

A Rasch Analysis of the Zarit Burden Interview (ZBI) Scale Among Tsunami Survivors' Caregivers

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Submission 1 July 2025 Accepted 19 April 2026 Published 29 April 2026

Abstract. This study aimed to validate the Zarit Burden Interview (ZBI) among caregivers of elderly tsunami survivors in Aceh, Indonesia. In contexts characterized by disasters or significant social disruption, such as the aftermath of a tsunami, the burden on caregivers becomes increasingly critical. This phenomenon is due to the compounded vulnerabilities experienced by elderly tsunami survivors, which arise from trauma, displacement, and weakened community support systems. Therefore, it is imperative to validate the ZBI (Zarit Burden Interview) in this context. Using the Rasch Model, the study included 513 participants and assessed the construct validity of the ZBI. The findings indicated that the ZBI had a high internal consistency (person separation reliability = .81). In dimensionality measurement, an unexplained variance in the 1st contrast of 2.6 was found, slightly above the threshold, suggesting multidimensionality. However, with raw variance explained exceeding 40% and approaching 60%, the instrument can be considered sufficiently unidimensional. However, item 21 was identified as a misfit. Thus, it requires revision, considering local cultural values. Overall, the validation of the ZBI using the Rasch model resulted in an instrument that is valid and applicable to post-disaster contexts.

Keywords: burden; caregiver; rasch model; tsunami survivor; validation

Elderly people require intensive care from caregivers due to the decline in their physical, psychological, and social abilities, which makes them vulnerable to disruptions in daily functioning, such as the emergence of chronic illnesses, cognitive decline, and reduced motor skills (Orlova et al., 2024; Reynolds et al., 2022; Umpimai et al., 2025). Individuals with a history of traumatic events may experience worsened physical and psychological conditions years after the traumatic experience, especially if the trauma was not adequately addressed at the time (Petkus et al., 2009; Scott et al., 2013).

The tsunami disaster in Aceh, Indonesia, in 2004 affected Acehnese, causing physical, social, economic, and psychological impacts, such as loss of family members, homes, and jobs (Frankenberg et al., 2011; Syukriyah & Himaz, 2024). Research conducted 20 years after the tsunami in Aceh shows

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that symptoms of Post-Traumatic Stress Disorder (PTSD), anxiety, and depression are still experienced by tsunami survivors (Safarina & Suzanna, 2020). Several tsunami survivors who were adults in 2004 have now reached old age and require caregiving support to improve their psychological well-being and quality of life (Amna et al., 2025).

Caregivers of elderly tsunami survivors in Aceh face distinct cultural and contextual challenges compared to caregivers of elderly individuals more broadly. In Aceh, the disaster disrupted traditional social structures, community networks, and family dynamics, which are often essential components of caregiving roles in this culturally diverse area (Frankenberg et al., 2011; Tukino, 2022). The aftermath of the tsunami resulted in not only physical destruction but also deep psychological distress, loss of jobs, and displacement, significantly increasing caregiving responsibilities beyond what is typically expected (Soonthornchaiya et al., 2019).

Burden is conceptualized as a form of encumbrance or pressure. In the context of caregiving, burden refers to the strain or pressure that individuals experience when providing care for someone (Choi et al., 2024). Furthermore, burden encompasses the psychological distress, economic and social pressures, disrupted family relationships, and other detrimental effects associated with caregiving responsibilities. A caregiver experiencing burden in caregiving may suffer adverse effects on their mental state and experience a decline in physical health (Annisa, 2016; Choi et al., 2024; Liu et al., 2020). Impaired physical health, manifesting as weight loss and fatigue, is also observed as a consequence of the burden associated with long-term caregiving. The excessive burden of providing long-term care can significantly disrupt one's lifestyle, resulting in limited social engagement and leading to social isolation (Arian et al., 2017; Rezaei et al., 2024). In contexts affected by disasters or significant social disruption, such as post-tsunami, the caregiver burden becomes even more critical, as elderly individuals face compounded vulnerabilities arising from trauma, displacement, and weakened community support systems (Kako & Mayner, 2019).

Caregivers of elderly tsunami survivors in Aceh may experience distinct coping strategies and culturally specific expressions of burden shaped by their collective trauma and recovery experiences (Hajar et al., 2024). Caregiving in Aceh is deeply intertwined with strong familial and religious obligations (Samad, 2015), which can influence the perception of "burden." Caregivers might minimize their own difficulties to avoid appearing ungrateful or neglectful of their family responsibilities (Bakung & et al., 2022). These factors influence the manifestation and perception of caregiver burden, highlighting the necessity of validating measurement tools such as the Zarit Burden Interview (ZBI) to accurately capture these culturally and contextually specific dimensions (Hajar et al., 2024).

The ZBI is a widely acknowledged tool for assessing caregiver burden, especially in chronic disease and schizophrenia (Gratão & et al., 2019; Haroen et al., 2025; Makanjuola & Ngcobo, 2025; Rahmani et al., 2022; Wantonoro et al., 2024); however, its validation among caregivers of elderly tsunami survivors in post-tsunami settings, as well as within the framework of cultural and familial values, remains significantly under-researched (Toyono & Noguchi, 2025). This highlights a notable gap in the existing literature on populations affected by disasters. Variations in cultural norms, family value systems, and types of social support can influence caregivers' perceptions and reports of caregiver

burden. Some studies have shown that the factor structure of the ZBI has not demonstrated consistent stability across different cultures, and its validity is substantially influenced by the local sociocultural context (Maria et al., 2025). The characteristics of caregivers for elderly tsunami survivors in this context may influence caregiving experiences that differ from those observed in other countries, such as Korea (Park et al., 2025), Germany (Braun et al., 2010), and Turkey (Özer et al., 2012).

The initial development of the ZBI over three decades ago aimed to assess the burden and stress experienced by caregivers of individuals with dementia, employing 29 items on a four-point Likert scale (Zarit et al., 1980). Subsequent adaptations and validations, such as the 22-item version, have been extensively adopted across various caregiving contexts, including those involving individuals with intellectual disabilities (Domínguez-Vergara et al., 2023), and have been translated into several languages (Braun et al., 2010; Özer et al., 2012; Park et al., 2025). While the ZBI has been widely utilized and adapted, its effectiveness in measuring the distinct challenges faced by caregivers of elderly tsunami survivors, especially given the unique stressors of disaster recovery, requires a comprehensive psychometric analysis. Thus, this study examined the psychometric characteristics of the ZBI in this specific demographic, focusing on its factor structure, reliability, and validity, to evaluate its appropriateness for application in disaster-stricken communities.

This study aimed to assess the validity of the Zarit Burden Interview (ZBI) as a measurement tool for caregivers of elderly tsunami survivors in Aceh, Indonesia, using the Rasch model. Developed by Georg Rasch in 1953, Rasch analysis is a statistical method widely utilized to interpret test results and survey data, providing valid and meaningful insights (Linacre, 2002). The foremost benefit of the Rasch model is its ability to convert ordinal data into interval scales (logit), thereby producing objective, precise, and diagnostic measurements that enhance the accuracy and significance of the statistical analyses. The Rasch model extends beyond a mere statistical technique. This is a comprehensive measurement framework that demands data alignment with the model, ensuring that the instruments are construct-valid, unidimensional, and devoid of bias. Through outputs such as item-person maps and fit statistics (infit and misfit), the Rasch model facilitates a comprehensive evaluation of item quality, person fit, and construct structure, rendering it highly beneficial for the development, validation, and refinement of psychological measurement instruments (Bond & Fox, 2015). Consequently, the Rasch model was selected to ensure that the ZBI effectively evaluates the burden experienced by caregivers of elderly tsunami survivors in a post-disaster context.

Methods

Participants

The participants were selected using a non-probability convenience sampling method. The inclusion criteria for participants were: (1) caring for elderly survivors of the Aceh tsunami, (2) male or female, (3) aged 18 years or older, (4) living in Aceh Province, and (5) physically and mentally healthy. The participants' residences in this study were located across 23 regencies and cities within Aceh Province and were systematically categorized into urban and rural areas. This classification was based on key

factors, such as population density and the availability of infrastructure facilities. The urban areas consist of Banda Aceh, Langsa, Lhokseumawe, Sabang, and Subulussalam, while the rural areas consist of Aceh Barat, Aceh Barat Daya, Aceh Besar, Aceh Jaya, Aceh Selatan, Aceh Singkil, Aceh Taming, Aceh Tengah, Aceh Tenggara, Aceh Timur, Aceh Utara, Bener Meriah, Bireun, Gayo Lues, Nagan Raya, Pidie, Pidie Jaya, and Simeulu.

Instrument

The instrument used in this study was the ZBI developed by Zarit et al. (1980). The ZBI was originally created in 1980 with 29 items. Currently, a 22-item version (ZBI-22) has been developed. This study used the ZBI-22, which has five answer choices: 0 (never), 1 (rarely), 2 (sometimes), 3 (quite frequently), and 4 (almost always). The ZBI score is calculated by summing the responses to each item. An elevated score signifies a heightened caregiving burden. The researcher acquired the original ZBI-22 from the official Zarit Burden Interview (ZBI) website (Mapi Research Trust, n.d.). Subsequently, the researchers engaged in a back-translation process to ensure the instrument's suitability and cultural relevance within the local context (Table 1).

Table 1

Adaptation Item of ZBI

Items	Original Version	Indonesian Version
1	Do you feel that your relative asks for more help than he/she needs?	<i>Apakah Anda merasa bahwa lansia yang Anda asuh/rawat/jaga sering meminta bantuan Anda secara berlebihan?</i>
2	Do you feel that because of the time you spend with your relative that you don't have enough time for yourself?	<i>Apakah Anda merasa tidak memiliki cukup waktu untuk diri sendiri karena harus mengasuh/merawat/menjaga lansia?</i>
3	Do you feel stressed between caring for your relative and trying to meet other responsibilities for your family or work?	<i>Apakah Anda merasa tertekan/stres antara harus mengasuh/merawat/menjaga lansia dan memenuhi tanggung jawab Anda terhadap keluarga atau pekerjaan?</i>
4	Do you feel embarrassed over your relative's behavior?	<i>Apakah Anda merasa malu dengan perilaku lansia yang Anda asuh/rawat/jaga?</i>
5	Do you feel angry when you are around your relative?	<i>Apakah Anda merasa jengkel ketika Anda berada di sekitar lansia yang Anda asuh/rawat/jaga?</i>
6	Do you feel that your relative currently affects your relationship with other family members or friends in a negative way?	<i>Apakah Anda merasa bahwa lansia yang Anda asuh/rawat/jaga berpengaruh buruk terhadap hubungan Anda dengan keluarga/teman?</i>
7	Are you afraid what the future holds for your relative?	<i>Apakah Anda khawatir dengan masa depan lansia yang Anda asuh/rawat/jaga?</i>
8	Do you feel your relative is dependent upon you?	<i>Apakah Anda merasa lansia yang Anda asuh/rawat/jaga tergantung pada Anda?</i>
9	Do you feel strained when you are around your relative?	<i>Apakah Anda merasa tegang ketika Anda berada di sekitar lansia yang Anda asuh/rawat/jaga?</i>

Table 1 (continued)

Items	Original Version	Indonesian Version
10	Do you feel your health has suffered because of your involvement with your relative?	<i>Apakah Anda merasa kesehatan Anda menurun karena mengasuh/merawat/menjaga lansia?</i>
11	Do you feel that you don't have as much privacy as you would like because of your relative?	<i>Apakah Anda merasa bahwa Anda tidak dapat mengerjakan aktivitas pribadi seperti yang Anda inginkan karena harus mengasuh/merawat/menjaga lansia?</i>
12	Do you feel that your social life has suffered because you are caring for your relative?	<i>Apakah Anda merasa bahwa kehidupan sosial/masyarakat Anda berkurang (misalnya: pengajian, arisan, kerja bakti) karena harus mengasuh/merawat/menjaga lansia?</i>
13	Do you feel uncomfortable about having friends over, because of your relative?	<i>Apakah Anda merasa tidak nyaman saat teman datang ke rumah karena ada lansia yang Anda asuh/rawat/jaga?</i>
14	Do you feel that your relative seems to expect you to take care of him/her, as if you were the only one he/she could depend on?	<i>Apakah Anda merasa bahwa lansia yang Anda asuh/rawat/jaga mengharapkan Anda untuk merawatnya, seolah-olah Andalah tempat bergantung?</i>
15	Do you feel that you don't have enough money to care for your relative, in addition to the rest of your expenses?	<i>Apakah Anda merasa bahwa Anda tidak punya cukup uang untuk mengasuh/merawat/menjaga lansia serta untuk menopang pengeluaran Anda?</i>
16	Do you feel that you will be unable to take care of your relative much longer?	<i>Apakah Anda merasa bahwa Anda tidak akan mampu untuk mengasuh/merawat/menjaga lansia lebih lama lagi?</i>
17	Do you feel you have lost control of your life since your relative's illness?	<i>Apakah Anda merasa Anda kurang memperhatikan diri Anda sendiri sejak mengasuh/merawat/menjaga lansia?</i>
18	Do you wish you could just leave the care of your relative to someone else?	<i>Apakah Anda mengharapkan orang lain yang merawat lansia yang Anda asuh/rawat/jaga?</i>
19	Do you feel uncertain about what to do about your relative?	<i>Apakah Anda merasa tidak yakin dengan apa yang seharusnya Anda lakukan untuk mengasuh/merawat/menjaga lansia?</i>
20	Do you feel you should be doing more for your relative?	<i>Apakah Anda merasa bahwa Anda seharusnya berbuat lebih banyak lagi untuk lansia yang Anda asuh/rawat/jaga?</i>
21	Do you feel you could do a better job in caring for your relative?	<i>Apakah Anda merasa mampu merawat dengan lebih baik lansia yang Anda asuh/rawat/jaga?</i>
22	Overall, how burdened do you feel in caring for your relative?	<i>Secara keseluruhan, seberapa berat beban yang Anda rasakan selama mengasuh/merawat/menjaga lansia?</i>

The back-translation process of this ZBI was conducted to refine the language and ensure semantic, conceptual, and contextual equivalence with the original version through a cultural validation procedure. Initially, the original ZBI version was translated into the local language by a translator who has expertise in psychology. Subsequently, an independent translator, unfamiliar with the original ZBI version, was engaged to identify discrepancies in meaning and detect translation drift. The third stage involved an expert committee review comprising two psychologists knowledgeable about the concept of burden, with one of the translators also being Acehnese. This committee was tasked with evaluating semantic and conceptual equivalence, as well as cultural sensitivity. Following this, the researchers conducted pilot testing by administering the pre-final version of the ZBI. Based on the pilot testing and expert recommendations, the researchers finalized the instrument, which was then subjected to psychometric validation. The data was analyzed by using the Rating Scale Model (RSM) (Andrich, 1978), which

is a parameterization within the family of Rasch measurement theory that is applicable to analyzing Likert scale data. However, the authors do not elaborate extensively on the Rating Scale Model (RSM) due to limitations in their knowledge of the technical aspects of the parameterization of polytomous Rasch models (e.g., RSM, PCM, etc.). Readers are encouraged to refer to Boone (2020) for a more comprehensive understanding of this topic.

The researchers distributed the ZBI questionnaire online using the Qualtrics survey platform to collect data. The survey was distributed as a link and QR code. The researcher received assistance from several colleagues located in various rural and urban areas, such as Langsa City, Lhokseumawe City, Aceh Barat Regency, and Banda Aceh City, to distribute the online questionnaire. Before collecting data, this research had already undergone and passed ethical review processes. Every participant in this study provided informed consent prior to completing the ZBI instrument using the Qualtrics application.

Data Analysis

The dataset was analyzed using the RSM, employing Winsteps software for this purpose. It is crucial to assess the quality of the instrument by producing essential outputs, such as item and respondent fit statistics (infit and outfit MNSQ), indices of reliability and separation, as well as the assessment of unidimensionality through residual analysis. Moreover, it provides person–item mapping (Wright map) to evaluate the correspondence between item difficulty levels and respondent abilities. The application of Winsteps ensures that the empirical data conform to the Rasch measurement model, thereby verifying that the instrument is not only reliable but also adheres to the principle of specific objectivity, remains unaffected by sample dependency, and is capable of identifying item bias through DIF analysis. This functionality is crucial for the development, validation, and adaptation of psychological measurement tools for diverse populations (Linacre, 2002).

Result

The study initially recruited 513 participants. The demographic profiles of these individuals are detailed below.

Table 2

Demographic Data

Demographic	<i>n</i>	Percentage (%)
Sex		
Female	380	73.68
Male	133	25.93
Residence Area		
Rural	191	37.23
Urban	322	62.77
Age		

Table 2 (continued)

Demographic	<i>n</i>	Percentage (%)
18–24	83	16.18
25–49	373	72.71
≥ 50	57	11.11
Education		
No formal education–Senior high school	264	51.44
Higher education	249	48.56
Marital Status		
Not married / Divorced / Single	227	44.25
Married / In a relationship	286	55.75
Children		
No children	214	41.72
Have children	299	58.28
Number of Elderly Cared for		
1 person	418	81.48
2 people	90	17.54
> 2 people	5	0.97
Relationship to the Elderly Cared for		
Grandparent	142	27.68
Parent	307	59.84
Parent-in-law	28	5.46
Aunt/Uncle	14	2.73
Extended relative	22	4.28

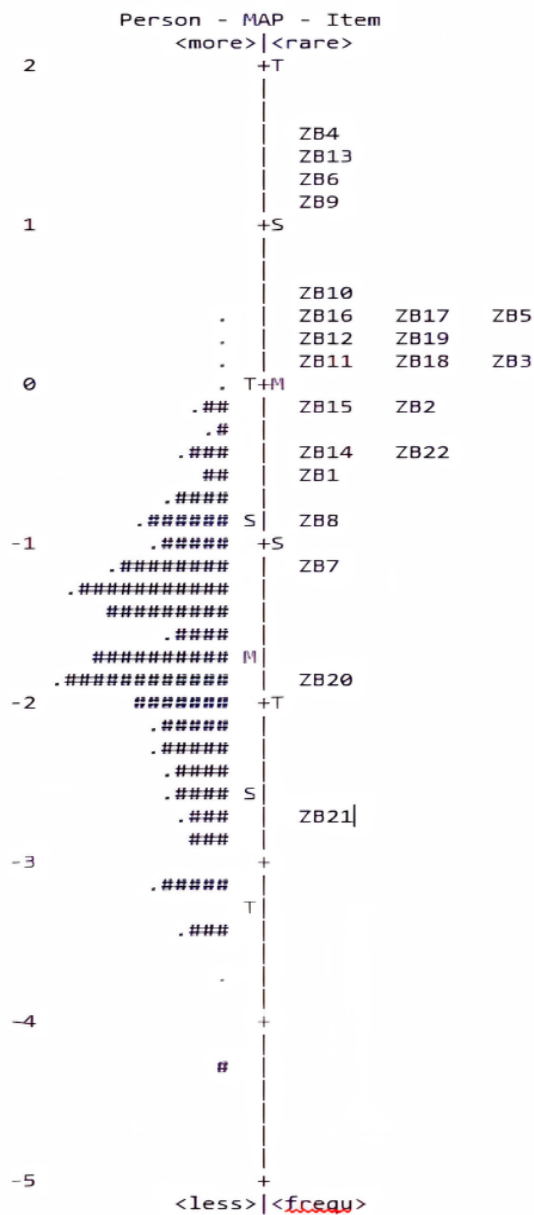
The demographic analysis revealed a predominance of female participants ($n = 380$) compared to male participants ($n = 133$). The respondents' ages ranged from 18 to 70 years, with a notable majority within the 25–49 age range. Younger caregivers predominantly attended to their parents or grandparents, whereas older caregivers were more inclined to care for their spouses or siblings. Regarding residential distribution, 322 participants resided in urban areas of Aceh, while the remaining 191 participants were from rural areas.

The participants exhibited a diverse range of educational backgrounds, with 264 individuals not having completed education up to the high school level and 238 having pursued higher education. Regarding marital status, 286 caregivers were married or in a relationship, while 277 were single, divorced, or otherwise unattached. Furthermore, 299 caregivers had children, whereas 214 caregivers did not.

Demographic analysis indicated that a significant portion of caregivers (418 individuals) was tasked with caring for a single elderly person. In comparison, 90 caregivers managed the needs of two older adults, and a small group of five caregivers attended to more than two elderly individuals. Examining familial connections, it is evident that 307 caregivers were responsible for their parents, 142 for their grandparents, and 28 for their parents-in-law. Additionally, 14 caregivers provided support to their uncle or aunt, and 22 were involved in the care of more distant relatives.

Figure 1

Wright Map (Person Map Item)



The Person Map Item serves as an analytical instrument utilized to assess the distribution of respondents' abilities in answering each item and to illustrate the spectrum of item difficulty levels. This map displays the distribution of respondents' abilities (burden level) on the left side and item difficulty levels on the right side, both represented on the same logit scale (ranging from approximately -5 to +2). As depicted in Figure 1, the left side of the map shows the distribution of respondents' answers, where negative values denote respondents with lower answering abilities, and positive values indicate respondents

with higher answering abilities (Linacre, 2002).

In general, most participants were concentrated in the -2 to -1 logit range, which means that the caregiver burden level among participants tended to be low to moderate. This can be seen from the number of [#] symbols in that area. Meanwhile, the items were spread from approximately -2.5 to +1.5 logits, indicating a variation in the level of item "difficulty" in detecting burden. On the right side of the map is the distribution of items, where those at the top (e.g., ZB4, ZB13, ZB6, and ZB9) are items that are "hard to agree with," and items at the bottom (ZB21 and ZB20) represent those that are "easy to agree with" for participants. In terms of targeting, this refers to the degree of match between the distribution of person ability and item difficulty level at the same logit value. Good targeting means that the average person ability is close to the average item difficulty, so the instrument can most accurately measure the construct for the study population (Linacre, 2002).

Based on the map above, it can be seen that the average item is around 0 logits, whereas the average participant is below that (around -1 to -2 logits). This indicates that the ZBI items are relatively more "difficult" than the burden level of the participants (Bond & Fox, 2015). In other words, this instrument is less sensitive in distinguishing participants with very low levels of burden. This is evident from the floor effect at the bottom, which refers to the condition when most respondents achieve very low scores and cluster at the lower end of the measurement, so the instrument is unable to accurately differentiate individuals with low person ability or low levels of the construct. This usually occurs because the items in the instrument are too "difficult" for the population, leading respondents to tend to select the lowest response categories.

Wright map analysis revealed no notable gap in item distribution in the central region, indicating that construct coverage was adequate for assessing low-to-moderate burden levels. However, for participants experiencing a very low burden (below 2.5 logit), the number of items was insufficient. Therefore, in studies involving a significant number of caregivers with low burden, it may be necessary to develop or incorporate items with a lower level of difficulty. Overall, the Wright map analysis demonstrates that the ZBI can measure burden across a range from low to high levels.

Rating Scale Analysis

The purpose of this step was to evaluate the functionality of the Likert scale response categories in terms of their optimal performance, orderliness, and ability to distinguish between participants' ability levels according to burden. This evaluation involved analyzing the frequency of use for each category, ensuring that the average measure increased consistently from lower to higher categories, verifying the sequential order of thresholds without any disorder, and assessing the fit of each category using the Outfit Mean Square statistic. If a category is infrequently used, lacks logical order, or shows misfit, it is recommended to combine or revise the category to ensure that the response scale accurately reflects an increase in the construct and enhances the measurement precision (Bond & Fox, 2015; Linacre, 2002). Consequently, the diagnostic of the rating scale ensures that each response option genuinely represents distinct construct levels and is consistently used by respondents during the measurement process. The following section details the results of the rating scale analysis conducted on the respondents:

Table 3*Rating Scale Analysis*

Category		Observed		Observed	Expected	Infit	Outfit	Andrich	Category	
				Average	Average	MNSQ	MNSQ	Threshold	Measure	
Label	Score	Count	(%)							
0	0	6979	62	-2.33	-2.30	.97	1.00	None	(-2.13)	0
1	1	1437	13	-1.29	-1.46	.96	.64	-.28	-.99	1
2	2	1775	16	-.69	-.72	1.05	.99	-1.30	.11	2
3	3	675	6	.16	.06	.89	.85	.63	.93	3
4	4	420	4	.52	.88	1.37	1.29	.95	(2.40)	4

Based on Table 3, it can be seen that for the observed count category, a score of 0 is the answer most frequently chosen by participants, while higher scores (3 and 4) are chosen the least. This indicates a tendency towards low burden scores among participants and suggests the potential for a floor effect. However, the rating scale in this instrument is still acceptable because all categories continue to be used by the participants. The Infit and Outfit MNSQ values fell within the acceptable range (.64–1.37) (Linacre, 2002), although the highest category had a low frequency and showed a slight misfit.

In addition, the results of the rating scale analysis can be seen through the Andrich Threshold criteria, which states that if the value moves from NONE to a negative value and then increases to a positive value in sequence, the instrument meets the criteria. Based on Table 2, the Andrich Threshold values show a movement pattern from negative to positive, namely NONE, -.28, -1.30, .63, and .95. These figures indicate a sequential movement, which demonstrates that the answer category choices on the Zarit Burden Interview instrument meet the criteria to be well understood by respondents in distinguishing the four answer choices for each item.

Unidimensionality

Item dimensionality analysis is employed to ascertain whether a measurement tool is unidimensional, indicating that it does not assess other psychological constructs. Within the Rasch Model, the criterion for unidimensionality is reflected in the raw variance explained by the measure, which must meet a minimum threshold of 40% to be considered adequate (Holster & Lake, 2016). According to these criteria, the measurement results indicate a raw variance explained by the measure of 55.6%, signifying that the ZBI instrument possesses a fairly good unidimensional structure and is nearing the optimal category ($\geq 40\%$). Consequently, it demonstrates sufficient capability to measure the construct of caregiving burden. See Table 4

Table 4

<i>Item Dimensionality</i>		Empirical	Modeled
Total raw variance in observations	49.5	100.0%	100.0%
Raw variance explained by measures	27.5	55.6%	56.8%
Raw variance explained by persons	5.3	10.7%	11.0%
Raw variance explained by items	22.2	44.8%	45.9%
Raw unexplained variance (total)	22.0	44.4%	100.0% 43.2%
Unexplained variance in 1st contrast	2.6	5.2%	11.7%
Unexplained variance in 2nd contrast	1.6	3.2%	7.2%
Unexplained variance in 3rd contrast	1.6	3.1%	7.0%
Unexplained variance in 4th contrast	1.3	2.7%	6.1%
Unexplained variance in 5th contrast	1.2	2.5%	5.6%

Item dimensionality measurement also requires attention to the value of unexplained variance in the 1st contrast. In the Rasch Model analysis, an unexplained variance in the 1st contrast with a value ≤ 2.0 indicates that there is no second dimension in the measurement of an instrument. In the results of the item dimensionality measurement, an unexplained variance in the 1st contrast value of 2.6 was found, which is slightly above the specified threshold, thus indicating that the instrument may be multidimensional. Nevertheless, considering that the raw variance explained by the measure has already exceeded the $> 40\%$ criterion and is approaching 60%, this shows that the instrument can still be categorized as having a sufficiently unidimensional structure with only minor indications of its multidimensionality.

Person Reliability

The reliability test of the measuring instrument in the Rasch model is assessed through person separation reliability (PSR) coefficient. PSR reflects the consistency of respondents' answers to the items (Wright & Masters, 1982). Based on the person separation reliability measurements yielded values of .81, which fall into the good category ($> .70$) based on predefined criteria (Tennant & Conaghan, 2007). Thus, this value further strengthens the assertion that the ZBI has adequate internal consistency in capturing the overall interaction between persons and items in measuring the caregiving burden.

Item Fit

The item fit test can be observed through three criteria: the outfit MNSQ value should be in the range of $.5 < \text{MNSQ} < 1.5$; the outfit ZSTD value should be in the range of $-2 < \text{ZSTD} < 2$; and the Pt Mean Corr value should not be negative or should be between $.4 < \text{Pt Mean Corr} < 0.85$ (Sumintono & Widhiarso, 2013). Based on Table 5, the results of the item fit test show that all items in the ZBI meet the criteria for item fit, except for item 21. The results of the item fit test indicate that item number 21 is considered a misfit item because it does not meet the three established criteria, and therefore it is recommended that this item be revised or replaced to improve the quality of the measurement.

Table 5

<i>Item Fit</i>													
Entry	Total	Total	Measure	Model S.E.	Infit		Outfit		PT-Measure		Exact OBS%	Match EXP%	Item
Number	Score	Count			MNSQ	ZSTD	MNSQ	ZSTD	CORR.	EXP.			
21	1499	513	-2.66	.05	1.86	9.9	2.19	27.5	.12	.59	27.5	41.7	ZB21
20	1118	513	-1.79	.05	1.43	6.5	1.45	29.8	.49	.63	29.8	37.6	ZB20
7	827	513	-1.21	.04	1.24	3.9	1.23	33.3	.57	.62	33.3	38.0	ZB7
14	489	513	-.47	.05	1.22	3.4	1.08	37.8	.56	.56	37.8	42.2	ZB14
1	560	513	-.64	.05	.96	-.7	1.21	44.1	.49	.58	44.1	41.3	ZB1
9	83	513	1.19	.10	1.11	.8	.82	86.9	.34	.31	86.9	86.2	ZB9
4	56	513	1.52	.12	1.07	-.4	.67	92.6	.33	.26	92.6	90.9	ZB4
15	383	513	-.26	.05	1.06	.9	.96	49.5	.53	.53	49.5	49.5	ZB15
6	69	513	1.35	.11	1.04	.3	.78	89.3	.32	.28	89.3	88.6	ZB6
13	66	513	1.38	.11	1.02	.2	.53	90.4	.38	.28	90.4	89.2	ZB13
18	265	513	.18	.06	.92	-.6	.92	63.4	.51	.47	63.4	60.4	ZB18
8	649	513	-.84	.05	.99	-.2	.89	43.1	.64	.60	43.1	38.6	ZB8
2	354	513	-.11	.05	.92	-1.2	.96	56.9	.55	.52	56.9	51.9	ZB2
5	195	513	-.46	.07	.89	-1.2	.86	71.7	.47	.43	71.7	68.3	ZB5
22	476	513	-.44	.05	.70	-5.5	.89	52.8	.59	.56	52.8	41.8	ZB22
19	235	513	-.29	.06	.87	-1.6	.87	64.5	.48	.45	64.5	62.7	ZB19
16	195	513	-.46	.07	.87	-1.5	.72	72.3	.51	.43	72.3	68.3	ZB16
10	178	513	-.54	.07	.81	-2.1	.70	74.3	.51	.41	74.3	71.0	ZB10
3	271	513	.16	.06	.80	-2.8	.70	63.2	.58	.48	63.2	58.5	ZB3
12	219	513	-.36	.06	.77	-2.9	.65	79.6	.55	.44	79.6	64.8	ZB12
17	212	513	.39	.07	.71	-3.7	.59	73.5	.58	.44	73.5	66.2	ZB17
11	293	513	.08	.06	.68	-4.9	.60	65.7	.61	.49	65.7	56.4	ZB11
MEAN	395.1	513.0	.00	.07	1.00	-.1	.92	-.3			61.5	59.7	
S.D.	351.9	.0	1.00	.02	.25	3.5	.36	3.2			19.4	17.3	

Discussion

The research findings highlight that the assessment of the Zarit Burden Interview (ZBI) among caregivers of elderly tsunami survivors can uncover differences in participants' abilities to engage with specific research items. In particular, items 4, 6, 9, and 13 were notably challenging for caregivers, whereas item 21 was relatively easy to address. This observation is in agreement with the study by Domínguez-Vergara et al. (2023), who also identified certain items as more difficult. The analysis of item dimensionality verified that the ZBI functions as a unidimensional scale, focusing solely on measuring the psychological construct of burden, without evaluating other psychological constructs, although there is a possibility of other measurable dimensions in this ZBI.

The results of the rating scale measurement indicate that the four alternative responses on this scale can be effectively distinguished by caregivers, thereby facilitating the selection of appropriate

responses to each statement within each item. This suggests that the ZBI demonstrates sufficient functionality and can be used to assess caregiver burden. The DIF analysis revealed that four items in this study exhibited differential item functioning or demonstrated bias concerning caregiver gender in the responses to these items.

The reliability of the ZBI in this study was classified as very good following testing, thereby indicating that the ZBI demonstrates strong consistency in assessing the burden level among caregivers in this investigation. This finding is consistent with several studies that asserted that the ZBI possesses good reliability with a consistent measurement of its constructs. Furthermore, ZBI exhibits high internal consistency and good validity (Braun et al., 2010; Rahmani et al., 2022).

A detailed examination of respondents' ability to answer each item revealed that item 21 was particularly easy, even for those with lower ability levels. In terms of item fit measurement, item 21 did not meet the three established criteria, categorizing it as a misfit item. These findings indicate that Item 21 requires revision or replacement to improve the overall validity and reliability of the ZBI.

In this study, item 21 was the most problematic item, with the following wording: "*Apakah Anda merasa mampu merawat dengan lebih baik lansia yang Anda asuh/rawat/jaga?*" This item measures moral judgment rather than a concrete burden. This item is also greatly influenced by local Acehnese cultural norms. In Acehnese culture, the responsibility of children to care for their parents (elderly) is a moral obligation rooted in the integration of tradition and Islamic values, as reflected in the philosophy "*hukom ngon adat lagee zat ngon sifeut*," which means that law and custom are like substance and attribute (inseparable). This emphasizes that social norms are always in harmony with the religious teachings (Manan & Munir, 2016; Yulia, 2016). In the social structure, families in Aceh are communal and oriented toward extended families, with children serving as the primary caregivers for elderly parents; therefore, family-based care is prioritized over institutionalization. The value of *birru walidain* (devotion to parents) reinforces this obligation as a form of religious and social service, and failure to fulfill this role may be viewed as a violation of cultural norms. Thus, caregiving for parents in Acehnese society is not only a personal act but also a cultural and spiritual duty that carries social consequences (Manan & Munir, 2016; Rayyan, 2025). In this context, the feeling of "being able to provide good care" becomes culturally biased because this item is understood more as "being obligated to care" rather than "being able to care."

In general, item 21 does not consistently represent the construct of caregiver burden, and therefore it is suggested that this item needs to be revised or replaced to improve the quality of measurement. In the process of revising this item, it is necessary to consider local cultural values and emphasize the objective measurement of burden, free from cultural bias.

The value of the unexplained variance in the first contrast indicates the possibility of a small-scale secondary dimension. This is further supported by the findings from the item fit statistics and the position of the items on the Wright map. This contrast is suspected to be mainly formed by item 21, which represents feelings of guilt or moral obligation in caregiving as influenced by cultural norms and religiosity. Therefore, the first contrast is more likely to reflect variation in item content rather than a new substantive latent dimension. In the Rasch model, this condition may appear as a split or residual

contrast. This occurs when some items tend to measure caregiving burden, while other items capture more of the cultural, moral, and religious values. On the other hand, the values of the subsequent residual contrasts indicate the existence of any additional substantive latent dimensions.

Another important finding of this study is the presence of a floor tendency, indicating that some caregivers reported relatively low levels of burden. Based on the Wright Map (Person–Item Map), it shows that the person-item targeting of the ZBI instrument is not yet optimal, as the distribution of items and participants is not entirely balanced. This misfit indicates that the ZBI items tend to be more difficult than the burden levels of the majority of participants, making the instrument less sensitive in capturing variations of burden at lower levels, which actually dominate the participants. As a result, some participants with low burden exhibit similar response patterns (for example, frequently choosing the lower categories). Consequently, the instrument’s capacity to differentiate at low burden levels is constrained, particularly concerning item 21. This item is readily agreed upon even by participants exhibiting low levels of burden. Due to its simplicity, the item is less effective in distinguishing among participants. This situation elucidates why item 21 exhibits misfit and limited discriminatory capacity, as nearly all participants tend to agree with it. This consensus may not necessarily stem from a high burden but could be influenced by cultural factors or moral norms. This condition may reflect coping mechanisms based on religiosity and social support in Acehese culture, which normatively places caregiving as a moral and spiritual obligation of children to their parents (Manan & Munir, 2016; Rayyan, 2025).

Limitations

This study has several limitations. First, the study’s participants are embedded within a unique cultural and geographical setting, specifically as caregivers in Aceh in the aftermath of the earthquake and tsunami disaster. Their response patterns may be shaped by religious values, collective family dynamics, and strong filial obligations. Therefore, caution is warranted when attempting to generalize these findings to caregivers in other regions, cultural contexts, or non-disaster situations. Second, this study failed to assess the local independence assumption of the Rasch model. Violations of this assumption can reduce the reliability and trustworthiness of the study’s findings (Marais & Andrich, 2008). Future researchers need to develop a deeper understanding of the technical aspects of the Rasch model before applying it in order to avoid repeating this limitation.

Conclusion

Based on the results of the Rasch model analysis and discussions, the ZBI instrument demonstrates good psychometric quality and is suitable for measuring caregiver burden in post-disaster contexts. In general, the majority of items showed a good fit with the model, supported by Infit and Outfit values within the recommended range, as well as good internal consistency. Overall, the validation of the ZBI using the Rasch model produced an instrument that is valid by means of construct validity in Acehese samples and post-disaster situations. Nonetheless, there exists the potential for a minor secondary dimension.

Furthermore, some items need improvement by considering local cultural values, particularly item 21. To enhance the ZBI, it is advisable to include items that assess low-intensity burdens, thereby reducing floor effects, and to adjust items with moral implications that might reflect filial obligations rather than caregiving stress. In collectivist settings such as Aceh, integrating sections that address family expectations, post-disaster stressors, and religious coping mechanisms could significantly improve cultural relevance.

Implications

In the post-disaster context, caregivers often face more complex burdens, not only related to caring for sick or vulnerable individuals but also psychosocial pressures, loss of resources, disruption of social roles, and uncertainty in the surrounding environment. Therefore, the use of the ZBI, which has been validated through the Rasch model, has several practical implications, such as serving as a rapid screening tool to identify caregivers experiencing caregiving burden in disaster-affected communities. The results of this screening can serve as a basis for designing more targeted psychological interventions. Additionally, systematic use of this instrument can support early detection, targeted intervention planning, and evidence-based psychosocial program evaluation, thereby contributing to the improvement of caregiver well-being and the quality of care for disaster survivors, especially the elderly.

Recommendations

Findings from Acehnese culture highlight the presence of dimensions such as religiosity, filial obligation, and social support, which serve as protective factors. Further research can develop a structural model integrating caregiver burden with religious coping and family cohesion. Moreover, considering the differences in caregiver roles within Acehnese culture—where female caregivers tend to spend more time at home caring for the elderly, while male caregivers play a greater role in providing material and financial needs—further DIF analysis is needed to ensure that there is no item bias based on gender or family role. Furthermore, while this instrument may be regarded as unidimensional, additional research is warranted to investigate the potential subdomains of caregiver burden from a theoretical standpoint.

Declaration

Acknowledgements

We would like to thank Vivi Ataini, a social worker who helped complete this research process. We also thank to Nyak Fadlullah from Universitas Islam Negeri (UIN) Ar-Raniry, Agung Pangeran Bungsu from Universitas Muhammadiyah Mahakarya (UMMAH), Fathayatul Husna from Universitas Teuku Umar, Noviandy from Institut Agama Islam Negeri (IAIN) Langsa, Heri Maslijar from Sekolah Tinggi Agama Islam Negeri (STAIN) Teungku Dirundeng, Linur Ficca Agustina from IAIN Lhokseumawe and Rismayani as the student of UIN Sunan Kalijaga who helped collected the data.

Funding

The authors did not receive any funding to conduct this research.

Authors' Contribution

NS was responsible for collecting, analyzing, and writing the research report. VJ contributed to conceptualizing the study, preparing research instruments, and data gathering. K provided input on the research plan and collected the research data. AL provided input related to the research concept and framework and prepared the instruments in the software. IU analyzed the data and assisted in writing the report.

Conflict of Interest

The authors declare that there are no conflicts of interest in the preparation of this manuscript.

Declaration of Generative AI in Scientific Writing

Researchers used AI to refine sentence structure and language and to generate ideas. Nevertheless, the results produced by AI are reviewed by the researchers.

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