

RESEARCH ARTICLE

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

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Abstract

Background: To test the psychometric properties of the Persian version of Zarit Burden Interview (ZBI-12) in the Iranian population.

Methods: After translating and cultural adaptation of the questionnaire into Persian, 100 caregiver spouses of Iran-Iraq war (1980-88) veterans with chronic spinal cord injury who live in the city of Mashhad, Iran, invited to participate in the study. The Persian version of ZBI-12 accompanied with the Persian SF-36 was completed by the caregivers to test validity of the Persian ZBI-12. A Pearson's correlation coefficient was calculated for validity testing. In order to assess reliability of the Persian ZBI-12, we administered the ZBI-12 randomly in 48 caregiver spouses again 3 days later.

Results: Generally, the internal consistency of the questionnaire was found to be strong (Cronbach's alpha 0.77). Inter-correlation matrix between the different domains of ZBI-12 at test-retest was 0.78. The results revealed that majority of questions the Persian ZBI-12 have a significant correlation to each other. In terms of validity, our results showed that there is significant correlations between some domains of the Persian version the Short Form Health Survey -36 with the Persian Zarit Burden Interview such as Q1 with Role Physical ($P=0.03$), General Health ($P=0.034$), Social Functional (0.037), Mental Health (0.023) and Q3 with Physical Function ($P=0.001$), Vitality (0.002), Social Function (0.001).

Conclusions: Our findings suggest that the Zarit Burden Interview Persian version is both a valid and reliable instrument for measuring the burden of caregivers of individuals with chronic spinal cord injury.

Key words: Burden, Iran, Persian, Reliability, SF-36, Spinal cord injury, Validity, ZARIT Caregiver Burden Interview

Introduction

The burden of care giving has been defined based on its physical, emotional, financial, and social duties (1). Chronic diseases with a high disability level can affect dramatically not only the patient but also the caregiver who is the main supporter of the patient (2, 3). Reversely, the behavior of a person who is receiving care is a factor that can increase the amount of stress and strain in the caregiver (4, 5). Additionally, long period of care giving for chronic patients can result in

burden (3, 6, 7).

The impression of this burden can eventually cause family conflicts and decreased social function in the patients and their caregivers (8). The issue of assessing the amount of strain in caregivers is a pivotal element that can give us better clues to palliate this obstacle. Tomoko et al. found that the presence of burden can influence the level of mental health and result in a decreased level of the quality of life in the caregivers of patients with stroke (9). Health system is facing with

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many spinal cord injured from both civilian and military trauma around the world. At present, between 250,000 to 400,000 Americans live their daily lives with a SCI disability. According to Blair JA, et al. 104 American combatants in Iraq or Afghanistan suffered from spinal cord injury from October 2001 to December 2009 (10).

A total of 2012 Iranian veterans with spinal cord injury remained from Iran-Iraq war (1980-88)(11-14).

Presently veterans with war related spinal cord injuries are a big burden on health providing system in developed and developing countries (15). So studies on spinal cord injured patients and their caregiver families are of significant importance.

Many instruments have been defined for assessing the amount of burden in caregivers, including the Zarit Caregiver Burden Interview (ZBI), Caregiver Strain Index (CSI), Screen for Caregiver Burden (SCB), and Burden Index of Caregivers (BIC)(16-19). In 1980, Zarit et al. introduced the Zarit Caregiver Burden Interview (ZBI) to evaluate the burden after a period of time of care giving for chronic patients (20, 21). The original English questionnaire included 29 items, then a version with 22-items developed in 1985 (22). The ZBI-22 proved to be valid and reliable in many clinical settings, countries and cultures (20). Bedard et al. in 2001 suggested a consolidated and short 12-item ZBI. They reported this 12-item ZBI is as competent as the 22-item ZBI in terms of validity and reliability (23). Recently Higginson IJ et al. reported that Short-form of ZBI (ZBI-12) was valid in advanced conditions. It also has been translated in various languages including Spanish, Japanese, and Chinese (24-27).

The purpose of this study was to evaluate the validity and reliability of the Zarit Caregiver Burden Interview (ZBI-12) in caregiver spouses of veterans with chronic spinal cord injuries (SCI) from the Iran-Iraq war (1980-1988).

Methods

Participants

From the registry of department of Martyrs and Veterans of city of Mashhad, the second populated city in the country, all hundred spouses of veterans with war related SCI who live in the city were invited by the research team to participate in the study. Including criteria was being a primary caregiver of a SCI veteran, Persian as the mother language and ability to read and write.

Twenty-eight care giver wives were not included in the study because of not having inclusion criteria or refused to participate. Seventy-two (72%) of the sample could participate in the survey

One physician from the research team and a trained research assistant did the face to face interview, then, they were asked to complete to the Persian version of ZBI-12. For test-retest procedure, randomly forty-eight caregivers were asked to fill out the Persian ZBI-12 three days later and send it by mail to us.

The study was approved by the Ethical Research Committee of Mashhad University of Medical Sciences and all participants signed the consent form.

Questionnaires

Zarit Caregiver Burden Interview (ZBI-12): The sort version of the ZBI is consisted of 12 items in two domains, personal strain and role strain. Each question are scored in five-point Likert scale from 0 to 4 (never to almost always) High score represent higher feel of burden. Range of summed score is 0-48.

The SF-36 health survey

In order to test concurrent validity, in addition to the ZBI-12, the Persian version of the Short Form Health Survey (SF-36) also was filled out by the caregivers. The SF-36 is a well known generic measurement of general health and consists of 36 items and eight subscales: Physical Functioning (PF), Social Functioning (SF), Vitality (VI), Role Emotional (RE), Bodily Pain (BP), Role Physical (RP), Mental Health (MH), and General Health (GH). It is widely recognized to assess the general health of the people. Each subscale can have minimum and maximum score of 0-100. The reliability and validity of the Persian version of the SF-36 are studied in 2005 by Motazeri A et al. Consequently it has been used in many investigations from Iran (28-33).

Translation procedure

Two independent translators who were bilingual in English and Persian carried out the first step of the translation, which was resulted in the forward translation. Next, a translator, whose mother-tongue was English, did the backward translation. In the third step, the team was invited to a meeting to create the final version of the translation (the Persian version) by considering forward and backward transcripts and a pr-final Persian ZBI short form was produced. Initially as pilot, we administered the questionnaires on 20 caregivers of the series and evaluated the responses in term of any difficulties or misunderstanding. At the end the final Persian ZBI (12-item) short form was developed and was used for all 72 caregiver participant of the study.

Floor and ceiling effects

These determinant factors can tell us the distinguishing power of the instrument to differentiate between the lowest or highest possible score. Floor and ceiling effects considered being present if more than 15% of our sample had a score between 0-4 and 44-48 respectively (34).

Validity

Concurrent validity was tested to demonstrate the extent to which the Persian ZBI-12 correlates with components of the Persian SF-36. A Pearson correlation was done for validity assessment. The Pearson's correlation coefficient of 0.40 or above was considered satisfactory. It was expected that questions 1, 6, 10, 11, 12 would correlate higher with the physical domains (PF, RP, BP, GH); whereas, items 2, 3, 4, 5, 7, 8, 9 would correlate higher with the mental domains (VT, SF, RE, MH).

The Chi-Square test was used for group differences. One-way analysis of variance (ANOVA) was used to test statistical significance of group differences. The Kruskal-Wallis and ANOVA were used for group analyses. All

Table 1. Sample characteristics

| Demographics | No. (%) |
|---------------------------|----------|
| <i>Education</i> | |
| Primary school | 37(51.4) |
| High school | 33(45.8) |
| Masters degree or higher | 2(2.8) |
| <i>Employment</i> | |
| Unemployed | 64(88.9) |
| Employed | 8(11.1) |
| <i>Number of children</i> | |
| 0 | 14(19.5) |
| 1 | 21(29.1) |
| 2 | 18(25.0) |
| ≥3 | 19(26.4) |
| <i>Time of marriage</i> | |
| Before injury | 31(43.1) |
| After injury | 41(56.9) |

tests were two-sided and P values less than 0.05 were considered as statistically significant. All calculations were performed SPSS Version 16, SPSS Inc., Chicago, IL.

Psychometric testing

Reliability or test-retest (internal consistency)

In order to assess reliability of the Persian ZBI-12 short form, we have done three dimensions of reliability including test-retest for stability or reproducibility, Cronbach's alpha for internal consistency and Interclass Correlation Coefficient for equivalence. For test-retest procedure, randomly forty-eight caregivers were asked to

fill out the Persian ZBI-12 three days later. The minimum acceptable level of Cronbach's alpha for a self-report questionnaire and item-scale correlation was assumed 0.6 based on Nunnally and Bernstein (1994)(35).

Statistical analyses

Descriptive statistics including numbers, proportions, mean and standard deviations were used to present data. In addition, for reliability assessment we used ICC (interclass correlation coefficient) and Cronbach's alpha between test and retest administrations of the questionnaire. We also performed exploratory factor analysis to determine whether the factorial structure of the translated Persian version is identical to that of the original English version (36).

Results

The mean age of the 72 participants was 44.7(+6.5) years with with a range of 31 to 66 years. Slightly over half of them had a primary school education (51.3%) and were unemployed (89%)[Table 1].

Table 2 shows the scores of the participants for each item of the Persian version of the Zarit Caregiver Burden Interview as well as the floor and ceiling effect of each question. Questions 1, 3, 4, 5, 7, 8, 9, 10 have a relatively high percentage ceiling effect while, items 2 and 11 show a relatively high percentage floor effect. Meanwhile, question 6 has both a floor and ceiling effect.

Reliability

Cronbach's alpha for the total ZBI-12 scale was 0.78. This Cronbach's alpha value confirms a strong internal consistency.

Overall, the internal consistency was strong (Cronbach's alpha=0.78). Interclass correlation Coefficient between different items of ZBI-12 at test-retest was also done to find the correlation between questions (ICC=0.78). The results revealed that there was significant correlation

Table 2. The absolute values for each item as well as the floor and ceiling effects with intra-class correlation

| ZBI item | Mean (SD) | Ceiling effect (%) | Floor effect (%) | ICC |
|---------------------------------------------------------------------------------|--------------|--------------------|--------------------|-------|
| Q1. You don't have enough time for yourself? | 1.618(1.618) | 48.6% [§] | 20.8% [§] | 0.752 |
| Q2. Stressed between caring and meeting other responsibilities? | 2.72(1.638) | 22.2% [§] | 54.2% [§] | 0.741 |
| Q3. Angry when around your relative? | 0.82(1.282) | 63.9% [§] | 8.3% | 0.831 |
| Q4. Your relative affects your relationship with others in a negative way? | 0.61(1.306) | 79.2% [§] | 9.7% | 0.793 |
| Q5. Strained when are around your relative? | 0.15(0.664) | 94.4% [§] | 1.4% | 0.889 |
| Q6. Your health has suffered because of your involvement with your relative? | 2.22(1.746) | 31.9% [§] | 41.7% [§] | 0.883 |
| Q7. You don't have as much privacy as you would like, because of your relative? | 0.74(1.434) | 75% [§] | 13.9% | 0.779 |
| Q8. Your social life has suffered because you are caring for your relative? | 0.61(1.327) | 79.2% [§] | 11.1% | 0.727 |
| Q9. You have lost control of your life since your relative's illness? | 0.47(1.021) | 77.8% [§] | 4.2% | 0.750 |
| Q10. Uncertain about what to do about relative? | 0.44(1.047) | 80.6% [§] | 5.6% | 0.966 |
| Q11. You should be doing more for your relative? | 2.25(1.659) | 27.8% [§] | 38.9% [§] | 0.797 |
| Q12. You could do a better job in caring for your relative? | 1.53(1.678) | 47.2% [§] | 23.6% [§] | 0.768 |

[§]. Significant floor or ceiling effect

Table 3. Inter-correlation matrix for the CHART measures

| Item | | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 |
|------|---|--------|-------|--------|--------|--------|--------|--------|-------|--------|------|--------|-----|
| Q2 | r | .340** | | | | | | | | | | | |
| | p | .002 | | | | | | | | | | | |
| Q3 | r | .080 | -.058 | | | | | | | | | | |
| | p | .252 | .315 | | | | | | | | | | |
| Q4 | r | .243* | -.038 | .344** | | | | | | | | | |
| | p | .020 | .376 | .002 | | | | | | | | | |
| Q5 | r | .211* | .027 | .314** | .264* | | | | | | | | |
| | p | .037 | .412 | .004 | .012 | | | | | | | | |
| Q6 | r | .234* | .204* | .295** | .242* | .092 | | | | | | | |
| | p | .024 | .043 | .006 | .020 | .222 | | | | | | | |
| Q7 | r | .246* | .100 | .342** | .426** | .294** | .356** | | | | | | |
| | p | .019 | .201 | .002 | .000 | .006 | .001 | | | | | | |
| Q8 | r | .226* | .040 | .430** | .643** | .388** | .269* | .463** | | | | | |
| | p | .028 | .368 | .000 | .000 | .000 | .011 | .000 | | | | | |
| Q9 | r | .272* | .189 | -.009 | .161 | .038 | .146 | .317** | .189 | | | | |
| | p | .010 | .056 | .469 | .089 | .377 | .111 | .003 | .055 | | | | |
| Q10 | r | .231* | .205* | .071 | .056 | .225* | .099 | .136 | .086 | .486** | | | |
| | p | .025 | .042 | .276 | .320 | .029 | .203 | .128 | .237 | .000 | | | |
| Q11 | r | .173 | -.016 | -.111 | .162 | .016 | .010 | .052 | .045 | .137 | .170 | | |
| | p | .073 | .448 | .177 | .086 | .447 | .468 | .333 | .354 | .125 | .076 | | |
| Q12 | r | .078 | -.043 | -.191 | .069 | -.010 | -.017 | -.146 | -.122 | .214* | .137 | .432** | |
| | p | .256 | .359 | .054 | .282 | .466 | .445 | .110 | .155 | .035 | .125 | .000 | |

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

between most of questions [Table 3].

Exploratory Factor Analysis

The sample was evaluated for its suitability for exploratory factory analysis. The results of Kaiser-Meyer-Olkin (KMO) measure for sampling adequacy was 0.68. Bartlett's Test demonstrated a highly significant value ($P < 0.000$; $X^2 = 0.66$).

Both of these statistic values confirmed factorability of the content of the Persian version of ZBI-12.

Concurrent Validity

In order to find out a relation between various items of the ZBI-12 and SF-36, Pearson's correlation was conducted [Table 4]. The test yielded that among the physical components of the SF-36 and questions 3,5 of the ZBI-12 were solely related to PF ($P = 0.01$ and 0.031 respectively); while, all parts of the physical section (PF, RP, BP, and GH) had a correlation to question 6 ($P = 0.00$, 0.045 , 0.00 and 0.022 respectively). Apart from this, RP and GH were related to item 1 ($P = 0.03$ and 0.034 respectively). For questions 4 and 8, except

for GH ($P = 0.779$ and 0.124 , respectively), there was a correlation with the physical components. Finally, PF and BP had a correlation to question 7 ($P = 0.049$ and 0.029 , respectively). In the mental component, just questions 1, 3, 6,7 and 8 had a correlation to 2-3 of the mental sections of the SF-36; meanwhile, questions 4, 9, 10, and 11 showed a correlation with just one section. The remaining items of the ZBI-12 did not demonstrate any relation to the mental part. Table 3 explains the findings further [Table 3].

Discussion

Comparing the findings of the present study that we have administered ZBI-12 on spinal cord caregivers to other groups of caregivers reveals a significant difference. The scores of ZBI-12 in caregivers of cancer patients, had better, but caregivers of acquired brain injury patients (ABI), achieved poorer scores than SCI patients (37). A possible explanation for this finding can be a higher work load in caring for ABI patients. While cancer patients have more abilities and physical function, thus, we can assume a lower level of burden in

Table 4. Pearson's correlation between ZBI-12 and SF-36

| | | SF-36 | | | | | | | | |
|-----------|-----|------------|------------|------------|------------|------------|------------|------------|------------|---------|
| | | PF | RP | BP | GH | VT | SF | RE | MH | |
| Range | | 20-100 | 0-100 | 0-100 | 0-100 | 10-100 | 0-100 | 0-100 | 4-96 | |
| Mean (SD) | | 64.7(23.9) | 47.2(47.0) | 54.8(33.6) | 45.2(26.4) | 52.7(20.6) | 59.0(33.1) | 47.2(49.3) | 49.5(24.4) | |
| ZBI-12 | Q1 | r | -.185 | -.257* | -.113 | -.251* | -.149 | -.246* | -.131 | -.267* |
| | | p | .121 | .030 | .345 | .034 | .212 | .037 | .271 | .023 |
| | Q2 | r | -.037 | -.010 | .082 | -.061 | .216 | .037 | .077 | .036 |
| | | p | .755 | .932 | .495 | .611 | .068 | .757 | .518 | .761 |
| | Q3 | R | -.370** | -.137 | -.219 | -.104 | -.361** | -.387** | -.227 | -.418** |
| | | P | .001 | .251 | .064 | .383 | .002 | .001 | .055 | .000 |
| | Q4 | r | -.250* | -.276* | -.235* | -.034 | -.066 | -.316** | -.083 | -.153 |
| | | P | .034 | .019 | .047 | .779 | .580 | .007 | .490 | .199 |
| | Q5 | r | -.254* | -.043 | -.182 | -.008 | -.175 | -.095 | -.008 | -.122 |
| | | P | .031 | .722 | .127 | .949 | .142 | .425 | .944 | .307 |
| | Q6 | r | -.532** | -.237* | -.405** | -.271* | -.093 | -.302** | -.096 | -.297* |
| | | P | .000 | .045 | .000 | .022 | .435 | .010 | .421 | .011 |
| | Q7 | r | -.233* | -.209 | -.258* | -.031 | -.184 | -.430** | -.206 | -.242* |
| | | P | .049 | .077 | .029 | .798 | .122 | .000 | .082 | .041 |
| | Q8 | r | -.407** | -.271* | -.298* | -.183 | -.155 | -.287* | -.153 | -.284* |
| | | P | .000 | .021 | .011 | .124 | .194 | .015 | .200 | .015 |
| | Q9 | r | -.016 | -.200 | -.053 | .001 | -.126 | -.102 | -.085 | -.259* |
| | | P | .893 | .092 | .661 | .993 | .290 | .395 | .475 | .028 |
| | Q10 | r | -.131 | -.289* | -.178 | -.034 | -.162 | -.254* | .006 | -.216 |
| | | P | .273 | .014 | .135 | .778 | .174 | .031 | .960 | .068 |
| | Q11 | r | .074 | -.149 | .073 | -.155 | -.029 | -.016 | .313** | .091 |
| | | P | .537 | .212 | .544 | .194 | .811 | .894 | .008 | .446 |
| | Q12 | r | .097 | .126 | .140 | .181 | -.027 | .011 | .080 | .009 |
| | | P | .416 | .292 | .241 | .128 | .825 | .925 | .502 | .940 |

*. Correlation is significant at the 0.05 level (2-tailed).

**.. Correlation is significant at the 0.01 level (2-tailed).

§§Two tailed P-value

§ Pearson's Correlation of Coefficient

their caregivers when compared to SCI caregivers.

Kumamoto et al. reported an excellent internal consistency for the instrument with a Cronbach's alpha=0.8 (38). Likewise, we have achieved a strong internal consistency with the Cronbach's alpha of 0.776. Moreover, the inter-correlation matrix between the different domains of the Persian version of ZBI-12 had a good correlation between various parts.

In agreement with the findings of Chattat in the Italian, Ko et al. in the Chinese and Boon Kheng Seng et al. in Singaporean versions, the intra-class correlation demonstrated a strong coefficient in terms of reproducibility for each item of the questionnaire (ICC> 0.7) (39-42).

Based on our assessment, a floor or ceiling effect exists in many items of the Persian version of ZBI-12. A possible explanation for these floor and ceiling effects can be due to the limited range of the scales, which are from 0 to 4. As far as we have assessed, these effects have not been examined for this questionnaire before and thus it needs more investigation in future.

According to the findings of Haley et al. who claim that increasing the level of burden in caregivers can aggravate emotional problems, we expected to find a negative correlation between the domains of the ZBI-12 and mental components of SF-36 (VT, SF, RE, MH), as the ZBI-12 focuses on issues like depression, mental health, negative effect, social support, stress and coping (43).

Our analysis revealed a significant negative relation between items of the instrument and psychological section of the SF-36. This finding confirms the convergent validity of the survey to assess items that are related to the mental health of the caregivers.

Furthermore, as we expected, question number 1, which is related to the amount of free time that the caregiver has, showed a negative significant correlation with the physical and mental domains of the SF-36.

It is a fact that a person, who has spent most of her time dedicated to her loved one, will have less mental and general health and experience more burdens. This finding has been confirmed by other studies (9, 44-50).

Mental health of caregivers is a determinant factor of quality of life. Psychological well-being has a negative correlation with the number of hours of providing care each day (10). This finding can explain the result of the Pearson's correlation that illustrated a negative significant correlation between question 1 and the MH domain of the SF-36.

With a decrease in the level of perceived general health, our expectation is less physical and psychological health. This phenomenon occurred for question 6. It demonstrated a negative significant correlation with all physical components of the SF-36 as well as the SF and MH parts.

Question 5 showed a divergent validity with the mental component; while, questions 9 and 11 showed divergent validity with the physical component of the SF-36. However, items 2 and 12 of the ZBI-12 demonstrated divergent validity with both components.

Comparison of our total scores with other studies done on caregivers of cancer patients, dementia and ABI yielded a similar total score (51, 52).

Finally, this study has some limitations. The main limitations are; small and convenient sample size derived from one city, only women caregivers participated, caregivers of SCI veterans only. All of this has an effect on the external validity of the study. Further studies

with big samples and in different clinical setting may be needed for this purpose.

Stress and coping in caregivers of people with a chronic disease is a paramount importance. Our findings suggested that the Persian version of the ZBI-12 questionnaire could be a valid and reliable instrument for the purposes of measuring the burden of caregivers who care for patients with chronic spinal cord injuries.

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