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Factor Structure of the Short Form of the Zarit Burden Inventory (ZBI-12) Among Iranian Family Caregivers of Patients Undergoing Hemodialysis: A Methodological Study

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Abstract

Background: *Measuring caregiver burden is crucial given the essential role of family caregivers in supporting patients undergoing hemodialysis. One of the most widely used tools for this purpose is the short form of the Zarit Burden Inventory (ZBI-12). This study aimed to evaluate the psychometric properties of the ZBI-12 among family caregivers of patients on hemodialysis in Iran.*

Methods: *The main inclusion criteria in this methodological study were being the patient's primary caregiver, aged 18 years or older, and having provided care for at least six months. The validity assessment of ZBI-12 was carried out in three stages: face validity, content validity and construct validity. Additionally, convergent and discriminant validity were examined, followed by assessing reliability.*

Results: *Exploratory factor analysis revealed two factors—caregiver-related and patient-related concerns—explaining 56.7% of the total variance. Confirmatory factor analysis supported the model with satisfactory fit indices (CMIN/df=3.061, RMSEA=0.061, NFI=0.905, PNFI=0.786). Based on average variance extracted and maximum shared squared variance values, the two factors showed both convergent and discriminant validity. Reliability was confirmed, with high internal consistency (Cronbach's alpha=0.90 and 0.79; McDonald's omega=0.902 and 0.843) and stability (Intraclass Correlation Coefficient=0.95 and 0.96).*

Conclusion: *The ZBI-12 demonstrated strong psychometric properties for assessing caregiver burden in the hemodialysis context. It is a reliable and valid tool that can guide the evaluation of caregiver challenges and support the development of effective educational and clinical interventions.*

Keywords: Caregiver, Validity, Reliability, Hemodialysis, Psychometric.
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Introduction

More than 10% of the global population (over 800 million individuals) suffer from Chronic Kidney Disease (CKD), making it one of the most prevalent chronic illnesses worldwide.[1] The incidence of CKD is also rising in Iran, a developing nation.[2] Among the various treatments for CKD, hemodialysis is one of the most commonly utilized methods.[3] However, individuals undergoing hemodialysis often encounter a range of physical, cognitive, and emotional challenges, making the treatment a stressful experience for both patients and their caregivers.[4] The relationship between CKD patients and their caregivers is critical, as many of the difficulties faced by patients also impact their caregivers. Thus, prioritizing caregiver well-being is essential, as the quality of care provided to patients undergoing hemodialysis is closely linked to the caregivers' health and overall condition.[5] In this context, caregivers and patients are considered an interdependent unit.[6]

A caregiver is defined as an individual who dedicates substantial time to providing care and support to a patient, playing a vital role in helping them manage their condition.[7] Informal caregivers, who are typically family members, provide unpaid care, complementing the roles of healthcare professionals such as physicians and nurses.[8] Family-centered care has gained recognition as an effective approach to enhancing healthcare quality.[9] However, excessive reliance on informal caregivers without addressing their needs across various domains can lead to significant challenges.[10] Caregiving encompasses multiple dimensions. Primary caregivers, usually family members, are responsible for not only the physical well-being of patients but also the management of treatment processes, including medication administration, monitoring health conditions, and covering medical expenses. These responsibilities often disrupt their daily routines, impose social restrictions, diminish personal independence, and contribute to emotional distress. Given the multifaceted pressures caregivers face, they are susceptible to considerable psychological and physical strain.[11,12] The burden of caregiving emerges from the demanding nature of these responsibilities and is characterized as a negative response to the challenges associated with patient care.[13] Due to the substantial toll caregiving takes, caregivers are sometimes referred to as "hidden patients" or the "second victims" of illness.[14] Research indicates that caregiving experiences and outcomes are influenced by cultural factors,[15] highlighting the need for context-specific assessments of caregiver burden. Identifying and addressing caregiving challenges in a timely manner is essential for mitigating adverse effects.[16]

Several instruments have been developed to measure caregiver burden, including the Caregiver Burden Inventory,[17] Caregiver Burden Scale,[18] Family Burden Interview

Schedule,[19] Burden Assessment Scale for Families of People with Dementia,[20] and Experience Caregiver Inventory.[21] One of the most widely utilized tools for assessing caregiver burden is the Zarit Burden Inventory (ZBI), which has been translated into multiple languages.[22] Originally developed by Zarit and colleagues in 1980, the ZBI initially consisted of 29 items.[23] In 1991, an 18-item version was introduced,[24] followed by a 12-item version developed by Hebert et al. in 2000.[25] However, these shorter versions were unable to effectively capture changes in caregiver burden over time. To address these limitations, Bedard et al. designed the 12-item Zarit Burden Inventory (ZBI-12) in 2001, which has since been widely employed in caregiving research.[26] This tool has been utilized in numerous studies.[27,28] The ZBI-12 is particularly advantageous due to its concise structure and straightforward items, allowing family caregivers of hemodialysis patients to respond without experiencing fatigue or disengagement. Given the substantial negative impact of excessive caregiving burden on family caregivers of hemodialysis patients, accurate assessment is crucial for improving community health. Therefore, the present study aims to evaluate the psychometric properties of the Persian version of the ZBI-12 in family caregivers of hemodialysis patients.

Materials and Methods

The current study employed a methodological research design to investigate family caregivers of patients receiving hemodialysis in specialized referral centers associated with Shahroud and Mazandaran Universities. The research was carried out over a six-month period, spanning from July 22, 2024, to January 19, 2025.

The 12-item Zarit Burden Inventory (ZBI-12), developed by Bedard et al. (2001), is a standardized tool designed to assess caregiver burden across two dimensions: personal strain and role strain. It utilizes a five-point Likert scale ranging from 0 (never) to 4 (always), with a total score varying between 0 and 48. Higher scores indicate an increased level of caregiving burden.[26,27]

Permission to translate the ZBI-12 was requested from the authors on September 5, 2023, and was granted on October 23, 2023. The translation process followed the World Health Organization (WHO) translation technique protocol. During the first phase of translation, two bilingual translators, fluent in both Persian and English, independently translated the ZBI-12. The translators were instructed to avoid direct or literal translation while maintaining the integrity of the original English text. They also identified and noted equivalent phrases for potential review in subsequent stages. As a result, two separate Persian translations of the ZBI-12 were produced. In the next phase, a team of psychology experts, alongside the primary translators, reviewed both Persian translations and addressed any discrepancies. This process resulted in a single, consolidated Persian version. Subsequently, two additional translators, also proficient in both languages, independently translated the Persian version back into English. This stage produced two distinct English translations of the ZBI-12. In the final phase, a panel of experts reviewed the two English versions and merged them into a single, final English version.[29]

Face validity was assessed in two phases: qualitative and quantitative. Face validity evaluates whether the structure of an instrument is intuitively valid from a user's perspective. In the qualitative phase, face-to-face interviews were conducted with ten family caregivers of patients undergoing hemodialysis. These participants were asked to provide feedback on the instrument's difficulty, appropriateness, relevance, and clarity. In the quantitative phase, the impact score was calculated by multiplying the frequency by the importance of each item. The same ten individuals who participated in the qualitative phase were asked to evaluate each item, assigning a score on a Likert scale from "not important" (1) to "very important" (5). Frequency, expressed as a percentage, refers to the proportion of individuals rating an item with a score of 4 or 5, while importance is the average score based on the Likert scale. Items with an impact score greater than 1.5 were considered suitable for further analysis and retained. Items with an impact score lower than 1.5 were not removed but revised.[30]

The aim of content validity is to ensure that the instrument accurately measures the concept it is intended to assess. There are two approaches to evaluating content validity: qualitative and quantitative. In the qualitative phase of content validity assessment, 12 experts reviewed the instrument. This group consisted of 8 faculty members from the nursing department, 2 psychiatrists and psychologists, and 2 specialists in instrument development. They evaluated the instrument for compliance with language conventions, appropriate use of terminology, correct item placement, and accurate scoring. For the quantitative assessment, the same 12 experts evaluated the instrument using the Content Validity Ratio (CVR) and the Content Validity Index (CVI). The formula used to calculate CVR is as follows: CVR=(ne-N/2)/(N/2). Each item was rated based on three criteria: essential (score 3), useful but unnecessary (score 2), and unnecessary (score 1). The variable ne represented the number of experts who classified the item as essential, while N denoted the total number of experts in the panel. According to the Lawshe table, the minimum acceptable CVR was set at 0.56.[31] For the CVI, the 12-item Zarit Burden Inventory (ZBI-12) was evaluated by 12 experts using the Waltz method. Each expert assessed the relevance of every item using the following scale: not relevant (1), somewhat relevant (2), relevant but needs revision (3), and completely relevant (4). The CVI for each item was calculated by dividing the number of experts who rated it as either 3 or 4 by the total number of raters. The interpretation of the CVI scores was as follows: values above 0.79 were considered adequate, scores between 0.70 and 0.79 were classified as questionable, and values below 0.70 were deemed unacceptable and were removed. Additionally, the overall Scale-Content Validity Index (S-CVI/Ave) was calculated to assess the validity of the entire instrument. Based on Polit and Beck's recommendations, an S-CVI/Ave score of 0.90 or higher was regarded as acceptable.[32,33]

The sample size was initially estimated using the formula $10\times12=120$ [34]. However, to ensure sufficient statistical power for subgroup analyses, the final sample included 400 family caregivers of patients undergoing hemodialysis. Of these, 200 participants were allocated to the Exploratory Factor Analysis (EFA) phase, while the remaining 200 were assigned to the Confirmatory Factor Analysis (CFA) phase. Participants were recruited through a convenience sampling method based on predefined inclusion and exclusion criteria from referral centers affiliated with Shahroud and Mazandaran Universities of

Medical Sciences. The inclusion criteria for family caregivers were as follows: (1) native Persian speakers, (2) providing informal care for a minimum of six months,[35] (3) aged 18 years or older, and (4) recognized as the primary caregiver by the patient.[36] For patients, the inclusion criterion was undergoing hemodialysis treatment for at least six months. Exclusion criteria for family caregivers included the presence of severe psychiatric disorders and receiving monetary compensation for caregiving. Patients were excluded if they: (1) had severe psychiatric disorders, (2) resided in a nursing home,[37] (3) had undergone a successful kidney transplant, (4) had completed their course of hemodialysis treatment, or (5) had passed away or been transferred to another medical facility.

Principal Axis Factoring (PAF) with Promax rotation was used to extract latent factors to assess construct validity.[38] The Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity were conducted to evaluate data suitability, with KMO values between 0.7 and 0.8 considered good and values between 0.8 and 0.9 classified as excellent. The number of latent factors was determined using the formula $CV=5.152/\sqrt{(n-2)}$, where n represents the sample size. Items were assigned to a factor if their factor loading was at least 0.33, though some researchers suggest a threshold of 0.4 or higher. CFA was then performed to validate the model identified in the EFA, ensuring alignment between the theoretical model and the actual data. Model fit was assessed using various goodness-of-fit indices, including Root Mean Square Error of Approximation (RMSEA)<0.08, Comparative Fit Index (CFI)>0.9, Parsimony Comparative Fit Index (PCFI)≥0.5, Parsimony normed fit index (PNFI)≥0.5, Incremental Fit Index (IFI)≥0.9, Tucker-Lewis Index (TLI)≥0.9, Normalized Fit Index (NFI)≥0.9, and Chi-Square Minimum per Degree of Freedom (CMIN/df)≤3.[33]

Following the guidelines of Fornell and Larcker (1981), Average Variance Extracted (AVE) and Composite Reliability (CR) were calculated for each construct to evaluate convergent and discriminant validity. Convergent validity was considered acceptable if the AVE for each construct exceeded 0.5 or if the CR was greater than 0.7. Discriminant validity was confirmed when the AVE value was higher than the Maximum Shared Squared Variance (MSV).[39]

In this study, Cronbach's alpha, McDonald's omega, and CR were calculated to assess the internal consistency of the Persian version of the ZBI-12. Reliability was considered acceptable if Cronbach's alpha, McDonald's omega, and CR exceeded 0.7. McDonald's omega offers a more accurate and realistic estimate of reliability compared to Cronbach's alpha, as it relies on fewer restrictive assumptions. Unlike Cronbach's alpha, McDonald's omega reflects true population reliability even when certain items are removed from a scale.[40] To evaluate the stability of the instrument, the Intraclass Correlation Coefficient (ICC) was calculated by having 30 family caregivers of hemodialysis patients complete the final version of the ZBI-12 twice, with a 14-day interval between assessments. An ICC value above 0.75 was considered desirable for ensuring the instrument's reliability.

The study assessed the Normality of data distribution using both univariate and multivariate methods. The results indicated that some items exhibited skewness beyond ±3, kurtosis exceeding ±7, and a Mardia coefficient greater than 8, suggesting a deviation from multivariate Normality.[41] Additionally, no missing data were observed. All statistical analyses were performed using SPSS and AMOS version 26.0.

This article presents the findings of a master's thesis in nursing that was approved by the Ethics Committee of Shahroud University of Medical Sciences under the code IR.SHMU.REC.1403.060. The guidelines of the Helsinki Convention were followed throughout the entire research process. The purpose of the research was clearly explained to all participants, who provided informed consent before their involvement. Participants were assured that any information shared would be kept confidential and that they had the right to withdraw from the study at any point. Participants were also allowed to receive the research results if desired.

Results

In this study, the majority of family caregivers were female (59.7%) and married (86.5%). The mean age of caregivers was 50.28±14.01 years. Additional demographic details of the caregivers are presented in Table 1. Regarding the patients, 228 (57.0%) were male, 323 (80.8%) were married, and 266 (66.6%) had an education level below a high school diploma. The mean age of the patients was 58.22±14.33 years. Most patients (55.3%) had vascular access via fistula. On average, they had been living with CKD for 104.16±96.49 months, with 52.84±49.73 months spent undergoing hemodialysis treatment.

Table 1. Demographic characteristics of participants (N=400)

Variables		Frequency (%)
Gender	Male	161 (40.3)
	Female	239 (59.7)
Marital status	Single	42 (10.5)
	Married	346 (86.5)
	Divorced	4 (1.0)
	Widowed	8 (2.0)
Education level	Below diploma	201 (50.2)
	Diploma	101 (25.3)
	Higher education	98 (24.5)
Job	Self-employed	125 (31.3)
	Retired	46 (11.5)
	Employed	31 (7.8)
	Unemployed	9 (2.3)
	Student	6 (1.5)

Relationship to patient	Housewife	183 (45.6)
	Parent	35 (8.8)
	Sibling	25 (6.3)
	Child	131 (32.8)
	Grandparent	4 (1.0)
	Wife	205 (51.1)
Underlying health conditions	No	198 (49.5)
	Yes	202 (50.5)
Insurance status	No	37 (9.3)
	Yes	363 (90.7)
		Mean (SD)
Age (per year)		50.28 (14.01)
Duration of caregiving (per month)		96.62 (87.65)
Number of children		2.16 (1.75)

Abbreviations: %: Percent; SD: Standard Deviation

All items displayed clarity, relevance, and importance in the qualitative face validity stage. Additionally, the impact score of all items in the face validity stage was slightly above 1.5.

During the qualitative content validity stage, some items were revised and refined based on the expert panel's recommendations. In the quantitative content validity assessment, all items achieved a CVR greater than 0.66 and an Item-Content Validity Index (I-CVI) exceeding 0.91. Given the established cutoff of 0.56, no items were eliminated. Additionally, the Scale-Content Validity Index/Average (S-CVI/Ave) was calculated as 0.95, indicating an acceptable level of content validity.

The KMO (0.855) and Bartlett's test (χ^2=2633.542, df=66, P-value<0.001) indicated adequate sampling for factor analysis. PAF with Promax rotation was used to determine the number of latent factors, resulting in two factors with eigenvalues greater than 1, which together explained 56.7% of the total variance (Table 2).

Table 2. Exploratory factor analysis on two factors of the Persian version of the ZBI-12 (N=200)

Factors	Qn. Item	Factor Loading	h2	ʌ	% Variance
Caregiver-related concerns	5- How much you are strained when you are around your patient?	0.769	0.575	4.740	39.5
	4- How do you feel that your relationship with your patient has affected your relationships with other relatives or friends?	0.753	0.543		
	1- How much do you feel that you don't have enough time for yourself because of the time you spend with your patient?	0.729	0.543		
	8- How do you feel that your social life has suffered due to caring for your patient?	0.724	0.490		
	9- How do you feel about losing control of your life since your patient's illness?	0.716	0.614		
	2- How much stress has taking care of the patient while also meeting other responsibilities of your work/family?	0.699	0.613		
	3- How angry are you when you are around your patient?	0.698	0.459		
	7- How much do you don't have as much privacy as you want to care for your patient?	0.698	0.455		
	6- How much involvement with your patient has affected your health?	0.636	0.455		
Patient-related concerns	11- How much do you feel you should do more for your patient?	0.999	0.952	2.066	17.2
	12- How much do you feel you could have taken better care of your patient?	0.867	0.706		
	10- How uncertain about what to do about your patient?	0427	0.406		

Abbreviations: h2: Item Communalities; ʌ: Eigenvalue.

CFA results confirmed the final model, with all goodness-of-fit indices meeting the criteria: RMSEA=0.061 (90% CI: 0.059–0.073), CFI=0.922, PCFI=0.798, NFI=0.905, PNFI=0.786, IFI=0.922, TLI=0.905, χ^2=153.087; df=50, P-value<0.001, and CMIN/df=3.061. The final model of the Persian version of the ZBI-12 is shown in Figure 1.

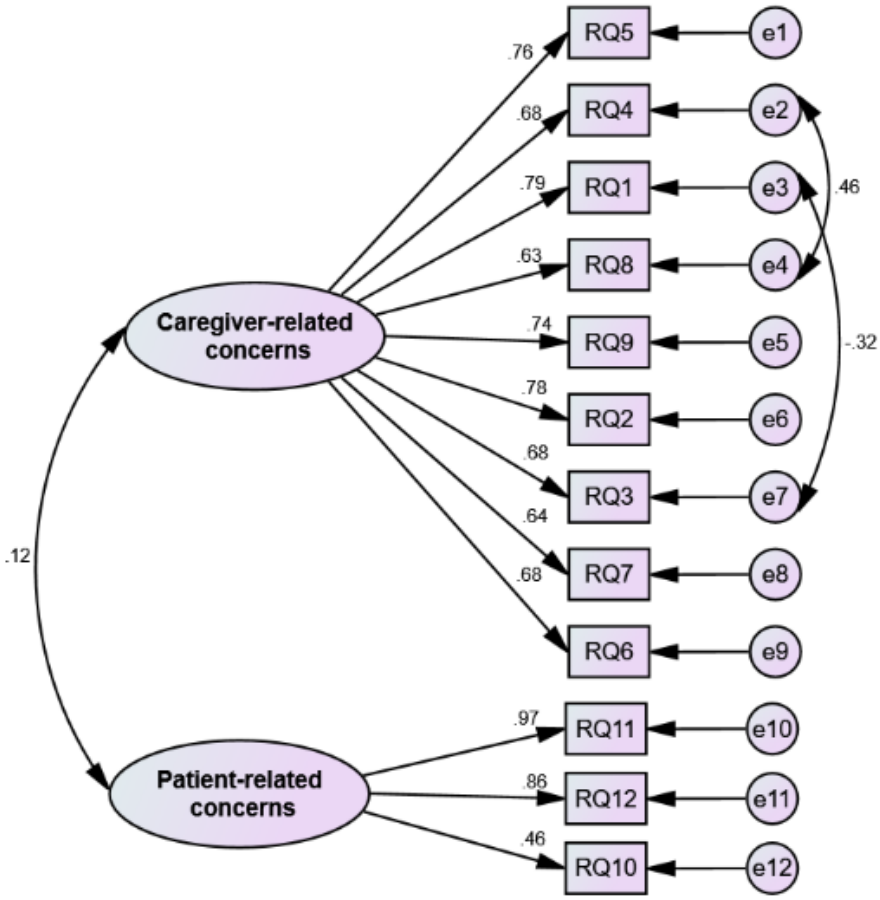

Figure 1. The final model of the Persian version of the ZBI-12 (N=200)

As shown in Table 3, the AVE values for both extracted factors exceeded 0.5, and the CR values were greater than 0.7, indicating good convergent validity for these factors. Additionally, since the AVE values were higher than the MSV, the discriminant validity of the two factors was also confirmed.

Based on the results showed in the Table 3, Cronbach's alpha, McDonald's omega coefficients, and CR were all above 0.7 for both factors, demonstrating good internal consistency. Additionally, the ICC for the two factors exceeded 0.75, indicating acceptable stability.

Table 3. Convergent and discriminant validity and reliability of the Persian version of the ZBI-12

Indices / Factors	CR	AVE	MSV	α	Ω	ICC (CI 95%)
Caregiver-related concerns	0.901	0.504	0.263	0.901	0.902	0.957 (0.912–0.979)
Patient-related concerns	0.824	0.632	0.006	0.793	0.843	0.960 (0.919–0.980)

Abbreviations: CR: Composite Reliability; AVE: Average Variance Extracted; MSV: Maximum Shared Squared Variance; α: Cronbach's alpha coefficient; Ω: McDonald's omega coefficient; ICC: Intraclass Correlation Coefficient.

Discussion

The aim of the present study was to validate the Persian version of the ZBI-12 for family caregivers of patients undergoing hemodialysis treatment. A review of the literature revealed that many studies have not addressed the psychometrics of an appropriate tool to measure the caregiving burden for family caregivers of hemodialysis patients, with only a few exceptions. For instance, Cil Akinci et al. (2014)[42] psychometrically tested a 22-item scale, Hejazi et al. (2022)[37] developed the Caregiver Burden Questionnaire for Family Caregivers of Hemodialysis Patients (CBQ-CHP) with 21 items, and Jung et al. (2024)[43] translated the CBQ-CHP into

Korean, evaluating its concurrent validity alongside the ZBI-22. One advantage of the ZBI-12 over these tools is its smaller number of items.

In this study, the results of EFA indicated that the ZBI-12 comprises two factors: Caregiver-related Concerns and Patient-related Concerns. The Caregiver-related Concerns factor includes 9 items (5, 4, 1, 8, 9, 2, 3, 7, 6), while the Patient-related Concerns factor consists of 3 items (11, 12, 10). The item numbers for each factor are listed in order of their factor loading. Together, these factors accounted for more than half of the total variance (56.7%). The first factor identified in this study emphasizes various issues that affect the physical and mental health of family caregivers. These include fatigue, anger, lack of personal time, social life disruptions, feelings of losing control, pressure from multiple responsibilities, lack of privacy, and health risks. It is important to note that a caregiver is defined as someone who provides care for individuals with disabilities or limitations due to illness.[44] Informal caregiving is a crucial component of home care, with caregivers playing an integral role as part of the healthcare team, complementing the work of doctors and nurses.[9] However, caregivers often face challenges that exceed their capabilities, resulting in psychological issues such as anxiety, depression, restlessness, financial difficulties, and a reduced quality of life[45]. These physical, economic, and psychological challenges, collectively referred to as caregiving burdens, often lead to substantial concerns and stress.[23] The Caregiver-related Concerns factor identified in this study aligns with the first factor (Personal Strain) from Bedard et al. (2001)[26] and the first factor (Role Strain) from Tang et al. (2016),[46] both of which also accounted for a larger portion of the total variance.

The second factor in this study, Patient-related Concerns, reflects the issues that family caregivers face regarding the quality and quantity of care they provide to their patients. This includes aspects such as striving to deliver better care, doing more for the patient, and being more focused on patient-related tasks. The Patient-related Concerns factor in this study, similar to the second factor (Role Strain) in the study by Bedard et al. (2001)[26], explained a smaller portion of the total variance. In caregiving research, contextual factors such as caregiver characteristics (age, gender, ethnicity, education, occupation, and economic status), the caregiver's relationship with the patient, and the duration of caregiving play an important role. Stressors related to the care recipient, such as symptoms, functional status, mental health issues, and role pressures, also contribute to the caregiving burden. Mediating factors, including coping mechanisms and social support, are essential considerations when examining caregiving challenges.[47] EFA, used in this study and in those by Rajabi-Mashhadi et al. (2015)[27] and Hejazi et al. (2022),[37] helps identify latent factors and the relationships between variables. In contrast, Jung et al. (2024)[43] did not use EFA to assess construct validity, demonstrating a different approach.

After conducting EFA, the CFA results in this study confirmed that all goodness-of-fit indices were met, which aligns with the findings from Tang et al. (2016).[46] CFA was also utilized in studies by Cil (2014),[42] Jung et al. (2024),[43] Hejazi et al. (2022),[37] Krystyna et al. (2022),[48] and Julio et al. (2023).[49] However, CFA was not referenced in the studies by Bedard et al. (2001)[26] and Haghshenas et al. (2023).[50] CFA is instrumental in providing deeper insights into the dimensionality and validity of a scale.[51]

The AVE, MSV, and CR values for both extracted factors in this study confirmed convergent and discriminant validity. In contrast, in the study by Hejazi et al. (2022),[37] the AVE for the first factor (physical and psychological burden) was found to be less than 0.5, though the other factors demonstrated good convergent validity. Additionally, while the MSV was less than the AVE in factors three and four, this was not the case for factors one and two. The convergent and discriminant validity results in the present study were consistent with the findings from Jung et al. (2024).[43] However, there was no mention of convergent and discriminant validity in the study by Bedard et al. (2001).[26]

In the present study, internal consistency was evaluated using Cronbach's alpha, McDonald's omega, and CR, with all values falling within acceptable ranges, indicating good internal consistency. This is consistent with previous studies, such as those by Rajabi-Mashhadi et al. (2015),[27] Bedard et al. (2001),[26] Whitlatch et al. (1991),[24] and Tang et al. (2016),[46] whose findings align with the current study's results. The use of multiple measures of internal consistency, including McDonald's omega and CR, strengthens the reliability of the scale. The CR values in the present study were consistent with those found by Hejazi et al. (2022).[37] CR provides an indication of the reliability of each factor independently and is not influenced by the number of scale items or sample size, making it a robust measure of internal consistency.[41]

Regarding stability, the ICC was used to evaluate the reliability of the factors over time. The ICC values obtained in the present study were satisfactory for both factors and were consistent with findings from study by Hebert et al. (2000).[25] In contrast to the study by Rajabi-Mashhadi et al. (2015), where the ZBI-12 was completed by 48 family caregivers within a short interval of 3 days, the present study utilized a longer interval of 14 days with 30 family caregivers. This longer interval enhances the reliability of the ICC results, suggesting a higher level of stability over time. While the study by Rajabi-Mashhadi et al. also reported favorable ICC results, the extended interval in the current study provides additional confidence in the stability of the instrument over a longer period.

Given the crucial role of family caregivers in enhancing the health and quality of care for patients undergoing hemodialysis, having a valid and reliable tool to evaluate caregiver burden and pinpoint the level of caregiving challenges can result in positive patient outcomes. As such, the Persian version of the ZBI-12, with its favorable psychometric properties, will help reach this objective.

The strengths of this study include the desirable sample size and adherence to psychometric principles. This study has some limitations. One limitation of this study lies in the reliance on a self-report instrument, which may introduce response bias. Although we obtained a substantial sample size from various centers and cities, the sampling was conducted in only two provinces, which may limit the generalizability of the findings to regions with different cultural or social characteristics. Additionally, the study employed a convenience sampling method, which could introduce selection bias and

further restrict the scope of our conclusions. While the Persian version of the ZBI-12 showed acceptable psychometric properties, further cultural adaptation remains essential. Cultural adaptation extends beyond literal translation and must account for deeper social and cultural dynamics. In Middle Eastern contexts—particularly in Iran, where caregiving for a family member is regarded as a sacred duty—prevailing cultural values and social expectations may shape participants' responses and influence the scale's validity. To overcome these challenges, future research should incorporate more comprehensive cultural adaptation strategies, supported by qualitative approaches (such as grounded theory, ethnographic or phenomenological studies), to ensure the tool captures the caregiving experience more accurately. These limitations should be considered when interpreting the results and their applicability to broader populations.

Based on the present study's findings, the Persian version of the ZBI-12 consists of 12 items and two factors. Due to the brevity and clarity of its items, it is considered a useful and valuable tool for measuring the caregiving burden among family caregivers of individuals undergoing hemodialysis. This version provides an efficient and reliable way to assess the challenges faced by caregivers in this specific context, offering the potential for application in both clinical and research settings.

Ethical Considerations

This article presents the findings of a master's thesis in critical care nursing that was approved by the Ethics Committee of Shahroud University of Medical Sciences under the code IR.SHMU.REC.1403.060. The guidelines of the Helsinki Convention were followed throughout the entire research process. The purpose of the research was clearly explained to all participants, who provided informed consent before their involvement. Participants were assured that any information shared would be kept confidential and that they had the right to withdraw from the study at any point. Participants were also allowed to receive the research results if desired.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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References

1. Alshammari B, Noble H, McAneney H, et al. An exploration of symptom burden and its management, in Saudi Arabian patients receiving haemodialysis, and their caregivers: a mixed methods study protocol. BMC Nephrol. Jul 9 2019;20(1):250. doi: 10.1186/s12882-019-1424-9

2. Ghiasi B, Nazari H, Babarabiei MA, et al. Prevalence and Causes of Chronic Kidney Disease in Patients Referred to the Nephrology Clinic in Ilam. sjimu. 2023;31(1):52-59.

3. Vachharajani TJ, Taliercio JJ, Anvari E. New Devices and Technologies for Hemodialysis Vascular Access: A Review. Am J Kidney Dis. Jul 2021;78(1):116-124. doi: 10.1053/j.ajkd.2020.11.027

4. Sousa H, Frontini R, Ribeiro O, et al. Caring for patients with end-stage renal disease during COVID-19 lockdown: What (additional) challenges to family caregivers? Scand J Caring Sci. Mar 2022;36(1):215-224. doi: 10.1111/scs.12980

5. Hemmati Maslakpak M, Torabi M, Radfar M, et al. The effect of psycho-educational intervention on the caregiver burden among caregivers of hemodialysis patients. Journal of Research Development in Nursing and Midwifery. 2019;16(1):13-24. doi: 10.29252/jgbfnm.16.1.14

6. Panthi RC, Dhungana M, Poudel D, et al. Quality of Life of Patients With Chronic Kidney Disease Under Maintenance Hemodialysis and Their Caregivers: A Cross-Sectional Study. Cureus. Oct 2023;15(10):e46651. doi: 10.7759/cureus.46651

7. Gayomali C, Sutherland S, Finkelstein FO. The challenge for the caregiver of the patient with chronic kidney disease. Nephrol Dial Transplant. Dec 2008;23(12):3749-51. doi: 10.1093/ndt/gfn577

8. Prudencio G, Young H. Caregiving in the US 2020: What does the latest edition of this survey tell US about their contributions and needs? Innovation in Aging. 2020;4(Supplement_1):681-681. doi: 10.1093/geroni/igaa057.2371

9. Towle RM, Tan CG, Saptu K, et al. What do caregivers value and is there agreement in perception of met needs between nurses and caregivers? Singapore Med J. Nov 2019;60(11):575-582. doi: 10.11622/smedj.2019040

10. Volpin M. The experiences of family caregivers of assisted living residents enrolled in Hospice. Journal of Pain and Symptom Management. 2010;39(2):344-345. doi: 10.1016/j.jpainsymman.2009.11.263

11. Chhetri SK, Baral R. Caregiver Burden among Caregivers of Patient Undergoing Hemodialysis in Tertiary Care Center : A Descriptive Cross-sectional Study. JNMA J Nepal Med Assoc. Mar 2020;58(223):148-152. doi: 10.31729/jnma.4779

12. Aung TNN, Aung MN, Moolphate S, et al. Caregiver burden and associated factors for the respite care needs among the family caregivers of community dwelling senior citizens in Chiang Mai, Northern Thailand. International Journal of Environmental Research and Public Health. 2021;18(11):5873. doi: 10.3390/ijerph18115873

13. Northouse LL, Katapodi MC, Song L, et al. Interventions with family caregivers of cancer patients: meta-analysis of randomized trials. CA Cancer J Clin. Sep-Oct 2010;60(5):317-39. doi: 10.3322/caac.20081

14. Haresabadi M, Bibak B, Hosein zadeh E, et al. Assessing burden of family caregivers of patients with schizophrenia Admitted in IMAM REZA hospital-Bojnurd 2010. Orginal Research. North Khorasan University of Medical Sciences. 2012;4(2):165-171. doi: 10.29252/jnkums.4.2.165

15. Dilworth-Anderson P, Williams IC, Gibson BE. Issues of race, ethnicity, and culture in caregiving research: a 20-year review (1980-2000). Gerontologist. Apr 2002;42(2):237-72. doi: 10.1093/geront/42.2.237

16. Thieken F, van Munster M. Deriving Implications for Care Delivery in Parkinson's Disease by Co-Diagnosing Caregivers as Invisible Patients. Brain Sci. Dec 10 2021;11(12). doi: 10.3390/brainsci11121629

17. Novak M, Guest C. Application of a multidimensional caregiver burden inventory. Gerontologist. Dec 1989;29(6):798-803. doi: 10.1093/geront/29.6.798

18. Elmståhl S, Malmberg B, Annerstedt L. Caregiver's burden of patients 3 years after stroke assessed by a novel caregiver burden scale. Arch Phys Med Rehabil. Feb 1996;77(2):177-82. doi: 10.1016/S0003-9993(96)90164-1

19. Pai S, Kapur RL. The burden on the family of a psychiatric patient: development of an interview schedule. Br J Psychiatry. Apr 1981;138:332-5. doi: 10.1192/bjp.138.4.332

20. Reinhard SC, Gubman GD, Horwitz AV, et al. Burden assessment scale for families of the seriously mentally ill. Evaluation and Program Planning. 1994/07/01/ 1994;17(3):261-269. doi: 10.1016/0149-7189(94)90004-3

21. Szmukler GI, Burgess P, Herrman H, et al. Caring for relatives with serious mental illness: the development of the Experience of Caregiving Inventory. Soc Psychiatry Psychiatr Epidemiol. Jun 1996;31(3-4):137-48. doi: 10.1007/BF00785760

22. Van Durme T, Macq J, Jeanmart C, et al. Tools for measuring the impact of informal caregiving of the elderly: a literature review. Int J Nurs Stud. Apr 2012;49(4):490-504. doi: 10.1016/j.ijnurstu.2011.10.011

23. Zarit SH, Reever KE, Bach-Peterson J. Relatives of the impaired elderly: correlates of feelings of burden. Gerontologist. Dec 1980;20(6):649-55. doi: 10.1093/geront/20.6.649

24. Whitlatch CJ, Zarit SH, von Eye A. Efficacy of interventions with caregivers: a reanalysis. Gerontologist. Feb 1991;31(1):9-14. doi: 10.1093/geront/31.1.9

25. Bravo G, Hébert R, Préville M. Reliability, Validity and Reference Values of the Zarit Burden Interview for Assessing Informal Caregivers of Community-Dwelling Older Persons with Dementia. Canadian Journal on Aging / La Revue canadienne du vieillissement. 2000;19(4):494-507. doi: 10.1017/S0714980800012484

26. Bédard M, Molloy DW, Squire L, et al. The Zarit Burden Interview: a new short version and screening version. Gerontologist. Oct 2001;41(5):652-7. doi: 10.1093/geront/41.5.652

27. Rajabi-Mashhadi MT, Mashhadinejad H, Ebrahimzadeh MH, et al. The Zarit Caregiver Burden Interview Short Form (ZBI-12) in spouses of veterans with chronic spinal cord injury, validity and reliability of the Persian version. Archives of bone and joint surgery. 2015;3(1):56.

28. Alaryni AA, Alrowaie F, Alghamdi A, et al. Assessment of Burden in Caregivers of Patients Undergoing Hemodialysis and Peritoneal Dialysis: A Cross-Sectional Study in Riyadh, Saudi Arabia. Cureus. Jan 2024;16(1):e52513. doi: 10.7759/cureus.52513

29. Nilsson J, Gardulf A, Lepp M. Process of translation and adaptation of the Nurse Professional Competence (NPC) Scale. Journal of Nursing Education and Practice. 2016;6(1):100. doi: 10.5430/jnep.v6n1p100

30. Hoseinzadeh E, Sharif-Nia H, Ashktorab T, et al. Development and psychometric evaluation of nurse's intention to care for patients with infectious disease scale: an exploratory sequential mixed method study. BMC nursing. 2024;23(1):65. doi: 10.1186/s12912-023-01669-z

31. Lawshe CH. A quantitative approach to content validity. Personnel psychology. 1975;28(4):563-575. doi: 10.1111/j.1744-6570.1975.tb01393.x

32. Ebadi A, Taghizadeh Z, Montazeri A, et al. Translation, development and psychometric properties of health related measures-Part 2: construct validity, reliability and responsiveness. 2017.

33. Sharif SP, Nia HS. Factor Analysis and Structural Equation Modeling with SPSS and AMOS: From Zero to Hero. 2021.

34. Williams B, Onsman A, Brown T. Exploratory factor analysis: A five-step guide for novices. Australasian journal of paramedicine. 2010;8:1-13. doi: 10.33151/ajp.8.3.93

35. Mirhosseini S, Imani Parsa F, Moghadam-Roshtkhar H, et al. Support based on psychoeducation intervention to address quality of life and care burden among caregivers of patients with cancer: A randomized controlled trial. Frontiers in Psychology. 16:1430371. doi: 10.3389/fpsyg.2025.1430371

36. Esmaeeli M, Mirhosseini S, Minaei-Moghadam S, et al. Care burden among Iranian family caregivers of patients with schizophrenia: the predictive role of quality of life and life satisfaction. Brief Research Report. Frontiers in Psychiatry. 2025-May-12 2025;Volume 16 - 2025. doi: 10.3389/fpsyt.2025.1559786

37. Hejazi SS, Hosseini M, Ebadi A, et al. Development and psychometric properties evaluation of caregiver burden questionnaire in family caregivers of hemodialysis patients. BMC Nurs. Sep 5 2022;21(1):246. doi: 10.1186/s12912-022-01025-7

38. Mirhosseini S, Sharif-Nia H, Gharehbaghi M, et al. Psychometric evaluation of the Farsi version of the electroconvulsive therapy related anxiety questionnaire. BMC Psychiatry. 2025/07/29 2025;25(1):729. doi: 10.1186/s12888-025-07169-5

39. Fornell C, Larcker DF. Evaluating structural equation models with unobservable variables and measurement error. Journal of marketing research. 1981;18(1):39-50. doi: 10.1177/002224378101800104

40. Cho E. Neither Cronbach's Alpha nor McDonald's Omega: A Commentary on Sijtsma and Pfadt. Psychometrika. 2021;86(4):877-886. doi: 10.1007/s11336-021-09801-1

41. Vinzi V. Handbook of partial least squares. Springer-Verlag Berlin Heidelberg; 2010.

42. Cil Akinci A, Pinar R. Validity and reliability of Turkish caregiver burden scale among family caregivers of haemodialysis patients. Journal of Clinical Nursing. 2014;23(3-4):352-360. doi: 10.1111/j.1365-2702.2012.04235.x

43. Jung JY, Kim JY. Validity and Reliability of the Korean Version of the Caregiver Burden Questionnaire for Family Caregivers of Hemodialysis Patients. Asian Nurs Res (Korean Soc Nurs Sci). Dec 2024;18(5):509-515. doi: 10.1016/j.anr.2024.10.007

44. Farzi S, Farzi S, Moladoost A, et al. Caring burden and quality of life of family caregivers in patients undergoing hemodialysis: A descriptive-analytic study. International journal of community based nursing and midwifery. 2019;7(2):88.

45. AARP & National Alliance for Family Caregiving. Caregiving in the U.S. 2020.

46. Tang JY, Ho AH, Luo H, et al. Validating a Cantonese short version of the Zarit Burden Interview (CZBI-Short) for dementia caregivers. Aging Ment Health. Sep 2016;20(9):996-1001. doi: 10.1080/13607863.2015.1047323

47. Yao H, Li K, Li C, et al. Caregiving burden, depression, and anxiety in informal caregivers of people with mental illness in China: a cross-sectional survey. BMC psychiatry. 2024;24(1):824. doi: 10.1186/s12888-024-06239-4

48. Jaracz K, Grabowska-Fudala B, Kleka P, et al. Development and Psychometric Properties of the Caregiver Burden Scale in Polish Caregivers of Stroke Patients. Psychol Res Behav Manag. 2022;15:665-675. doi: 10.2147/PRBM.S348972

49. Domínguez-Vergara J, Santa-Cruz-Espinoza H, Chávez-Ventura G. Zarit Caregiver Burden Interview: Psychometric Properties in Family Caregivers of People with Intellectual Disabilities. Eur J Investig Health Psychol Educ. Feb 5 2023;13(2):391-402. doi: 10.3390/ejihpe13020029

50. Haghshenas H, Jokar Z, Zarshenas L, et al. Assessing the psychometric properties of persian version of Zarit Burden interview among family caregivers of patients with multiple sclerosis. BMC Nurs. Apr 6 2023;22(1):97. doi: 10.1186/s12912-023-01260-6

51. Levine TR. Confirmatory factor analysis and scale validation in communication research. Communication Research Reports. 2005;22(4):335-338. doi: 10.1080/00036810500317730