

Reliability and Validity of Gujarati version of the Tilburg Frailty Indicator (TFI)

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ABSTRACT

Background: The Tilburg Frailty Indicator (TFI) is self-reported questionnaire to screen for The Frailty. The questionnaire consists of 15 questions designed to screen frailty in community-dwelling older people. TFI has a multidimensional approach to frailty, that includes physical, psychological, and social dimensions. It diagnoses frailty based on three domains: Physical, Psychological and Social. The TFI is brief, easy to complete, and applicable in both research and clinical practice. It offers a holistic assessment of an individual's vulnerability, helping healthcare professionals identify frail individuals early and implement suitable preventive or rehabilitative measures.

AIM: The aim of the study is to find out the reliability and validity of the Gujarati version of the Tilburg Frailty Indicator in community dwelling older adults.

Materials and Method: A cross-sectional study was conducted from September 2023 to January 2024 in Ahmedabad, Gujarat, India. A cross-sectional study was conducted from September 2023 to January 2024 in Ahmedabad, Gujarat, India. The TFI was translated into Gujarati language according to Beaton guideline after obtaining permission from the author. A total of 150 participants and eight professionals with more than 12 years of experience in the field of Geriatric medicine, Physical Therapy and Healthcare area were involved in the examination of each item of the Gujarati version of TFI. The Statistical Package for the Social Sciences (SPSS) version 26.0 was used for the statistical analysis.

Result: Mean age of the participants was 69.5 ± 8.5 . The Content Validity Ratio (CVR) for item 11, 12, 15, 16, 17, 20, 21, 22, 24, 25 was 0.75 and for item 13, 14, 18, 19, 23 the value was 1. Internal consistency of Gujarati TFI was calculated through Cronbach's alpha ($\alpha=0.994$) suggesting high internal consistency. Test-retest reliability of TFI was calculated through the Interclass Correlation Coefficient (ICC=0.987) suggesting excellent test-retest reliability.

Conclusion: The TFI-Gujarati is proved as an easy-to-administer, reliable, valid, and reproducible tool for the assessment of frailty among Gujarati community dwelling older adults. Our research suggests that this information will support researchers, policymakers and health care professionals in interpreting scores of the TFI, which may guide their efforts to reduce frailty and its adverse outcomes.

Keywords: Tilburg Frailty Indicator, Frailty, Reliability and Validity, Cross cultural comparisons, Translation

INTRODUCTION

As the elderly population grows globally, the occurrence of frailty is also on the rise [1]. Frailty has become a key concept in research on aging and the care of older individuals worldwide [2]. Frailty is defined as a dynamic and multidimensional state that affects individuals who experience declines in one or more domains of human functioning physical, psychological, or social. These declines result from the interaction of various biological, psychological, and environmental factors that accumulate over time. Such a state increases a person's vulnerability to stressors and heightens the risk of adverse health outcomes, including falls, disability, hospitalization, and mortality. This definition highlights that frailty is not merely a physical condition but a comprehensive syndrome reflecting the complex interplay of multiple factors influencing overall well-being [3]. Frailty is distinct from both comorbidity and disability, even though all three conditions contribute to unique care requirements in older adults. Therefore, a tool to assess frailty should be designed to exclude disability while encompassing multiple domains of human functioning - physical, psychological, and social [4]. Several instruments have been developed to assess frailty, though only a few have been thoroughly validated. To address this limitation, quick and simple screening tools have been introduced to help healthcare professionals identify frailty early, before significant functional decline occurs. Some tools, such as the Fried and FRAIL scales, primarily focus on the physical component of frailty, while others, like the SHARE Frailty Index, use the accumulation of deficits model. Meanwhile, multidimensional tools such as the Tilburg and Groningen Frailty Indicators take a more comprehensive approach by including physical, psychological, and social domains, capturing the complex and evolving nature of frailty [5]. Most definitions of frailty mainly emphasize physical problems in older adults, often neglecting psychological and social factors that influence overall well-being. To address

this, the Tilburg Frailty Indicator (TFI) was developed as a multidimensional tool. It consists of two parts: Part A includes 10 questions on determinants of frailty such as age, lifestyle, and health, while Part B assesses frailty across three domains—physical, psychological, and social—through 15 items [6].

Frailty assessment is essential for early detection and management of health risks in older adults. However, language and cultural differences can limit the use of existing tools in regional populations. Therefore, translating and validating the Tilburg Frailty Indicator (TFI) into Gujarati is necessary to ensure accurate and culturally relevant frailty assessment among Gujarati-speaking older adults.

MATERIALS & METHODS

The methodological research design used included translating and adapting the original English language version of the TFI into Gujarati language and undertaking validity and reliability testing of the TFI-Gujarati version. The study was carried out using a cross-sectional study design with older people living in Ahmedabad City, Gujarat, India from September 2023 to January 2024. In previous studies, it has been suggested that a sample size of 50 or more is needed for a reliability estimate of an instrument. [7,8] The sample size was 10 times the number of items in the instrument. [9] The TFI consists of a total of 15 items that will be analysed. Therefore, 150 community-dwelling older people were required for this validity and reliability study. To ensure a larger sample, the data were collected from 150 community-dwelling older people living in Ahmedabad, Gujarat. After obtaining a written informed consent, a survey conducted on convenient samples of community-dwelling older people using the new TFI-Gujarati version. The TFI-Gujarati was administered using a face-to-face interview technique.

Inclusion and Exclusion criteria: The participants included in the study were recruited from across Ahmedabad. Both male

and female willing to participate aged ≥ 60 years with Gujarati as their mother tongue. Individuals with severe cognition impairment, severe musculoskeletal impairment, neurological condition and any surgical history in past 6 months were excluded.

Study Procedure

Language Translation and Adaptation process

Permission to perform TFI translation and adaptation was obtained from the developer of the TFI. A standardized protocol was followed for the translation and cross-cultural adaptation of the original English version of the instrument.

Stage 1: The first step in the adaptation process involved forward translation of the instrument. Two bilingual translators, both native speakers of the target language, independently translated the Tilburg Frailty Indicator (TFI) from English into Gujarati, resulting in two separate versions (G1 and G2). For cross cultural adaptation, after getting the permission of the original author two questions of Part-A question 4 and question 6 were changed. We did put question 4 open ended and put a blank instead of using the regions from the original questionnaire, because the regions mentioned in the original versions did not fit for the population of the targeted region. We also did the same for question 6, because the wages will differ if we convert the wages given in the original questionnaire to INR.

Stage 2: Synthesis of the Translations: The original questionnaire and the two translated versions (G1 and G2) were compared carefully and one common version called G12 was made.

Stage 3: Using the G12 version, two translators whose first language was English translated it back into English (BG1 and BG2). This step was done to check if the Gujarati version had the same meaning as the original one. Back translation helps find any major mistakes or differences in understanding between the two versions.

Stage 4: A committee of eight professionals from the fields of geriatric medicine, physiotherapy, and healthcare was formed to review the translated and back-translated questionnaires. They examined the wording, content, format, scoring, and ease of use to ensure accuracy and clarity of the instrument.

Stage 5: The last step of the adaptation process was pretesting. The final version of the questionnaire was given to experts and 10 randomly selected older adults from the total of 150 participants. They were asked to complete the questionnaire to check if the questions were clear and easy to understand, and to record the time taken to finish the translated Gujarati version of the TFI.

Face and Content Validity

For The validation of the instrument was completed before administering the final version of the TFI to any study participant. The TFI-Gujarati was tested for both face validity and content validity.

For Face validity, the questionnaire was given to experts and 10 randomly selected older adults from the total of 150 participants. They were asked to complete it to check how well they understood each item and to record the time taken to finish the translated Gujarati version of the TFI.

For Content validity, a panel of eight professionals from the fields of geriatric medicine, physiotherapy, and healthcare reviewed the questionnaire to ensure its relevance and clarity.

Each item was rated by the experts on a 3-point scale:

1 = Rejected

2 = Accepted with modification

3 = Accepted

The Content Validity Ratio (CVR) was calculated using the formula:

$$CVR = (N_e - N/2) / (N/2)$$

Where,

N_e = Number of experts rating the item as "accepted"

N = Total number of experts

According to Lawshe's table, a CVR value of 0.75 or above was considered acceptable for content validity^[10].

Reliability

After taking written informed consent from 150 participants, the final version of the questionnaire was given to them. Participants were requested to fill questionnaire. After the duration of one week again the questionnaires were given to the same participants^[11]. The gap given to participants was to avoid any memory of past questions. Cronbach's alpha was used to calculate the internal consistency of the TFI. The ICC was used to calculate the test-retest reliability of the Gujarati version of the TFI. ICC of < 0.50 considered as fair, 0.50-0.75 considered as moderate, 0.75-0.9 considered as good and >0.90 considered as excellent reliability^[12].

STATISTICAL ANALYSIS

Data analysis was performed using SPSS version 26.0. The internal consistency of the TFI-Gujarati was assessed using Cronbach's alpha coefficient. Test-retest reliability was evaluated using the Intraclass Correlation Coefficient (ICC). A p-value of less than 0.05 was considered statistically significant for all analyses.

RESULT

A total of 150 participants aged more than 60 years enrolled in the study. Among them, 80 were females (53.33%) and 70 were males (46.67%). The participants had a mean age of 69.5 ± 8.5 years.

Face and content validity

For face validity, all eight experts and 10 participants shared their feedback on the words, content, format, scoring, and overall ease of understanding of each question. They agreed that all items were clear, suitable, and could be used to assess frailty in the Gujarati-speaking population.

For content validity, the group of eight experts reviewed each item of the Gujarati version of the TFI and reached a common agreement. All items were marked as either "accepted" or "accepted with modification." Out of 15 items, 5 were rated as accepted (score 3) and 10 were rated as accepted with modification (score 2). The CVR values for items 11, 12, 15, 16, 17, 20, 21, 22, 24, and 25 were 0.75, while items 13, 14, 18, 19, and 23 had a CVR of 1. Since all CVR values were 0.75 or higher, the Gujarati version of the TFI was considered valid according to Lawshe's standard^[10]. [Table/Fig-1]

Reliability

Test-retest reliability measures the stability of an instrument over time. In this study, a one-week interval was used between the two administrations of the questionnaire. The results showed test-retest reliability and inter-observer variability were very good given their ICC values (0.987) and high internal consistency ($\alpha=0.994$). These findings confirm that the Gujarati version of the TFI is a reliable and consistent tool for screening frailty.

DISCUSSION

The present study aimed to translate, culturally adapt, and validate the Gujarati version of the Tilburg Frailty Indicator for use among older adults in Gujarat. The results demonstrated that it has excellent reliability and satisfactory validity, confirming its suitability for screening frailty in Gujarati-speaking elderly populations. The Gujarati version of the Tilburg Frailty Indicator proved to be a valid and reliable tool for identifying frailty among community-dwelling older adults. The translation and cultural adaptation process followed internationally accepted guidelines, ensuring linguistic clarity and cultural suitability.

Professional Consensus on the Gujarati Adaptation of the Items										Count of Professional Indicating "Accepted"	CVR
Items of the scale	Pr 1	Pr 2	Pr 3	Pr 4	Pr 5	Pr 6	Pr 7	Pr 8			
Part B Components of frailty											
B1 Physical components											
11. Do you feel physically healthy?	3	2	3	3	3	3	3	3	3	7	0.75
12. Have you lost a lot of weight recently without wishing to do so? ('a lot' is: 6 kg or more during the last six months, or 3 kg or more during the last month)	2	2	3	3	3	3	3	3	3	7	0.75
Do you experience problems in your daily life due to:	3	3	3	3	2	3	3	3	3	7	0.75
13.difficulty in walking?	3	3	3	3	3	3	3	3	3	8	1
14.difficulty maintaining your balance?	3	3	3	3	3	3	3	3	3	8	1
15.poor hearing?	3	3	3	2	3	3	3	3	3	7	0.75
16.poor vision?	3	3	3	2	3	3	3	3	3	7	0.75
17.lack of strength in your hands?	3	3	3	2	3	3	3	3	3	7	0.75
18.physical tiredness?	3	3	3	3	3	3	3	3	3	8	1
B2 Psychological components											
19. Do you have problems with your memory?	2	3	3	3	3	3	3	3	3	8	1
20. Have you felt down during the last month?	2	3	3	3	3	3	3	3	3	7	0.75
21. Have you felt nervous or anxious during the last month?	3	3	3	3	3	3	2	3	3	7	0.75
22. Are you able to cope with problems well?	3	3	2	3	3	3	3	3	3	7	0.75
B3 Social components											
23. Do you live alone?	3	3	3	3	3	3	3	3	3	8	1
24. Do you sometimes miss having people around you?	3	2	3	3	3	3	3	3	3	7	0.75
25. Do you receive enough support from other people?	3	2	3	3	3	3	3	3	3	7	0.75
[Table/Fig-1]: Content Validation Ratio (CVR) value of 25 questions of the Gujarati TFI. Pr 1, Pr2, Pr 3 suggests number of professionals.											

The face and content validity of the TFI-G were confirmed through expert evaluation and participant feedback. All experts agreed that the translated items were relevant and easy to understand for the Gujarati-speaking population. The Content Validity Ratio (CVR) values were greater than 0.75 for all items, meeting Lawshe's acceptable threshold for content validity [10].

Reliability analysis demonstrated excellent internal consistency (Cronbach's $\alpha = 0.994$) and strong test-retest reliability (ICC = 0.987). These results are consistent with those reported in previous studies of the TFI in other languages, including the Turkish version ($\alpha = 0.79$, ICC = 0.97) [11] and the original Dutch version ($\alpha = 0.73$) [6]. Similarly, the Polish version also showed high reliability and cultural applicability [7]. These findings indicate that the TFI-G is a stable and consistent tool for frailty assessment. Its multidimensional approach, covering physical, psychological, and social domains, helps healthcare professionals identify frailty early and provide suitable preventive or rehabilitative care.

The study concludes that the TFI-G is a reliable, valid, and culturally appropriate instrument for assessing frailty among Gujarati-speaking older adults. Future research with larger samples and diverse settings is recommended to further validate the construct and predictive validity of the tool.

The study had several strengths, such as a careful translation process, a good number of participants, and inclusion of older adults from the community. However, it had some limits. It was done in only one city and did not test all types of validity.

Future research should use the Gujarati TFI in both community and hospital settings and compare it with measures like grip strength, walking speed, and quality of life.

In short, the Gujarati version of the Tilburg Frailty Indicator is a valid, reliable, and culturally suitable tool to identify frailty early and help improve the quality of life of older adults in Gujarat.

CONCLUSION

The TFI-Gujarati is proved as an easy-to-administer, reliable, valid, and reproducible tool for the assessment of frailty among Gujarati community dwelling older adults. Our research suggests that this information will support researchers, policymakers and health care professionals in interpreting scores of the TFI, which may guide their efforts to reduce frailty and its adverse outcomes.

Declaration by Authors

Ethical Approval: Approved

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