations. However, the present study measured caregiver burden as the primary outcome and did not directly assess changes in cognitive appraisal, self-efficacy, emotional regulation, or specific coping mechanisms. Therefore, although the theoretical model provides a useful framework for interpreting the findings, the mechanisms through which the intervention may influence caregiver burden cannot be established from the current data.

The present findings are generally consistent with previous studies of educational and supportive interventions for family caregivers. (Alavi & Sotoudeh, 2023) reported improved psychological outcomes following family-centered supportive education among caregivers of patients undergoing hemodialysis, while (Farzi et al., 2019) described benefits of targeted educational approaches for caregivers' coping and perceived stress. (Nuriyyatiningrum et al., 2020) also reported favorable psychological outcomes following psychoeducational support for caregivers of patients with chronic kidney disease. In addition, (Khouban-Shargh et al., 2024), reported improvements following stress management training among caregivers of patients receiving hemodialysis. Taken together, these studies provide a relevant context for the present findings, although differences in intervention content, outcome measures, study populations, and methodological designs should be considered when making direct comparisons.

A relevant feature of the present intervention was its structured focus on stress management in addition to information related to caregiving. The program included educational and supportive components intended to help caregivers manage the psychological demands associated with caregiving. The observed reduction in caregiver burden suggests that incorporating stress management into caregiver education may be beneficial. Nevertheless, the present study did not separately evaluate the contribution of individual intervention components; therefore, it is not possible to determine which component, or combination of components, was responsible for the observed changes.

From a clinical perspective, the findings suggest that structured stress management education may be considered as a supportive component of family-centered care in hemodialysis services. Nurses are well positioned to provide caregiver education because of their continuing interaction with patients and families during long-term hemodialysis treatment. However, implementation beyond the study setting requires further evaluation of feasibility, acceptability, resource requirements, and sustained outcomes. The current findings do not provide sufficient evidence to determine whether such an intervention would reduce healthcare utilization or

costs, and these outcomes should be examined directly before policy or economic conclusions are drawn.

Several limitations should be considered when interpreting the findings of this study. First, the relatively small sample size (*n* = 36) and recruitment from a single hemodialysis unit may limit the statistical power and generalizability of the findings. Second, the quasi-experimental design did not involve random allocation to the intervention and control groups. Consequently, selection bias and unmeasured differences between groups cannot be excluded, limiting the ability to establish a causal relationship between stress management education and changes in caregiver burden.

Third, potential baseline differences between the intervention and control groups should be considered when interpreting the between-group findings. Although baseline characteristics should be assessed to determine group comparability, the small sample size may limit the ability to detect meaningful differences between groups. Any baseline imbalance could influence the magnitude of the observed post-intervention differences. Fourth, caregiver burden was assessed using the original caregiver burden questionnaire. Although the original instrument was used without modification, caregiver burden was measured through self-report, which may be susceptible to recall, response, and social desirability biases. These potential sources of measurement bias should be considered when interpreting changes in caregiver burden scores.

Fifth, participants in both the intervention and control groups were recruited from the same hemodialysis unit. Therefore, contamination between groups cannot be completely excluded, as participants may have interacted and exchanged information related to stress management during the study period. The extent of such information exchange was not assessed and may have influenced the observed outcomes. This possibility is particularly relevant because improvement was also observed in the control group. Sixth, the relatively short follow-up period limits conclusions regarding the sustainability of the observed changes in caregiver burden. Although improvement was observed following the intervention, the present study cannot determine whether these changes persisted beyond the study period. Future studies should include longer follow-up periods with repeated assessments to evaluate the sustainability of intervention-related changes. Seventh, the characteristics of the participants may limit the applicability of the findings to more diverse caregiver populations. A substantial proportion of participants were women and housewives, while caregivers with different occupational, socioeconomic, and family circumstances may experience different caregiving demands. Furthermore, because the study was conducted in a single Indonesian healthcare setting, sociocultural and healthcare-system factors should be considered when applying the findings to other populations or settings.

Finally, the intervention was delivered through face-to-face sessions, which may limit its scalability in settings with restricted personnel or resources. Future research should evaluate stress management education using larger multicenter samples, randomized allocation where feasible, longer follow-up periods, and strategies to minimize contamination between study groups.

IMPLICATION AND LIMITATIONS

Implications For Nursing Practice

The findings suggest that structured stress management education may be considered as a supportive component of family-centered nursing care for family caregivers of patients undergoing maintenance hemodialysis. Nurses are well positioned to identify caregiver burden and provide education and supportive strategies to help family caregivers manage the demands associated with long-term caregiving. However, given the quasi-experimental design, non-randomized allocation, small sample size, and single-center setting, the findings should be interpreted cautiously and require confirmation in larger and more rigorous studies

before broader implementation. Future research should evaluate the feasibility, acceptability, sustainability, and effectiveness of the intervention across different hemodialysis settings. As healthcare utilization and economic outcomes were not assessed, the present findings do not support conclusions regarding reductions in healthcare costs or integration into the BPJS financing system.

Limitations

Several limitations of this study should be acknowledged. First, the relatively small sample size (n = 18 per group, total N = 36) and the single-center setting at a single hemodialysis unit may constrain the statistical power and limit the generalizability of the findings to broader populations of hemodialysis caregivers across diverse clinical and cultural settings. Second, the quasi-experimental design without complete random assignment may introduce selection bias, although baseline demographic and clinical characteristics between groups were comparable. Third, the outcome assessment relied solely on self-reported questionnaires, which may be subject to response bias, social desirability, or recall bias, and lacked objective physiological markers of stress (e.g., cortisol levels, heart rate variability, or blood pressure monitoring). Fourth, post-intervention outcomes were evaluated immediately following the final educational session over a two-week period. Consequently, the long-term retention of stress management skills and the sustained impact on caregiving burden remain unknown. Future longitudinal studies with extended follow-up intervals (e.g., 3 to 6 months) are needed to assess long-term sustainability. Finally, a baseline floor effect was observed, as over half of the participants in both groups initially exhibited "no burden" or "mild burden," leaving limited room to measure reductions in moderate-to-severe burden categories. Future trials should recruit larger, multi-center cohorts and evaluate whether baseline burden severity moderates intervention efficacy.

CONCLUSION

The findings suggest that stress management education may contribute to reducing caregiver burden among family caregivers of patients undergoing hemodialysis. A greater reduction in caregiver burden was observed in the intervention group than in the control group, although improvement was also observed in the control group. These findings provide preliminary support for the potential use of structured, nurse-led stress management education as a supportive component of family-centered nursing care in hemodialysis settings. However, given the quasi-experimental design, small sample size, single-center setting, and short follow-up period, the findings should be interpreted cautiously and confirmed through larger, multicenter studies with more rigorous designs and longer follow-up.

SUGGESTIONS

Hemodialysis units are encouraged to integrate structured stress management education into routine caregiver support programs. Nurses should provide practical coping strategies, emotional support, and opportunities for discussion to help caregivers manage long-term caregiving demands. Future studies should involve larger multicenter samples, longer follow-up periods, and hybrid delivery methods combining face-to-face and digital education to assess the sustainability and broader applicability of the intervention.

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DECLARATION OF INTEREST

The authors declare that there is no conflict of interest

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AUTHOR CONTRIBUTION
Author 1: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, Writing – Original Draft Preparation.
Author 2: Conceptualization, Methodology, Supervision, Validation, Formal Analysis, Writing – Review & Editing, Project Administration.
Author 3: Methodology, Validation, Investigation, Writing – Review & Editing.
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