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The efficacy of training based on the family-centered empowerment model on the mental health of aged women: a stratified randomized controlled trial

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Abstract

Background Mental health among older women is substantial due to their longer life expectancy. They are more susceptible to mental disorders like depression and anxiety compared to older men. Additionally, older women fulfill essential family roles and depend on social support for age-related health issues. Family-centered education provides a platform to assist families and foster a collaborative relationship between the patient, family members, and health care providers in end-of-life care. The study aimed to explore how education based on family-centered empowerment model affects mental health in aged women.

Methods This randomized controlled trial involved a group of 60 elderly women aged 60 years and older, specifically selected from elderly-friendly health centers in Tabriz-East Azerbaijan, who were randomly assigned to either an intervention or control group with an equal ratio. The intervention group received a family-centered healthy lifestyle intervention weekly for 10 sessions, while the control group received standard care from elderly-friendly centers. The mean score of mental health using a three-part questionnaire of demographic-anthropometric characteristics and a mental health questionnaire (GHQ) were assessed before the intervention, 4 and 8 weeks after the intervention through SPSS/version 13 using, ANCOVA, independent t-test, and repeated measure analysis at a significant level of $p < 0.05$.

Results The average age (standard deviation: SD) was 64.0 (3.8) years. The literacy level of the more than half of the participants was primary school. Regarding occupation and marital status, the majority of them were married and housekeeper. Two months after the intervention (end of the intervention), a significant decrease was detected in terms of overall mental health score in the intervention group compared to the control (the adjusted difference was -5.7 with a 95% CI from -10.3 to -1.1 , and the p -value was 0.015). In the intragroup analysis, two months after the intervention, there was a significant decrease in overall mental health score compared to baseline in the intervention

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group (the mean change was -5.4 , with a 95% CI from -9.9 to -0.9 , and a p-value of 0.015). Moreover, a significant decrease was indicated in the physical subscale score in the intervention group compared to the control group (the adjusted difference was -5.7 , with a 95% CI from -10.2 to -1.2 , and a p-value of 0.015). There was no significant difference between the two groups in other subscales ($p > 0.05$). In the intragroup analysis, there was a significant decrease in the physical subscale score (the mean change was -1.7 , with a 95% CI from -2.9 to -0.2 , and a p-value of 0.038) and anxiety symptoms (the mean change was -1.8 , with a 95% CI from -3.4 to -1.0 , and a p-value of 0.033) compared to the baseline in the intervention group.

Conclusion An education based on family-centered empowerment model could improve the overall mental health score in elderly women. Hence, it may be recommended to regard this approach as a practicable educational strategy for improving the well-being of the elderly.

Trial registration Iranian Registry of Clinical Trials; <https://irct.behdasht.gov.ir/trial/30535> (IRCT20161126031087N2), registered (03/08/2018).

Keywords Mental Health, Elderly women, Education, Family centered empowerment model

Introduction

Globally, the aging of the population is progressing at an unprecedented rate. In the year 2060, it is expected that the population of individuals aged 65 and above in the United States will nearly double, ascending from 46.3 million to 98 million. Although individuals are experiencing increased longevity, studies indicate that their overall health may not improve accordingly. In addition to greater exposure to chronic medical disorders and neurodegenerative conditions, older individuals encounter an amplified susceptibility to mental health disorders including depression, anxiety, and stress [1].

Based on the information provided by the World Health Organization (WHO), mental health comprises subjective well-being, intergenerational dependence, autonomy, competence, perceived self-efficacy, and self-actualization of one's intellectual and emotional potential [2]. It is estimated that around 15–20% of the elderly population experiences various forms of mental health issues, with a significant prevalence of concurrent mental health disorders within this demographic [1]. The exact percentage of elderly women showing optimal mental health remains unspecified. However, the data highlights the significant prevalence of mental health disorders, particularly depression and anxiety, among elderly women. The prevalence of depression among elderly women rises significantly, with 30% of those aged 55 to 60 experiencing depressive symptoms, compared to 40% of women aged 80 and above [3]. The results showed that the prevalence of anxiety among the elderly was 11.24% [4], wherein, women showing higher anxiety levels than men [5]. The variation in the prevalence of mental disorders between men and women may be, in part, due to the greater likelihood of women to develop such disorders following the onset of chronic conditions, as opposed to men [6]. Furthermore, social isolation emerges as a critical risk factor, correlating with elevated rates of depression and anxiety in socially isolated elderly women.

Despite the common belief that the elderly are commonly placed in institutions, a staggering 95% of individuals aged over 65 reside in their own homes, with many receiving some level of care from a family member [7]. The family unit, serving as a crucial social support system, grows in significance as older individuals' age, particularly due to a decline in their social interactions during this life stage. As a result, there is an urgent need to approach the issue of aging in the context of the family [8]. Numerous surveys conducted by ASEAN (Association of Southeast Asian Nations) have revealed that the majority of elderly support in Asian countries is provided by their children and/or grandchildren. Even so, it is predictable that the shift towards nuclear family configurations may result in deficiencies in the traditional family frameworks that are widespread in Asia [9, 10].

Educating family members on disease control and prevention can be highly beneficial due to the strong correlation between family dynamics and individuals well-being [11]. The family-centered empowerment model (FCEM) stands out as an effective approach for enhancing health outcomes and elevating overall quality of life [12]. Empowerment involves promoting intentional actions focused on self-care, familial well-being, and community engagement to take responsibility for personal health and well-being [13]. The process of empowering the elderly is continuous and is of significant importance in their tendency towards reintegration into society. Viewed as a form of individual rehabilitation, empowerment strives to unlock the latent potential of the elderly for a full life and enhanced survival prospects. In the context of elderly rehabilitation, families play a crucial role by staying aware, engaged, and adaptable to varying circumstances. The model of family-centered care not only empowers elderly individuals and their families but also reduces their dependence on family support while respecting their choices, values, beliefs, and cultural practices. This model, underpinned by family-centric principles,

incorporates the active participation of both families and elderlies in the planning, execution, and assessment of healthcare provisions [14, 15]. Four organized executive phases have been identified for the incremental execution of family-centered empowerment frameworks that are both unified and coherent. The phases are structured as follows: perceived threat, problem-solving, educational engagement, and evaluation [16]. Previous investigations have demonstrated that the application of a FCEM yields positive and substantial effects on women's mental health and their quality of life [16–20].

The increasing incidence of elderly populations in Iran, alongside an improvement in life expectancy, results in a rise in disabilities and mental health challenges among the older population. This population, particularly women, displays significant susceptibility concerning mental health and illustrates a substantial dependence on familial support [21]. Given the importance of religious and cultural values along with the strength of familial relationships, and considering the lack of research in Iran that examines the impact of the FCEM on the mental health of older adults, it is essential to clarify the effects of this intervention. This study aimed to determine the effects of an educational intervention based on the FCEM on the overall and particular aspects of mental health scores among elderly women to address and alleviate age-related challenges.

Methods

Study design and participants

This study is a randomized controlled trial, in which participants comprised elderly (aged 60 years and older) women who were referred to five the elderly-friendly health care centers in Tabriz, Iran (12 individuals were selected from each center) from January 2019 to January 2020. In the first month after the start of the intervention, one person from the intervention group dropped out of the study due to unwillingness to continue and one person from the control group lost to follow-up due to inability to refer for back pain. Finally, 58 participants (29 in each group) were analyzed (Fig. 1). The inclusion criteria consisted of being female and possessing literacy skills in both reading and writing, aging 60 years or older, having a family member available to participate in training sessions, demonstrating proficiency in performing daily tasks autonomously, displaying independence in daily activities, lacking significant vision and hearing impairments, and not showing cognitive or mental disorders as indicated in the records of individuals within the SIB as Integrated Health System. The exclusion criteria included participation in other comparable research projects, the presence of neurological impairments (e.g., paralysis, stroke, and Parkinson's disease), as well as documented psychological disorders identified through

both the patient's self-report and medical history. In addition, individuals were not considered if they demonstrated acute cardiovascular conditions, uncontrolled chronic conditions mentioned in the participants' health files (such as malignancies and severe diabetes), restrictive musculoskeletal conditions, acute and chronic kidney problems, parathyroid irregularities, and thyroid dysfunction.

The sample size

The software G*POWER (version 3.1.2) was utilized for the determination of the sample size in this study. It was calculated based on the study conducted by Masoudi et al. [22]. regarding the influence of family-centered intervention on social functioning which yielded largest sample size compared to the other domains. This evaluation encompassed variables such as $mean_1=50.35$, $mean_2=73.21$, $Sd_1=15.50$, $Sd_2=25.27$, and was in a two-tailed test with 95% confidence and 95% power. Considering a possible 20% sample loss for each group, an estimated 30 individuals were required.

Randomization and intervention

Sixty eligible elderly women were randomly divided into two groups (intervention and control groups) using block randomization with a 1:1 allocation ratio generated by random allocation software. Allocation concealment was maintained through the use of matte closed envelopes sequentially numbered from one to sixty. Consequently, the nature of the received intervention remained undisclosed to all participants, researchers, and statistical analysts prior to the allocation to the respective groups. The allocation sequence was generated based on random blocking by an individual not actively engaged in the study. After group assignment, blinding was not feasible due to the study's nature. During the in-person visit, after clarifying the research objectives, outlining the advantages of lifestyle education, highlighting the lack of potential risks associated with educational interventions, and ensuring the confidentiality of the data, informed consent was acquired from all participants. Then participants provided demographic information and completed the General Health Questionnaire-28 (GHQ-28) questionnaire under the supervision of the researcher within a secluded environment. In collaboration with healthcare professionals, the educational booklet was developed in accordance with the educational guidelines established by elderly-friendly centers. The content's validity was approved by the professors. The intervention group underwent a series of 5 sessions, each lasting 60 min, throughout 5-week duration, focusing on mental health enhancement programs utilizing the FCEM. Instead, control group were given standard care from

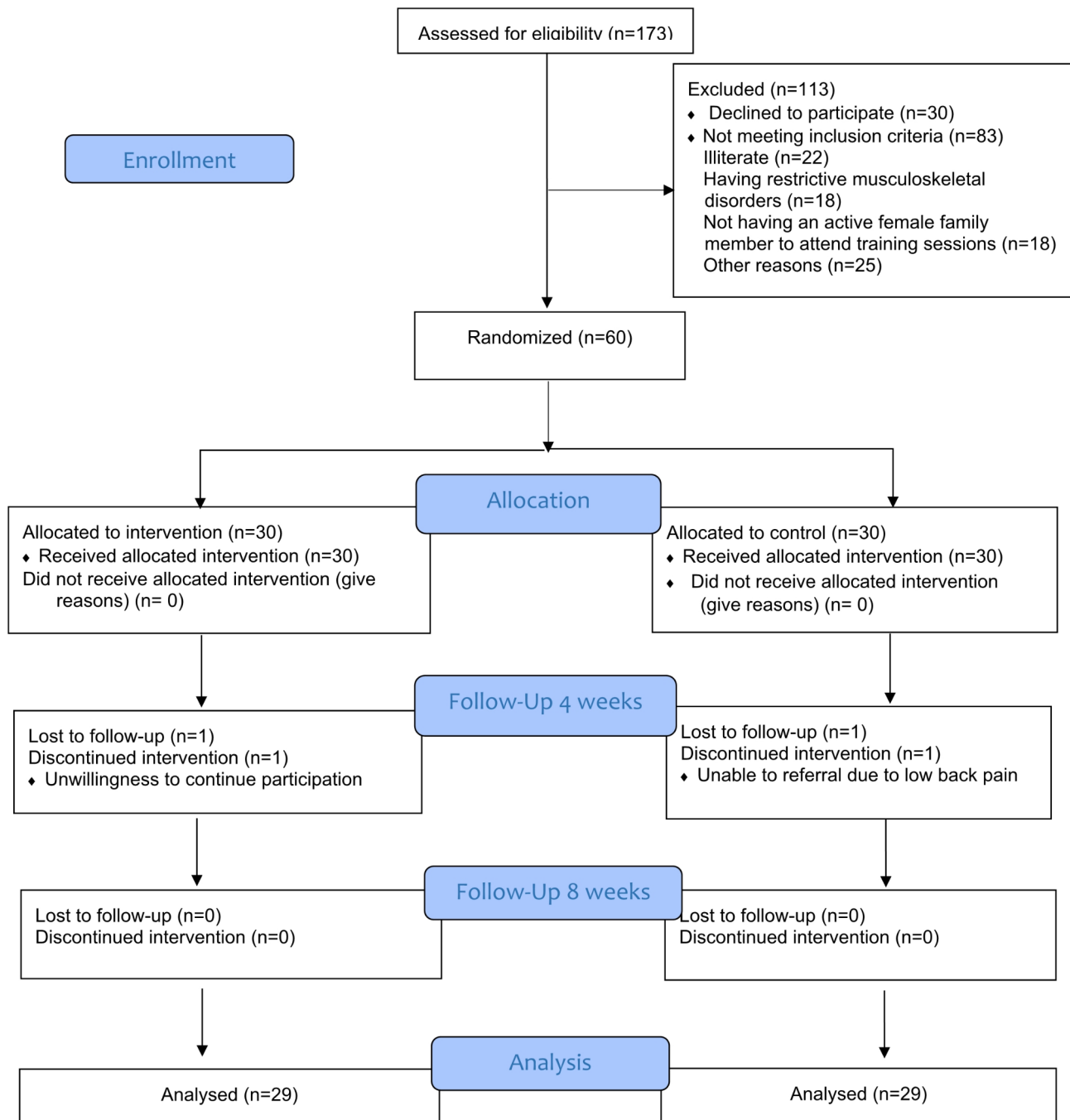


Fig. 1 Flow diagram of the progress through the phases of the randomized controlled trial

elderly-friendly centers, which included recommendations regarding healthy nutritious, exercise, and physical activities.

Data collection tool

The demographic inventory and GHQ-28 were used for data collection [23]. A questionnaire containing demographic and anthropometric information was administered, which covered personal attributes such as age,

educational attainment, marital status, family income, recent medication use, body mass index (BMI), weight, height, waist circumference, waist-to-hip ratio, and blood pressure. The BMI was determined by taking an individual’s weight in kilograms and dividing it by the square of their height measured in meters. Weight was assessed by a Seca™ portable scale with a precision of 0.1 kg in scantily clad without shoes. Height was assessed utilizing a Seca™ wall-mounted stadiometer, ensuring a precision of

0.1 cm while maintaining a standardized posture (with the behind of the shoulders, head, pelvis, and the behind of the heel and legs in contact with the wall). The measurement of waist circumference was conducted at the narrowest point of the waist while the person was at the end of his normal exhalation. The Waist-to-Hip Ratio (WHR) was similarly computed by dividing the circumference of the waist by that of the hip. After a 15-minute sitting, blood pressure was assessed using the fully automatic digital blood pressure monitor manufactured by OMRON (Japan). The researcher employed standardized instruments for all participants both prior to and following the intervention.

GHQ was initially introduced by Goldberg (1972) as a self-reported screening tool for identifying psychiatric disorders in non-clinical groups, and has become the most commonly utilized instrument globally [24]. There are numerous questionnaires used in the field of mental health to assess various conditions and symptoms such as Mental Health Quality of Life Questionnaire (MHQoL) [25], Patient Health Questionnaire-9 (PHQ-9) [26], and Symptom Checklist-90-Revised (SCL-90-R) [27]. But GHQ-28 has been widely embraced due to its concise nature, simplicity of use, and user-friendliness. The 28-item iteration of the GHQ is known as the unique version that provides subscale ratings for different domains within the field of psychopathology [23]. The instrument examines four dimensions associated with physical functioning, symptoms of anxiety and sleep disruption, social functioning, and symptoms of depression. Each dimension comprised of 7 elements, and responses were assessed on a four-point continuum (ranging from not at all to much more than normal), where lower ratings indicated typical mental well-being while higher scores suggested mental health issues. Each component was assessed on a four-point Likert scale spanning from 0 to 3, culminating in a total score falling between 0 and 84 and a cutoff score of 24. Individuals surpassing this cutoff were identified as potentially experiencing mental health issues, while scores exceeding 41 suggested an acute condition [2]. The validation of this questionnaire was performed by Nourbala et al. in Tehran in 2001 [28]. Wherein, 10% of participants (90 individuals) underwent re-evaluation via the test-reset method one-week post-initial implementation, yielding a correlation coefficient of $r=0.85$, significant at the 99% confidence level. Moreover, in the present study, the method of face and content validity was used to determine the validity of the instrument. The questionnaire was provided to 12 faculty members of the Tabriz University of Medical Sciences in related fields for further review. After incorporating their constructive feedback, the necessary adjustments were made in the final forms. To determine the reliability of the mental health instruments, a pre-test and

post-test were conducted on 20 individuals from the control group. The reliability of the instruments was assessed using internal consistency (Cronbach's alpha coefficient) and ICC (Intra-Class Correlation). The Cronbach's alpha coefficient for the overall GHQ was 0.88, for the subscale of physical symptoms it was 0.74, for the anxiety and insomnia subscale it was 0.73, for the social dysfunction subscale it was 0.79, and for the depression subscale it was 0.90.

The educational sessions by FCEM

The FCEM was applied in five sessions of 60 min for five weeks through a series of four interconnected and coherent implementation stages: perceived threat, problem solving, educational participation, and evaluation. In this model, an active female member of the family, with the desire and decision-making power chosen by the elderly person's preference, accompanied her in all work steps [29] (Table 1).

In the fifth session, a summary of the sessions was prepared. Then, the elderly and their families were given 4 and 8 weeks to apply the concepts of the FCEM.

Ethical consideration

All activities carried out in research including human subjects were in accordance with the ethical principles established by the institutional and/or national research board, as well as the 1964 Helsinki declaration and subsequent revisions, or similar ethical guidelines. This study was conducted based on FCEM on the mental health of elderly women. After being approved by the Ethics Committee (IR.TBZMED.REC.1397.112) of the Tabriz University of Medical Sciences, this trial was registered at the Iranian Registry of Clinical Trials; <https://irct.behdasht.gov.ir/trial/30535> (IRCT20161126031087N2), registered (03/08/2018). A written informed consent was obtained from the participants.

Data analysis

After the completion of data collection, the acquired data were subjected to analysis utilizing SPSS version 23 with a set significance level of 0.05. The examination of the normality of quantitative data was conducted through the utilization of the Kolmogorov–Smirnov test. Various methods were employed for intergroup comparison, including the independent t-test, one-way ANOVA, Chi-square test, Chi-square by trend, and Fisher's exact test. Prior to the implementation of any interventions, the independent t-test was utilized to compare the scores related to mental health and its respective domains, as well as anthropometric indicators among the groups under study. Subsequent to the intervention, ANCOVA test and ANOVA with repeated measurements were conducted at different time points (4 weeks and 8 weeks

Table 1 Educational sessions

Educational sessions	Educational program
Perceived threat step	
This step was held in the form of two training sessions, each lasting 60 min.	
<i>First session</i>	Education in the field of nutrition, stress management, and interpersonal relationships was obtained using the lecture method and researcher-constructed educational pamphlets based on the reference of the Ministry of Health and Medical Education's innovative elderly services. Moreover, peer group contacts were provided to create a perceived threat in this elderly group.
<i>Second session</i>	After reviewing the materials of the previous session, training on physical activity, spiritual growth, and responsibility for health was obtained through lectures and teaching aids, including educational booklets .
Problem- solving step	
This step was based on group discussion. For this purpose, a group discussion session was held in the form of a 60-minute session.	
<i>Third session</i>	The focus was on problem-solving, including identifying the problem, explaining goals, providing solutions, and choosing the best one. A group discussion took place where elderly individuals and their families talked about practical issues and discussed solutions with concrete examples. We also provided instruction on skills for a better life and handed out booklets and pamphlets on the topics covered for the elderly and their families.
Educational engagement step	
The topics discussed in the group discussion session were communicated to other family members through the elderly, during a session lasting 60 min.	
<i>Fourth session</i>	Emphasized educational participation, with educational materials distributed to family members through the elderly. An educational booklet and a question-answer method were utilized under the researcher's guidance.
Evaluation step	
The evaluation includes two phases of process assessment conducted throughout the intervention procedure across all sessions and a final evaluation after 4 and 8 weeks in two groups.	
<i>Fifth session</i>	A summary of the sessions was prepared. Then, the elderly and their families were given 4 and 8 weeks to apply the concepts of the FCEM.

post-intervention) while adjusting for the baseline scores. Intention-to-treat approach was implied to analyze data.

Results

A total of 173 women were initially examined in this study, of which 30 were not included due to unwillingness to participate and 83 were not included in the study due to lack of inclusion criteria. Finally, 60 elderly women aged 60 and above were eligible and consented to participate in the study.

The average age (standard deviation: SD) of women in the intervention group was 63.6 (2.9) and in the control group was 64.4 (4.7) years. The mean (SD) of body weight in the intervention group was 74.9 (11.4) and in the control group was 73.8 (10.5) kg ($p=0.7$). Only two people (6.7%) in the intervention group and four people (13.3%) in the control group had normal BMI. The rest of the people in the two groups were overweight and obese ($p=0.396$). More than half of the women (59.3%) in both groups were currently living with their children ($p=0.792$). More than three-quarters of women (88.1%) in both groups had access to their children during illness ($p=0.706$) and only three people in the intervention group and four people in the control group did not have access. About 83% of women in the intervention group and 76% in the control group had the support of their children ($p=0.532$). There was no significant difference

between the two groups in terms of individual-social characteristics ($p<0.05$) (Table 2).

According to the results of Table 3, in terms of overall mental health score, two months after the intervention, a significant decrease was observed in the intervention group compared to the control with a 95% CI of -5.7 (-10.3 to -1.1) and a p-value of 0.015. In the intragroup analysis, there was no significant decrease in the intervention group one month later compared to before the intervention ($p=0.132$), but two months after the intervention (end of the intervention), there was a significant decrease compared to baseline (mean change was -5.4, with a 95% CI of -9.9 to -0.9, and a p-value of 0.015). Based on the repeated measurement test, this reduction was significant in the intervention group ($p=0.007$) as well as the interaction between the group and the mental health score was significant over time ($p=0.043$).

After the intervention, a significant decrease was indicated in the physical subscale score in the intervention group compared to the control group (the difference was reported as -5.7, with a 95% CI ranging from -10.2 to -1.2, and a p-value of 0.015). There was no significant difference between the two groups in other subscales ($p>0.05$). In the intragroup analysis, there was a significant decrease in the physical subscale score (the mean change was -1.7, with a 95% CI of -2.9 to -0.2, and a p-value of 0.038) and anxiety symptoms (the mean change was -1.8, with a 95% CI of -3.4 to -1.0, and a

Table 2 Comparison of demographic characteristics among participants of the two groups based on family-centered empowerment and control

Variable	Intervention (n = 29) n (%)	Control (n = 29) n (%)	p-value
Age (years) *	63.6 (2.9)	64.4 (4.7)	0.431
Weight (kg) *	74.9 (11.4)	73.8 (10.5)	0.7
Body Mass Index (kg/m ²) [§]			0.394
18.5–24.9	2 (6.7%)	4 (13.3%)	
25–29.9	10 (33.3%)	13 (43.3%)	
≥ 30	18 (60.0%)	13 (43.3%)	
Education [‡]			0.116
Primary school	20 (66.7%)	12 (40%)	
Diploma and Under diploma	8 (26.7%)	14 (46.7%)	
Collegiate	2 (6.7%)	4 (13.3%)	
Marriage [§]			0.084
Unmarried (Single, Widow, divorced)	5 (16.7%)	12 (40.0%)	
Married	25 (83.3%)	18 (60.0%)	
Occupation [§]			0.251
Housekeeper	26 (86.7%)	21 (70.0%)	
Working at home	0	2 (6.7%)	
Retired	4 (13.3%)	7 (23.3%)	
Income [‡]			0.829
Sufficient	17 (56.7%)	18 (60.0%)	
Less than sufficient	13 (43.3%)	9 (30.0%)	
More than sufficient	0	3 (10.0%)	
living with their children [§] / yes	17 (56.7%)	18 (62.1%)	0.792
Access to their children [§] / yes	27 (90%)	25 (86.2%)	0.706
Supported by their children [§] / yes	25 (83.3%)	22 (75.9%)	0.532

All numbers were reported as numbers (percentages) except age and weight, which represent mean (standard deviation). *Independent t-test ‡Trend Chi-square ¥ Chi-square § Fisher.

Table 3 The comparison of total score of mental health in the studied elderly women

Variable	Intervention (n = 29) Mean (SD)	Control (n = 28) Mean (SD)	Mean differences (95% CI)	p-value
Total score (0–84)				
Baseline (1)	28.5 (11.6)	24.8 (10.2)	-	0.163*
4 weeks after intervention (2)	24.4 (12.2)	24.0 (9.3)	-	0.216 [‡]
8 weeks after intervention (3)	23.0 (11.9)	25.1 (9.6)	-5.7 (-10.3 to -1.1)	0.015 [‡]
p[§]	0.007	0.775	-	§ 0.043

The range of GHQ28 questionnaire scores is from 0 to 84. low scores are a sign of better mental health and scores of 24 and above are considered unhealthy). The cutoff point for the overall score is 24. The cutoff score for each subscale of mental health is 5.

* Independent t-test, [‡] ANCOVA adjusted for baseline values.

[§] ANOVA with repeated measurements using Sphericity test and if Mauchly test was significant, we used from Greenhouse.

p-value of 0.033) at the end of the study compared to the baseline in the intervention group. This decrease was not significant in the subscale of social functioning ($p=0.182$) and depression symptoms ($p=0.051$). Also, at the end of the intervention, no significant difference was observed in any of the subscales in the control group ($p>0.05$) (Table 4).

In terms of the level of satisfaction with the received intervention in the intervention group, all people were satisfied (43.3%) and completely satisfied (56.7%).

Discussion

The results of this study demonstrated that the utilization of education based on the FCEM has been helpful on improving mental health. In terms of overall mental health score, two months after the intervention, a significant decrease was observed in the intervention group compared to the control. However, this reduction was not observed one month after the intervention. Moreover, a significant decrease was indicated in the physical subscale score in the intervention group compared to the control group, there was no significant difference

Table 4 Comparison of the total score of mental health in the studied elderly women

Variable	Intervention (n=29) Mean (SD)	Control (n=28) Mean (SD)	Mean differences (95% CI)	p-value
Physical domain (0–21)				
Baseline	7.7 (3.8)	7.5(3.1)	-	0.268*
8 weeks after intervention	6.4 (2.8)	6.6 (2.7)	-	-
6 months after intervention	6.2 (3.1)	6.8 (3.4)	-5.7 (-10.2 to -1.2)	0.015[‡]
p[§]	0.066	0.497	-	0.219 [§]
Anxiety symptoms (0–21)				
Baseline	7.9 (3.4)	6.8 (3.1)	-	0.196*
8 weeks after intervention	5.9 (2.6)	7.0 (3.0)	-	-
6 months after intervention	6.1 (2.8)	7.5 (3.3)	-1.4 (-3.2 to 0.3)	0.100 [‡]
p[§]	0.014	0.613	-	0.026[§]
Social performance (0–21)				
Baseline	9.6 (4.3)	8.3 (3.8)	-	0.182*
8 weeks after intervention	9.7 (4.4)	8.7 (4.3)	-	-
6 months after intervention	8.6 (3.1)	9.0 (3.1)	-1.6 (-3.6 to 0.4)	0.124 [‡]
p[§]	0.239	0.637	-	0.255 [§]
Depression symptoms (0–21)				
Baseline	3.4 (1.3)	2.5 (1.9)	-	0.158*
8 weeks after intervention	2.2 (1.5)	1.5 (1.0)	-	-
6 months after intervention	2.1 (0.8)	1.4 (0.7)	-0.18 (-2.1 to 1.7)	0.856 [‡]
p[§]	0.082	0.182	-	0.929 [§]

The range of GHQ28 questionnaire scores is from 0 to 84. low scores are a sign of better mental health and scores of 24 and above are considered unhealthy). The cutoff point for the overall score is 24. The cutoff score for each subscale of mental health is 5.

*Independent t-test, [‡]ANCOVA adjusted for baseline values.

[§]: ANOVA with repeated measurements using Sphericity test and if Mauchly test was significant, we used from Greenhouse.

between the two groups in subscales of anxiety symptoms, social functioning, and depression symptoms. The intragroup analysis illustrated a significant decrease in the physical subscale score and anxiety symptoms when compared to the baseline measurement.

Mental health is a crucial component of overall health. Although due to cultural variations, a comprehensively inclusive definition of mental health is challenging to establish. Despite this, there is a consensus that mental health is more than the absence of mental disorders and what is certain is that maintaining mental health is as important as physical health [30]. In the female population, it is imperative to direct heightened focus towards this high risk group because of their extended life expectancy, increased disability rates, lower educational attainment, and significant prevalence of widowhood, independent living, and reliance on financial support. Given that family environments often shape health behaviors and provide a foundation for growth and adaptation, targeting the family unit as a whole rather than solely focusing on individuals offers a promising approach to enhancing the health outcomes of individuals, families, and communities [31].

The FCEM represents a framework aimed at improving the mental health and overall well-being of individuals by considering the dynamics of their family systems. This model can significantly influence the mental health of

women, resulting in a range of positive outcomes, including enhanced quality of life [18, 19], reduced stress levels [17], increased self-efficacy, improved self-esteem, more favorable attitudes [20], and the adoption of health-promoting behaviors [16].

In alignment with our outcomes, Abusalehi et al. similarly demonstrated a beneficial impact of education on improving mental health. This group carried out a quasi-experimental investigation to analyze the impact of the educational intervention on mental health promotion of the elderly in nursing homes. The mental health promotion educational program administered to a sample of 90 elderly subjects consisted of 8 sessions, each lasting 45 min. According to the result of this study, the educational intervention in the experiment group was found to be associated with lower GHQ scores, indicating an improvement in mental health [32]. The differentiation between the aforementioned investigation and our study resides in the utilization of social cognitive theory to examine the influence on the mental health of elderly individuals in nursing homes. Another study also yielded consistent outcomes [33]. It focused on the impact of educational interventions in enhancing the mental health and overall quality of life in elderly individuals diagnosed with cancer. Thirty elderly participants were purposefully selected for this study. Following the initial assessment, the intervention group engaged in a series of eight

educational sessions. The outcomes illustrated a notable enhancement in mental health among the elderly through the implementation of acceptance and commitment counseling.

In our study, after the intervention, a significant decrease was indicated in the physical subscale score in the intervention group compared to the control group and baseline measurement. In the elderly population, regular involvement in physical activity is crucial for the enhancement or maintenance of muscle strength and power, promotion of mobility and independence, and prevention of falls and fractures. While the justification for physical activity among older individuals has mainly focused on its effects on physical well-being and performance, there is increasing evidence indicating its beneficial effects on various aspects of mental health. Recent comprehensive longitudinal studies have initiated the documentation of significant preventive associations for mental disorders [34] such as cognitive impairment, Alzheimer's disease, dementia [35–38], and depression [39] in older adults.

In accordance with the current study, Doshmangir et al. conducted research focusing on the significance of maintaining regular physical activity in older individuals [40]. The purpose was to utilize the educational recognition phase of the PRECEDE model as an educational intervention framework to explore predisposing, enabling, and reinforcing factors related to physical activity in the elderly, as well as the impact of education on these factors. The study involved conducting three educational sessions on regular physical exercise for a group of 80 elderly individuals, with each session lasting between 45 and 60 min. Various methods such as short educational speeches, small and large group discussions, Q&A sessions, and practical demonstrations were employed to enhance knowledge, attitudes, and self-efficacy. The findings of the research indicated that the educational intervention had a positive effect on the predisposing, enabling, and reinforcing factors that contribute to regular physical activity among the elderly. Several research studies have presented evidence that maintaining a consistent regimen of physical activity can result in significant improvements in mental health among the elderly population. Moreover, it facilitates a reduction in physiological responses to stress, promotes positive effects on body image, and subsequently decreases levels of anxiety and depression [41, 42].

According to the findings of our study, although, the intragroup analysis demonstrated a significant decrease in anxiety symptoms within the intervention group compared to the baseline, there were no statistically significant variations in the average scores of the elderly participants in the anxiety subscale between the

intervention and control groups, both at 4 weeks and 8 weeks post-intervention.

In a study conducted by Jahani Eftekhari et al., the effect of educational intervention based on the Self Efficacy and Health Literacy Theory on the health-promoting lifestyles was investigated on the 80 healthy volunteer women [43]. Results demonstrated a significant difference between the intervention group and the control group across all 6 scales: nutrition, health responsibility, interpersonal relationships, spiritual growth, physical activity, and anxiety management. The outcomes of the aforementioned study vary from our study in relation to the anxiety management, potentially influenced by factors like the differences in the educational model, or cultural variances among women residing in different urban areas of the country. Interestingly, the elderly participants in the study consistently expressed concerns about their offspring. Consequently, it appears that managing stress necessitates additional interventions involving a higher number of sessions.

In the study by Khavoshi et al. entitled "Effect of educational intervention on the lifestyle of elderly people referred to clinical centers of Eslamshahr, Iran: application of health belief model". The intervention group participated in educational courses designed based on Health Belief Model. Findings indicated the importance of prevention, nutrition, and physical activity, whereas stress management and interpersonal relationships did not exhibit significant variations [44]. These outcomes align with the current study regarding stress management.

Furthermore, in our study there was no significant difference between the two groups in subscales of depression symptoms and social functioning.

Our findings did not align with the research conducted by Wallace et al. in the United States of America regarding the implementation and effectiveness of a community-based health promotion program for older adults. The study involved monitoring participants in their homes during physical activity, dietary interventions, and safety assessments. The intervention group showed significantly better results on 7 out of 8 SF-36 subscales and displayed reduced signs of depression when compared to the control group [45]. The variation observed may be from differences in the research instruments utilized and the nature of the intervention employed in the current study.

An important strength of our investigation was the high level of collaboration among the experts responsible for the elderly population across all five elderly-friendly health centers (research settings). However, a distinguished limitation faced in the current research was the inadequate literacy levels among the elderly population, which led to challenges in recruiting women in this study

and the extension of the intervention timeframe. Other limitations consisted of the limited number of training sessions and the short follow-up period post-intervention. Therefore, it is suggested that a study with a longer follow-up period and more number of training sessions be designed and implemented in order to confirm the accuracy and validity of the findings more strongly. Furthermore, the study was constrained to elderly-friendly centers in Tabriz, thus restricting the generalizability to all elderly individuals in the region. It is recommended to carry out similar research in various healthcare facilities, rather than solely focusing on elderly-friendly centers, in order to ensure that the findings can be applied to a broader population of elderly individuals.

Conclusion

The results of the present study indicated the positive effects of FCEM-based training by observing an increase in the total score of mental health in elderly women. Considering the important role of the family in caring for the elderly, this approach may be considered as a practical educational strategy to promote the well-being of the elderly.

Abbreviations

WHO	World Health Organization
FCEM	Family-Centered Empowerment Model
ASEAN	Association of Southeast Asian Nations
GHQ-28	General Health Questionnaire-28

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12905-024-03442-z>.

Supplementary Material 1

Acknowledgements

The authors would like to acknowledge the Research Deputy of Tabriz University of Medical Sciences for their kind financial support (Grant: 59878), the respected staff of the Health Centers, and the elderly for their participation in this investigation.

Author contributions

"FKH. designed the study and performed main analysis. N.M.S. and Sh.B. collected data. H.N.A. and S.B. make a major contribution in writing the manuscript. All authors read and approved the final manuscript."

Funding

The financial support for this study was provided by the Research and Technology Deputy of Tabriz University of Medical Sciences (No: 59878).

Data availability

The data that support the findings of this study are not openly available due to reasons of sensitivity and are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

This study was conducted after being approved by the Ethics Committee (IR.TBZMED.REC.1397.112) of the Tabriz University of Medical Sciences,

this trial was registered at the Iranian Registry for Clinical Trials (IRCT20161126031087N2, <https://irct.behdasht.gov.ir/trial/30535>) with the Clinical Trials Registry (2018-08-03). A written informed consent was obtained from the participants.

Consent for publication

This manuscript does not present personal information, such as individual data, therefore consent for publication is not applicable.

Competing interests

The authors declare no competing interests.

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Received: 11 July 2024 / Accepted: 4 November 2024

Published online: 08 November 2024

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