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The Effect of Social Support on the Empowerment Status and Alopecia-Related Quality of Life in Breast Cancer Patients: A Cross-Sectional Structural Equation Modeling Study

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ABSTRACT

Objective: This cross-sectional study was conducted to investigate the effect of social support on empowerment status and alopecia-related quality of life in breast cancer patients.

Methods: This study included 150 breast cancer patients who were admitted to the oncology outpatient clinic of a training and research hospital in Erzurum province, eastern Turkey, and met the inclusion criteria. Data were collected using the Descriptive Information Form, the Cancer Empowerment Scale, the Chemotherapy-Induced Alopecia Quality of Life Scale, and the Cancer Patient Social Support Scale. Structural equation modeling was used to examine the direct and indirect relationships among variables. This study was conducted in accordance with the STROBE guidelines.

Results: Social support was found to positively affect empowerment status ($\beta = 0.960$) and alopecia-related quality of life ($\beta = 0.335$). Empowerment status had a positive and significant effect on alopecia-related quality of life ($\beta = 0.647$). The indirect effect of social support on alopecia-related quality of life through empowerment status was positive and significant ($\beta = 0.622$), and the total effect of social support on alopecia-related quality of life was also positive and significant ($\beta = 0.957$). Social support explained 92% of the variance in empowerment status, and the overall model explained 94% of the variance in alopecia-related quality of life.

Conclusions: Social support positively influences both empowerment status and alopecia-related quality of life in breast cancer patients. In addition, social support improves alopecia-related quality of life indirectly by enhancing empowerment status. Strengthening social support mechanisms may therefore contribute to improved quality of life related to chemotherapy-induced alopecia in breast cancer patients.

Summary

- Patient and Public Involvement
  - Patients and the public were not involved in the design of this study, the development of the research questions, or the selection of outcome measures. This was due to the use of standardized, previously validated instruments and the cross-sectional design conducted in a clinical outpatient setting.

1 | Introduction

Breast cancer is the most common cancer among women worldwide [1] and accounts for about one in four female cancer cases in Turkey [2]. When detected early, survival rates can exceed 90%. Treatment options, including surgery, chemotherapy, radiotherapy, and immunotherapy, improve survival but may cause significant side effects [3].

Social support is crucial for helping patients cope with the challenges of cancer treatment [4]. It has been shown to improve hope, a sense of belonging, treatment adherence, quality of life, and overall health outcomes [5–9]. In breast cancer patients, social support is also associated with better survival rates, lower stress, and improved emotional well-being [10–14]. Conversely, lack of social support has been linked to higher cancer-related mortality [15].

Empowerment enables cancer patients to take control of their disease, treatment, and care, ultimately becoming knowledgeable about their condition [16]. Empowered patients are informed and actively participate in treatment decisions, requiring a collaborative relationship with healthcare professionals [17]. In chronic diseases, empowerment has been shown to improve patient satisfaction, psychological adjustment, quality of life, and sense of control in decision-making [18–21]. Social support has been highlighted as an important factor in fostering empowerment [22].

Alopecia is a common side effect of cancer treatments and can be psychologically distressing, sometimes causing patients to consider discontinuing therapy. Although not life-threatening, alopecia significantly affects body image and self-perception [23]. Even though hair loss is temporary, it can reduce quality of life, making effective management important [24].

Women with breast cancer often face long-term physical, sexual, and psychosocial challenges due to the disease and its treatment. Loss of the breast, which symbolizes femininity, and hair, which affects body image, can be particularly distressing [25]. Empowerment can improve quality of life, treatment adherence, and foster positive attitudes toward life [26]. Social support further enhances empowerment, protects emotional well-being, and is associated with a positive body image in breast cancer patients [27–31]. Social support also helps manage stress, coping skills, and the psychological effects of alopecia [10, 32–35]. However, the mediating role of empowerment in the relationship between social support and alopecia-related quality of life has not been studied. Therefore, this study aims to examine the effect of social support on empowerment and alopecia-related quality of life in women with breast cancer, filling a gap in the literature (Figure 1).

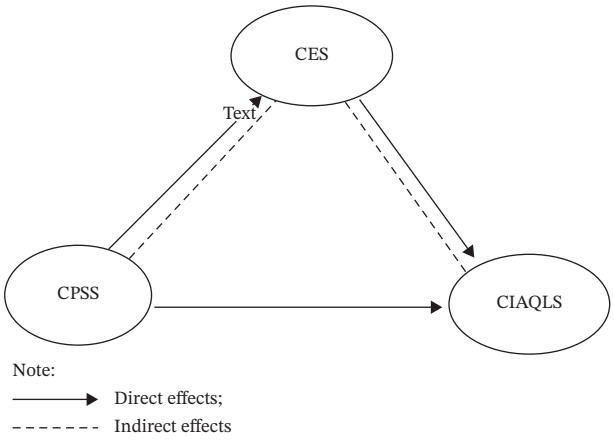

FIGURE 1 | Proposed model.

RQ1. To what extent are social support empowerment status and alopecia associated with quality of life in breast cancer patients?

RQ2. Does the empowerment status of breast cancer patients mediate the relationship between social support and alopecia quality of life?

2 | Method

2.1 | Study Design

This study was designed as a descriptive, correlational, and cross-sectional research. The purpose was to examine the relationships between social support, empowerment, and alopecia-related quality of life in women with breast cancer.

2.2 | Population and Sample of Research

Patients admitted to the oncology outpatient clinic of a training and research hospital in Erzurum, a province in the east of Turkey, with a diagnosis of breast cancer between September and December 2023 constituted the population, while the sample consisted of patients who met the research criteria (being over 18 years of age, being able to understand Turkish, having been diagnosed with breast cancer for at least 6 months, and having no psychological or communication problems) and volunteered to participate The appropriate sample size was determined through a priori analysis using G-Power 3.1.9.4. For the a priori power analysis, since there were no similar studies on the subject, the effect size was considered as 0.15 ($f^2 = 0.15$) according to the multiple regression test in Cohen's effect size table. The minimum possible number of patients was found to be 74 when the confidence interval (CI) was set at 95% [36], the level of significance was 0.05 [36], the level of significance was 0.05 (Faul et al. [36]), and the power was 0.95 [37]. During this period, 161 patients were approached. Since 4 of the patients did not want to participate and 7 did not meet the inclusion criteria, the final number of participants was 150 (93% participation). In addition, simulation-based studies in the structural equation modeling (SEM) literature indicate that sample sizes between 100 and 200 are generally adequate for mediation models with moderate complexity, particularly when standardized path coefficients are large and factor loadings are high [38, 39].Given the high

standardized path estimates and the substantial proportion of explained variance observed in the present model, the final sample size of 150 participants was considered sufficient to ensure adequate statistical power for the analyses.

2.3 | Data Collection Tools

Data were collected using four instruments: the Descriptive Information Form, the Cancer Patient Social Support Scale (CPSS), the Cancer Empowerment Scale (CES), and the Chemotherapy-Induced Alopecia Quality of Life Scale (CIAQLS).

2.3.1 | Descriptive Information Form

The 18-question form was prepared by the researcher. The form includes questions about sociodemographic status, questions about the disease and treatment, and questions about alopecia and social support status.

2.3.2 | CPSS

Developed by Eylen (2002), the CPSS is a 35-item, 5-point Likert-type scale with three subscales: confidence support, emotional support, and information support. Scores range from 35 to 175, with higher scores indicating greater perceived family support [40]. The Cronbach's alpha was 0.92 in the original study and 0.98 in the present study.

2.3.3 | CES

The CES was developed by van den Berg et al. to measure how cancer patients cope with their disease. It contains 40 items and four subscales: personal strength, social support, health care, and community support. Higher scores indicate greater empowerment [41]. It was adapted into Turkish by Yılmaz et al. The total Cronbach's alpha value of the scale is 0.93 [42]. In the present study, this value was found to be 0.98 for the total score.

2.3.4 | CIAQLS

The CIAQLS was developed by Ateş and Olgun. It consists of 19 items on a 5-point Likert scale and has three subscales: Reflections on General Life, Negative Reflections on Inner World, and Positive Thoughts (reverse scored). Items 2, 15, 16, and 17 are reverse coded. Scores range from 19 to 95, with lower scores indicating poorer quality of life. The total Cronbach's alpha value of the scale is 0.88 [24]. The Cronbach's alpha was 0.83 in the present study.

2.4 | Data Collection Process

Data were collected in the oncology outpatient clinic during the study period. After their medical appointments, patients were invited to a private room, where the Descriptive Information Form, CPSS, CES, and CIAQLS were administered. Each patient completed the forms individually through face-to-face interviews conducted by the researchers. The interviews lasted about 15–20 min. To avoid bias, patients were interviewed separately and were not allowed to influence each other's responses.

2.4.1 | Ethical Considerations

This study was approved by the Atatürk University Ethics Committee (approval date: 09.12.2022; approval number: 2022-12/8). Permission was obtained from the Department of Neurology of the hospital where the study was conducted. The study was conducted in accordance with the principles of the Declaration of Helsinki. Participation in the study was entirely voluntary. The researchers explained the purpose and procedures of the study to all participants, and written informed consent was obtained prior to data collection.

2.5 | Data Analysis

Descriptive statistics were conducted using SPSS, while confirmatory factor analysis (CFA) and SEM were performed with Mplus 8.3. A Cronbach's alpha coefficient of ≥ 0.70 was considered acceptable for internal consistency [43, 44]. For each variable, mean scores and standard deviations were calculated, and correlation analyses were carried out. SEM was applied to examine both direct and indirect relationships among variables. Because the analysis required numerical integration, the Bayes estimator was used. This estimator performs well in such analyses and provides more robust predictions and CIs in relatively small samples compared with frequentist methods [45, 46]. The Bayes estimator employs a Markov Chain Monte Carlo (MCMC) approximation of the Metropolis–Hastings algorithm, suitable for ordered categorical data with three or more categories [46]. Significance was determined when the 95% CI for a parameter did not include zero [47]. Unlike traditional approaches, the Bayes estimator does not provide conventional fit indices. Instead, model convergence was evaluated using potential scale reduction (PSR) values and parameter trace plots [48]. A PSR value < 1.05 was taken to indicate convergence and model acceptability [49]. Parameter distributions were also examined throughout the estimation process, with additional iterations performed if large variations were observed [48]. Finally, to assess explained variance, Cohen's f^2 effect sizes were calculated and interpreted as small ($f^2 \geq 0.02$), medium ($f^2 \geq 0.15$), or large ($f^2 \geq 0.35$) [50]. CFA was conducted using a Bayesian estimator. In Bayesian CFA, traditional reliability and validity indices such as composite reliability (ω) and average variance extracted (AVE) are not provided as standard outputs. Therefore, construct validity was evaluated based on standardized posterior factor loadings, convergence diagnostics, and internal consistency estimates.

3 | Results

Participants' mean age was found to be 47.46 ± 9.89 years. Of the participants, 42% were high school graduates, 45.3% lived in an extended family, 65.3% were married, 94.7% were unemployed, 66.7% had an income equal to their expenses (medium level), 87.3% had children, and 46% had a disease stage of 3. It was found that all of the participants experienced hair loss, 77.3% used an assistive tool after hair loss, and 76.7% had a relative who supported them during treatment. In addition, 39.3% of the participants stated that their spouse/partner was supportive during the disease (Table 1).

3.1 | Descriptive Analyses

Kurtosis and Skewness values showed that the data met the normality assumption. Cronbach's alpha internal consistency coefficients ranged between 0.81 and 0.98, and Cronbach's alpha was above the threshold value for the whole scale and its sub-

TABLE 1 | Descriptive characteristics of the patients.

Characteristics	Number ($n = 150$)	%
Educational status		
Literate	38	25.3
Primary education	41	27.3
High school	63	42
Undergraduate and higher	8	53
Type of family		
Nuclear family	62	41.3
Extended family	68	45.3
Broken family	20	13.3
Marital status		
Married	52	34.7
Single	98	65.3
Working status[*]		
Yes	8	5.3
No	142	94.7
The status of having children		
Yes	131	87.3
No	19	12.7
Income status		
Income < expense	37	24.7
Income = expense	100	66.7
Income > expense	13	8.7
Stage of disease		
Stage 1	56	37.3
Stage 2	25	16.7
Stage 3	69	46.0
The status of losing hair		
Yes	150	100
The status of using assistive tools such as wigs and scarves	116	77.3
Yes	34	22.7
No		
The status of having relatives who provide support during the treatment		
Yes	115	76.7
No	35	23.3
The status of your spouse/partner supporting your disease		
No spouse/partner	26	17.3
Supported/helped	59	39.3
Could not accept	36	24.0
Got away	29	19.3
	Mean ± SD	**Min–Max**
Age (yr)	47.46 ± 9.80	26–67
Diagnosis year (yr)	11.52 ± 9.13	1–45

[*]Most participants were housewives; thus, the observed high unemployment rate does not necessarily indicate active job-seeking.

dimensions. The mean values for the variables were $M = 110.9$ (SD = 34.1) for the CPSS, $M = 40.8$ (SD = 12.7) for the confidence support subscale, $M = 38.13$ (SD = 12.0) for the emotional support subscale, and $M = 31.96$ (SD = 9.93) for the information support subscale. Mean values were found as $M = 119.9$ (SD = 40.8) for CES, $M = 56.9$(SD = 19.67) for personal strength

subscale, $M = 26.86$ (SD = 9.16) for social support subscale, $M = 18.18$ (SD = 6.57) for health care subscale, and $M = 17.95$ (SD = 6.22) for community support subscale. Mean values were found as $M = 60.76$(SD = 12.22) for CIAQLS, $M = 29.61$ (SD = 7.81) for reflections on general life, $M = 19.79$(SD = 6.67) for negative reflections on inner world, and $M = 11.35$(SD = 2.45) for positive thoughts.

All correlation coefficients between the variables ranged between 0.79 and 0.98 and were significant at $p < 0.01$ level. Table 2 shows the descriptive analysis results.

3.2 | Bayesian Mediation Analysis

The model convergence we tested using the Bayes estimator was achieved at 4300 iterations, and the PSR value dropped below 1.05 (1.045), but there was visible variation in the trace plots (Figure 2). We checked the PSR values by increasing the number of iterations with the TECH8 command and found that the variation in the trace plots was minimized at 50,000 iterations, indicating that the model should not be rejected [45].

It was found that the direct effect between CPSS and CES was positive and significant ($\beta = 960$, 95% CI [0.942, 0.973]), the direct effect between CPSS and CIAQLS was positive and significant ($\beta = 0.335$, 95% CI [0.110, 0.556]), and the direct effect between CES and CIAQLS was positive and significant ($\beta = 0.647$, 95% CI [0.426, 0.866]). The indirect relationship between CPSS and CIAQLS through CES was positive and significant ($\beta = 0.622$, 95 CI% [0.429, 0.797]). The total effect of CPSS on CIAQLS ($\beta = 0.957$, 95% CI [0.939, 0.972]) was found to be positive and significant. These findings indicate that CES partially mediates the relationship between CPSS and CIAQLS. The final structural model explained 92.2% of the variance in CES and 94.8% of the variance in CIAQLS. Effect sizes were evaluated using standardized path coefficients and Cohen's f^2 values, indicating a large effect of CPSS on CES ($f^2 = 0.479$) and a large effect of the predictors on CIAQLS ($f^2 = 0.486$) (Table 3). The structural equation model is illustrated in Figure 3.

4 | Discussion

The present study aimed to analyze the effect of social support on cancer empowerment status and alopecia quality of life in breast cancer patients. The relationships between the variables were shown by multivariate statistical analyses and SEM with Bayes estimator was used for this purpose. The aim of using SEM was to analyze the direct and indirect effects of social support on alopecia quality of life in breast cancer patients through cancer empowerment status. For this purpose, first, the direct effects of social support on empowerment status and alopecia quality of life were analyzed. Next, the direct effect of cancer empowerment status in breast cancer patients on alopecia quality of life was analyzed, and finally, the indirect effect of social support on alopecia quality of life through cancer empowerment status was examined.

Social support was found to have a positive significant direct effect on the cancer empowerment status of breast cancer patients. In breast cancer patients, social support is an important factor on the quality of life and empowerment status of patients. Studies have shown that social support has a positive effect on illness adaptation, anxiety and stress, and there is a positive relationship between social support and quality of life [10, 14, 27, 51]. In another study, it was found that social support increased emotional well-being and had positive effects on coping skills and also had an indirect effect on empowerment [52]. In the literature, while inadequate social support is associated with an increase in cancer-related mortality rates, increased social support has been found to have positive effects on physical, social, and psychological functioning [15, 53]. In line with these results, it can be said that social support can play a vital role in the empowerment of breast cancer patients by providing them with the necessary resources, information, and emotional support to take an active role in the treatment and care processes. In addition, nurses can be effective in empowering breast cancer patients by encouraging patients to receive social support through various methods.

Social support has been found to have a direct positive and significant effect on alopecia quality of life in breast cancer patients. Social support and empowerment have been found to be directly associated and especially social support from family has been found to be associated with positive body image [28, 30, 31]. In a study with similar results, social support was reported to be important in the relationship between resilience and quality of life [14]. In the well-being of breast cancer patients, social support is a crucial factor. The alopecia experienced is not only physical but also causes very important psychosocial side effects [54]. In a study on the relationship between social support and hope, body image, and resilience, social support was found to have a mediating role [55]. In another study, similar results were found and social support was found to have a mediating role in the relationship between body image, depression, and post-traumatic growth [56]. A relationship was also emphasized between body image, illness perception, and social support in breast cancer patients [57]. In breast cancer patients, social support is thought to be an important factor in alleviating the problems related to alopecia and body image, especially affecting the experiences of patients on the perceived quality of life related to alopecia and body image.

It has been found that cancer empowerment status of breast cancer patients has a direct positive and significant effect on alopecia quality of life. Empowered patients can actively participate in their treatment and care and specialize in their disease [16]. It can be seen that as a result of this situation, positive results are achieved in terms of improvement in quality of life, psychological harmony and well-being [18, 21]. Alopecia is often overlooked because it is not considered a life-threatening side effect. Nevertheless, psychological and social aspects of alopecia can have a negative impact on the psychological well-being of patients. Empowerment in breast cancer patients with alopecia and perceived negative body image are thought to play a role in affecting quality of life. It is thought that discomfort caused by alopecia may cause negative consequences on empowerment by affecting the effective coping mechanisms of breast cancer patients with treatment and care. Therefore, it is thought that nurses will contribute to better patient outcomes by taking roles in the empowerment of breast cancer patients with alopecia.

Another result found in the current study is that social support has an indirect positive and significant relationship on alopecia quality of life through empowerment in breast cancer

TABLE 2 | Descriptive statistics.

Questionnaires	*M* (SD)	Skewness	Kurtosis	*α*	1	2	3	4	5	6	7	8	9	10	11	12
CPSS	110.9 (34.1)	−0.038	−1.645	0.98	1											
Cs	40.8 (12.7)	−0.045	−1.543	0.95	0.98**	1										
Es	38.13 (12.0)	−0.043	−1.546	0.95	0.98**	0.95**	1									
Is	31.96 (9.93)	−0.055	−1.515	0.94	0.98**	0.94**	0.95**	1								
CES	119.9 (40.8)	−0.332	−1.556	0.98	0.94**	0.93**	0.93**	0.92**	1							
Ps	56.9 (19.67)	−0.275	−1.533	0.98	0.94**	0.93**	0.93**	0.92**	0.99**	1						
Ss	26.86 (9.16)	−0.342	−1.419	0.93	0.92**	0.92**	0.90**	0.89**	0.97**	0.95**	1					
Hc	18.18 (6.57)	−0.208	−1.423	0.92	0.91**	0.89**	0.89**	0.89**	0.96**	0.94**	0.93**	1				
Cs	17.95 (6.22)	−0.366	−1.327	0.91	0.90**	0.89**	0.88**	0.88**	0.96**	0.94**	0.93**	0.90**	1			
CIAQLS	60.76 (12.22)	−0.304	−1.423	0.83	0.92**	0.91**	0.91**	0.90**	0.93**	0.93**	0.91**	0.90**	0.91**	1		
Rgl	29.61 (7.81)	−0.317	−1.396	0.86	0.91**	0.90**	0.90*	0.88**	0.93**	0.93**	0.90**	0.89**	0.91**	0.98**	1	
Iw	19.79 (6.67)	−0.212	−1.434	0.93	0.92**	0.91**	0.91**	0.90**	0.92**	0.92**	0.89**	0.89**	0.89**	0.97**	0.93**	1
Pt	11.35 (2.45)	0.215	−1.114	0.81	0.81**	0.79**	0.80**	0.80**	0.82**	0.82**	0.79**	0.80**	0.80**	0.79**	0.83**	0.84**

Note: Iw = Negative reflections on inner world dimension, Pt = Positive thoughts dimension.

Abbreviations: CES = Cancer Empowerment Scale, CIAQLS = Chemotherapy-Induced Alopecia Quality of Life Scale, CPSS = Cancer Patient Social Support Scale, Cs = Confidence support, Cs = Community support; Es = Emotional Support, Hc = Healthcare, Is = Information support, Ps = Personal strength, Rgl = Reflections on general life dimension, Ss = Social support.

** $p < 0.01$.

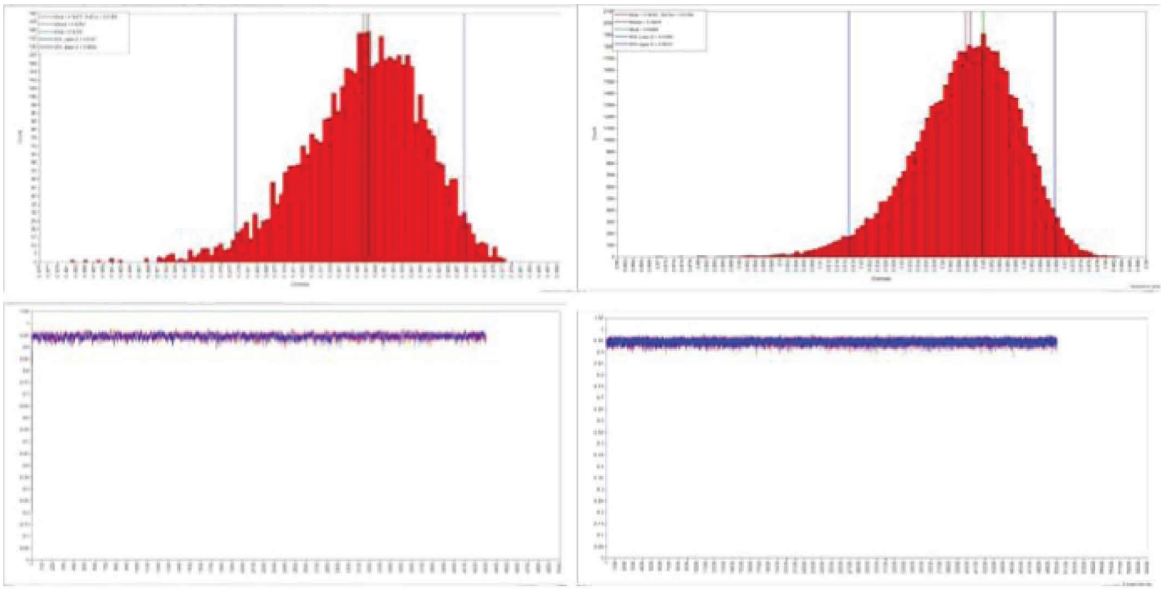

FIGURE 2 | Parameter trace plot and histograms with fbiterations ranging from 4.300 to 50.000.

patients. In other words, empowerment has a partial mediation effect between social support and alopecia quality of life. In other words, social support of breast cancer patients directly affects their alopecia quality of life but also positively and indirectly through empowerment. It can be said that social support is indirectly effective in empowerment as a result of its positive effects on coping skills. Initiatives to empower breast cancer patients may have a positive effect on alopecia quality of life by increasing their perceived social support [52]. Enabling breast cancer patients to take an active role in treatment and care and increasing their social support by maintaining their well-being is the aim of empowering breast care patients [18]. It is thought that empowered cancer patients can control the results of treatment and care by specializing in their diseases and increase their quality of life due to alopecia with the social support they perceive. Therefore, in nursing interventions, empowerment of breast cancer patients with alopecia can help to improve quality of life by giving importance to positive care outcomes.

5 | Study Limitations

First, causal relationships could not be inferred due to the descriptive correlational and cross-sectional design of the study, which only allows conclusions about associations between social support, empowerment status, and alopecia-related quality of life. Although mediation analyses were conducted, the identified mediation paths should be interpreted as statistical associations rather than cause-and-effect relationships.

Second, the results may not be generalizable to other populations, as the study was conducted at a single center and included only breast cancer patients. In addition, the study was conducted in a single oncology center in eastern Turkey, and cultural and healthcare system characteristics may limit the transferability of the findings to other settings. All data collection instruments were administered in Turkish, and language-related or cultural differences may affect the applicability of the results to populations using different language versions of these scales.

TABLE 3 | Standardized results for Bayesian mediation model.

	β	S.E.	z	95% CI		p	R^2
				Lower	Upper		
Direct effect							
CPSS ⟶ CES	0.960	0.007	137.142	0.942	0.973	< 0.001	0.922
CPSS ⟶ CIAQLS	0.335	0.119	2.815	0.110	0.556	< 0.001	
CES ⟶ CIAQLS	0.647	0.116	5.577	0.426	0.866	< 0.001	
Indirect effect							
CPSS ⟶ CES ⟶ CIAQLS	0.622	0.112	5.555	0.429	0.797	< 0.001	
Total effect							
CPSS ⟶ CIAQLS	0.957	0.010	95.70	0.939	0.972	< 0.001	0.948

Abbreviations: CES = Cancer Empowerment Scale, CIAQLS = Chemotherapy-Induced Alopecia Quality of Life Scale, CPSS = Cancer Patient Social Support Scale.

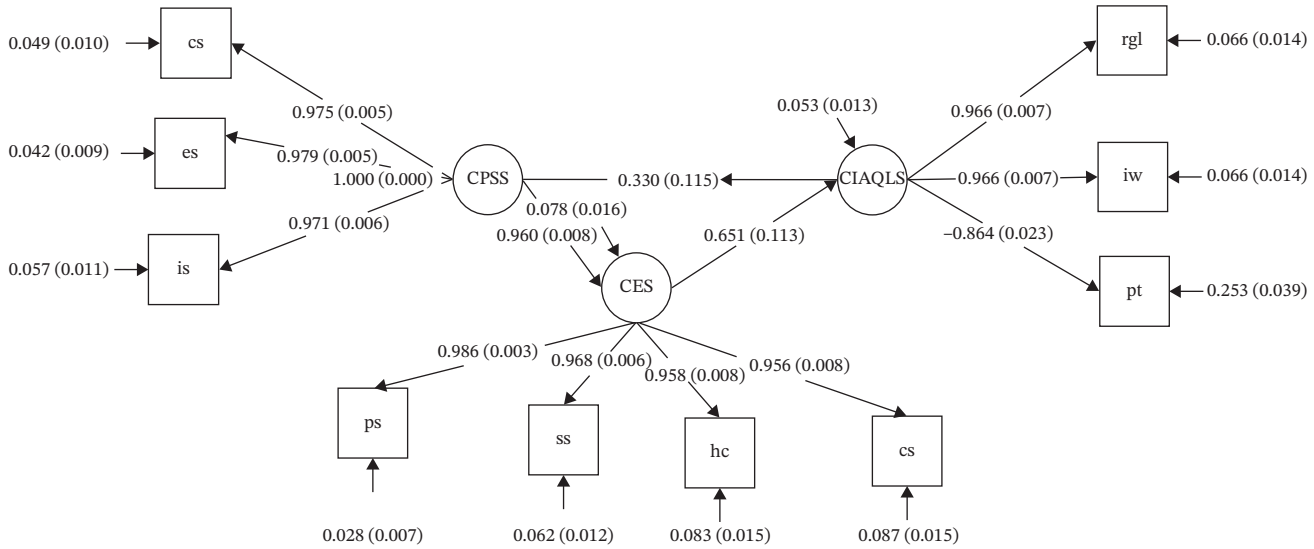

FIGURE 3 | Structural equation model. CPSS = Cancer Patient Social Support Scale, Cs = Confidence support, Es = Emotional Support, Is = Information support, CES = Cancer Empowerment Scale, Ps = Personal strength, Ss = Social support, Cs = Community support; Hc = Healthcare, CIAQLS = Chemotherapy-Induced Alopecia Quality of Life Scale: Rgl = Reflections on general life dimension Iw = Negative reflections on inner world dimension, Pt = Positive thoughts dimension.

Third, a large proportion of participants were housewives, contributing to the high unemployment rate observed in the sample; therefore, this finding may not accurately reflect labor market activity and should be interpreted cautiously when generalizing to broader populations.

Future multicenter and cross-cultural studies are recommended to validate the findings and enhance their generalizability.

6 | Conclusion

The findings of this study indicate that social support is positively associated with empowerment status and alopecia-related quality of life in breast cancer patients. Empowerment status was also positively associated with alopecia-related quality of life and appeared to play a mediating role in the association between social support and alopecia-related quality of life. However, due to the cross-sectional nature of the study, these findings should be interpreted as associative rather than causal. Future longitudinal studies are recommended to clarify the causal relationships among these variables.

Author Contributions

Study design: Nisa Yavuzer Bayrak and Gülcan Bahcecioglu Turan.

Data collection: Nisa Yavuzer Bayrak, Gülcan Bahcecioglu Turan, and Elanur Yilmaz Karabulutlu.

Data analysis: Nisa Yavuzer Bayrak and Gülcan Bahcecioglu Turan.

Study supervision: Nisa Yavuzer Bayrak, Gülcan Bahcecioglu Turan, and Elanur Yilmaz Karabulutlu.

Manuscript writing: Nisa Yavuzer Bayrak, Gülcan Bahcecioglu Turan, and Elanur Yilmaz Karabulutlu.

Critical revision of the manuscript for important intellectual content: Nisa Yavuzer Bayrak, Gülcan Bahcecioglu Turan, and Elanur Yilmaz Karabulutlu.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are not publicly available due to ethical restrictions and the inclusion of sensitive patient information. However, anonymized data may be made available from the corresponding author upon reasonable request and with appropriate ethical approval.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section. *(Supporting Information)*

The STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) checklist was used to guide the reporting of this observational study. The completed STROBE checklist is provided as a supporting file (STROBE_checklist_.docx) to ensure transparency and completeness of reporting in accordance with international standards.