

# Reliability and Validity of Gujarati Version of SARC-F Tool Used as Screening of Sarcopenia: A Cross-sectional Study

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## ABSTRACT

**Introduction:** Sarcopenia is a disease which causes gradual loss of muscle mass, strength, and physical capability of one's health mainly seen in older age. Early detection of sarcopenia and good treatment with proper diet should be necessary to prevent it. Strength, Assistance in walking, Rise from chair, Climbing stairs, Falls (SARC-F) is the English questionnaire used for early screening of sarcopenia. SARC-F questionnaire contains five components. It was recognised as the most up-to-date and coherent screening tool for screening the sarcopenia.

**Aim:** To translate and validate the Gujarati version of SARC-F questionnaire.

**Materials and Methods:** A cross-sectional study was conducted at the Nootan College of Physiotherapy, Visnagar, Ahmedabad, Gujarat, India between the 1<sup>st</sup> week of May to 1<sup>st</sup> week of June 2022 to translate the English origin SARC-F questionnaire in Gujarati language. For validation process, 190 individuals more than 60 years old, both male and female across Ahmedabad with normal cognition, able to walk independently were included

in the study. Individuals were asked to complete the translated version of the SARC-F questionnaire over the gap of 48 hours for measuring the test-retest reliability. Face validity and content validity were assessed by the expert committee itself.

**Results:** A total of 190 participants were included in the study in which 87 were males and 103 females. Out of total participants 51 (26.84%) were diagnosed with sarcopenia. The reliability was checked by Interclass Correlation Coefficient (ICC) value which was 0.811 suggesting good reliability. Face validity was checked by the team of eight experts. Content validity was assessed with Content Validity Ratio (CVR) value more than 0.75 which suggested good content validity. The Content Validity Index for each item on the scale (I-CVI) value was in the range of 0.84-1 that also suggested good content validity at individual item level.

**Conclusion:** The translation process and validation of SARC-F Gujarati questionnaire demonstrated good content validity. The translated Gujarati questionnaire was a simple and reliable tool for diagnosing sarcopenia in daily clinical practice in older individuals.

**Keywords:** Muscle mass, Older adults, Psychometric property, Strength assistance in walking rise from chair climbing stairs falls

## INTRODUCTION

The term sarcopenia was coined by Rosenberg in 1989 which describes progressive and generalised loss or decrease of muscle mass with increase in age. Sarcopenia is a greek word which suggests 'sarx' means flesh and 'penia' means loss [1]. In 2010, the definition of sarcopenia was given by the European Working Group on Sarcopenia in Older Population (EWGSOP) as considering low muscle mass with low muscle function (performance) [2]. Later on other international groups developed similar definitions for sarcopenia with focusing on walking speed, grip strength in older person with lean muscle mass [3,4]. In 2009 investigators and clinicians met and set the clinical criterias for sarcopenia. This group was named as International Working Group on Sarcopenia (IWGS). In 2010, the IWGS defined sarcopenia as presence of low skeletal muscle mass and low muscle function which is assessed by walking speed [5]. Due to change in ethnicity, atmosphere, genetic background, body size and structure, the EWGSOP and IWGS criteria might not be applicable to Asian population [6].

In 2014 the Asian Working Group for Sarcopenia (AWGS) justified sarcopenia as a age related loss of muscle mass, low muscle strength and or low physical performance [7]. In 2019 AWGS criteria were revised where the definition remained the same but the cut-off values, diagnostic process, protocols were modified [8].

There are mainly three dimensions to diagnose sarcopenia. Muscle mass, muscle strength, physical performance. There are various diagnostic criteria, clinical outcome measures, questionnaires, biological markers and imaging techniques to diagnose sarcopenia [9,10]. Imaging techniques such as Dual Energy X-ray Absorptiometry (DEXA) is the gold standard for measuring muscle mass. Other imaging techniques

like Computed Tomography (CT) scan, Magnetic Resonance Imaging (MRI), sonography can also be useful for the same. Due to higher cost, heavy machines, time consuming and lack of skilled specialists the non imaginary techniques like Bioelectrical Impedance Analysis (BIA), Anthropometric measurements are also used for measuring muscle mass [11]. Muscle strength can be measured by a hand held dynamometer. For measuring physical performance a wide variety of clinical tools and questionnaires are available. The Short Physical Performance Battery (SPPB) tool is very easy and widely used for checking physical performance. The questionnaire SARC-F is noted as a quick screening tool for sarcopenia [12].

The SARC-F questionnaire was developed by Malmstrom and Morley in 2013. This questionnaire is a brief, inexpensive tool used for early screening of sarcopenia. It is a quick and self reported questionnaire which includes five components. SARC-F questionnaire contains five items such as strength, assistance in walking, rising from a chair, climbing stairs and falls. A score 0, 1 and 2 points is given for each of the answers. The total score range is from 0-10 points. The score of four and above indicates a risk of having sarcopenia [13].

The SARC-F questionnaire was originally created in English. It is translated and validated in different languages such as German, Thai, Japanese, Spanish, Turkish, French, Korean and Vietnamese [14-21]. For the Indian population SARC-F questionnaire can be used for evaluating patients with sarcopenia. In the area of Gujarat, local language is Gujarati. To evaluate people with sarcopenia in Gujarat the questionnaire need to be translated and validated in Gujarati. So the purpose of the study was to translate and validate the SARC-F questionnaire in Gujarati language.

## MATERIALS AND METHODS

A cross-sectional study was conducted from 1<sup>st</sup> week of May to 1<sup>st</sup> week of June 2022 at the Nootan College of Physiotherapy, Visnagar, Ahmedabad, Gujarat, India. It was conducted in two processes. The step one was to translate the SARC-F questionnaire in Gujarati language and in step two, the Gujarati translated questionnaire was assessed for face validity, content validity, test retest reliability. An ethical approval was taken by the Institutional Ethical Committee of Nootan College of Physiotherapy, Visnagar with reference No. NCP/181-A/2022.

**Inclusion and Exclusion criteria:** The participants included in the study were recruited from across Ahmedabad. Males and females between the age 60-80 years with Gujarati as their mother tongue, with normal cognition and able to walk independently were included in the study. The participants with amputated limbs, having serious cardiac illness and who did not give consent to participate in the study were excluded.

### Study Procedure

**Phase 1: Translation process:** The translation procedure was done in four steps by following Beaten's guidelines [22].

1. The first step was forward translation from English to Gujarati language. An independent translator who was a healthcare professional had done this translation. The translator was explained about the purpose of the translation. Emphasis was drawn on conceptual translation rather than literal translation. Another independent translator with knowledge of Gujarati language was assigned for translation without explaining purpose of translation (T1 and T2).
2. In second step, reconciliation of both the translations were done and the final Gujarati version was framed (final Gujarati T version).
3. In the third step, the backward translation process was started with two independent translators from Gujarati to English (B1 and B2). Translators were unaware about the purpose of translation. Again the translation was focused on conceptual rather than literal translation.
4. In the last step of the process both the Gujarati and English versions of questionnaires were checked and a draft of the Gujarati version of SARC-F was prepared. It was submitted to the original developer of the questionnaire. Thus, prefinalised Gujarati version of SARC-F questionnaire was prepared.

**Phase 2: Face and Content Validity Testing:** Completion of translation process, a validation study was conducted to assess the Gujarati version of SARC-F questionnaire performance in the diagnosis of sarcopenia condition in older population. An expert committee of eight members with 6.7 years of total work experience were organised. Members of the expert team checked the original questionnaire and the translated version of the questionnaire. The experts checked the questionnaires for the content, format, words and meanings, scoring and easy administration of the translated version of the questionnaire.

The validities were measured to check the important and relevant content in an instrument, which is quantified by CVR. The experts were requested to score each item from 1, 2 and 3 with 1 meaning not necessary, 2 meaning useful but not essential and 3 meaning essential. The formula of content validity ratio is  $CVR = (Ne - N/2) / (N/2)$ , where, Ne is number of panelists indicating essential and N is the total number of panelists. The numeric value of CVR is determined by the Lawshe table. In this study, with eight panelists, if CVR value was more than 0.75, the item in the instrument were accepted [23].

For the face validity, the experts and the target community were asked a question, do you think this questionnaire is appropriate to assess the sarcopenia in any individual? The answer was noted as Yes or No.

The content validity of the questionnaire was determined using the CVI. The expert panel asked to rate each item based on relevance, clarity, simplicity and ambiguity on a four point scale [23] [Table/Fig-1].

Relevance	Clarity
1=Not relevant	1=Not clear
2=Item need some revision	2=Item need some revision
3=Relevant but need minor revision	3=Clear but need minor revision
4=Very relevant	4=Very clear
Simplicity	Ambiguity
1=Not simple	1=Doubtful
2=Item need some revision	2=Item need some revision
3=Simple but need minor revision	3=No doubt but need minor revision
4=Very simple	4=Meaning is clear

**[Table/Fig-1]:** Rating based on relevance, clarity, simplicity and ambiguity on a four point scale.

The CVI value was computed for each item on a scale (I-CVI) and for overall scale (S-CVI). The I-CVI was for the number of experts giving rating of either 3 or 4 for each item divided by the total number of experts. The S-CVI was calculated using the average calculation method (S-CVI/Ave). The I-CVI of each item should be at least 0.78 and S-CVI/Ave should be  $\geq 0.90$  [24,25].

**Phase 3: Cognitive debriefing:** After the translated version of the questionnaire interviews were conducted for ten samples by independent interviewees. Interviews were conducted to check the final questionnaire whether it is easy to understand and appropriate. The final version of the questionnaire (F-guj) was prepared after completion of interviews. This final version of the questionnaire mailed to the developer John Morley to take his approval was taken for the same.

**Phase 4: Reliability of the F-Guj SARC-F questionnaire:** After taking written informed consent from 190 participants (30:1 item ratio with 20% of drop out rate), the final version of the questionnaire was given to them [26]. Participants were requested to fill up the document. After one week again the questionnaires were given to the same participants with the administrator. The gap of 48 hours were given to participants to avoid any memory of past questions. Test-retest reliability was calculated by ICC. ICC of  $< 0.50$  considered as fair, 0.50-0.75 considered as moderate, 0.75-0.9 considered as good and greater than 0.90 considered as excellent reliability [27].

## STATISTICAL ANALYSIS

Statistical analysis was considered significant at the 5% critical level ( $p < 0.05$ ). All the analysis were performed using Statistical Package for the Social Sciences (SPSS) statistics version 26.0. This reliability was measured by ICC with level of significance set to 0.05.

## RESULTS

A total of 190 participants were included in the study in which 87 were males and 103 females. Total 51 (26.84%) individuals were diagnosed having sarcopenia (SARC-F score more than 4). Basic characteristics with mean age and gender distribution were shown in [Table/Fig-2].

Variables	Values n (%)
Age (years) (mean $\pm$ SD)	59.8 $\pm$ 8.4
BMI (kg/m <sup>2</sup> ) (mean $\pm$ SD)	26.5 $\pm$ 3.82
Underweight	31 (16.3%)
Normal weight	57 (30%)
Overweight	56 (29.4%)
Obese	46 (24.2%)
Smokers	80 (42.1%)
Episode of falls in previous year	54 (28.4%)
Malnutrition	60 (31.5%)

**[Table/Fig-2]:** Basic characteristics of the study participants.

**Translation of the Gujarati version of SARC-F questionnaire:** The translation process was done following beaten guidelines without any difficulties and approved by professor Morley, the developer of the questionnaire.

In the cognitive debriefing phase minor modifications needed for better understanding in weight specification the pound was converted into kilograms. In the first question item 'strength' was evaluated by the question how much difficulty do you have in lifting and carrying 10 pounds where 10 pounds was converted into 5 kilograms. This change was accepted by all translators. A small number of individuals were interviewed for the same. They found it appropriate and better to understand.

**Validity testing:** All the eight experts accepted all components of the Gujarati translated SARC-F questionnaire. The CVR value was 1 for all items in the questionnaire which was more than 0.75 which suggests that translated content had good content validity.

In the face validity, all the experts and individuals from the target community agreed for yes indicating that the SARC-F Gujarati questionnaire is relevant, reasonable for assessing sarcopenia in older individuals. Content validity at the item level was also measured. I-CVI value was in the range of 0.87-1, range which suggests good content validity at the item level.

The I-CVI values given by all 8 experts for 5 items of SARC-F questionnaire are given in [Table/Fig-3]. The mean and standard deviation of all components of the SARC-F questionnaire were given in [Table/Fig-4].

No.	No. of experts in agreement	Total no. of experts	I-CVI (experts in agreement/no. of experts)	S-CVI/Ave
1	7	8	0.875	0.975
2	8	8	1	
3	8	8	1	
4	8	8	1	
5	8	8	1	

[Table/Fig-3]: I-CVI values of experts for SARC-F questionnaire

No.	Components	Mean	SD
1.	Strength	0.55	0.679
2.	Assisting in Walking	0.22	0.486
3.	Rising From Chair	0.27	0.492
4.	Climbing Stairs	0.44	0.612
5.	Fall	0.17	0.402

[Table/Fig-4]: SARC-F questionnaire components and its mean values

Number of participants	ICC Value	95% Confidence interval		p-value
		Lower bound	Upper bound	
190	0.811	0.765	0.851	0.001

[Table/Fig-5]: ICC value and p-value of SARC-F questionnaire

Various translation of SARC-F	Author	Publication year	Reliability (ICC value or Cronbach alpha or Kappa coefficient)	Validity (sensitivity, specificity, PPV, NPV)
German [14]	Drey M et al.,	2019	Excellent inter-rater reliability and good test re-test reliability	Sensitivity=75%, specificity=67%
Thai [15]	Akarapornkrai P et al.,	2020	Not tested	Sensitivity=21.5%, specificity= 93.7%, PPV=50%, NPV= 80.3%
Japanese [16]	Ida S et al.,	2017	Kappa coefficient=0.66	Sensitivities=14.6% (M)33.3%(F), specificities=85.8%(M)-72.4%(F), PPV=33.3% (M)-17.3%(F), NPV=65.7%(M)-86.2%(F)
Spanish [17]	Parra-Rodríguez L et al.,	2016	Cronbach alpha=0.641. ICC=0.80	Sensitivity=78.3%; specificity=50.8%
French [19]	Beaudart C et al.,	2018	Excellent inter-rater reliability-(ICC=0.90), excellent test-retest reliability-(ICC=0.86)	Sensitivity=55.6, specificity=85.4, PPV=19.2, NPV=96.8
Korean [20]	Kim S et al.,	2018	Cronbach alpha=0.866. ICC=0.977	Sensitivity=11-60% (M), and 28-34%(F), specificities=96.6-98%(M), 85-87.7%(F), NPV=89.2-99.3%(M), 88.5-98.4%(F)
Vietnamese [21]	Nguyen TN et al.,	2020	Cronbach alpha=0.85	Sensitivity=66.7%, specificity=67.1%
Polish [31]	Zasadzka E et al.,	2020	Cronbach alpha=0.784	Sensitivity=92.9%, specificity=98.1%, NPV=98.1%.
Romanian [32]	Gasparik A et al.,	2020	Cronbach alpha=0.75.	Specificity=84% PPV=78% and NPV=77%.
Greek [33]	Tsekoura M et al.,	2020	Cronbach alpha=0.93	Sensitivity=34.4, specificity=93.2, PPV=26.4, NPV=66.6
Gujarati	Trivedi K., Khatri S.	Present study	ICC=0.811	Future recommendation

[Table/Fig-6]: Various translated language versions of SARC-F questionnaire, different language translations of SARC-F questionnaires and details about reliability and validity [14-17,19-21,31-33].

ICC: Inter class correlation; PPV: Positive predictive value; NPV: Negative predictive value

**Reliability testing:** The test-retest reliability was undertaken by 190 individuals. Participants had to complete the Gujarati SARC-F questionnaire twice with 48 hours of interval as to minimise any memory of previous answers. The ICC value was 0.811, which suggests good reliability. Also, there is good reliability shown between item by item level. It suggests Gujarati questionnaire is reliable for screening in individuals having sarcopenia [Table/Fig-5].

## DISCUSSION

The SARC-F questionnaire was developed by Malmstrom TK, Morley JE in 2013. It is a good freely available screening tool for sarcopenia. The five components are easy to understand and also require less skillful training to learn this questionnaire. It has high sensitivity when combined with Mini Sarcopenia Risk Assessment [MSRA] [28]. According to Rossi AP et al., in 2021 the sensitivity of SARC-F was 94.0% and specificity was 40.0%. The combination of SARC-F and MSRA got improved accuracy in sarcopenia diagnosis with specificity of 100% and sensitivity 63%. They concluded both the questionnaire combined in hospital wards as an easy, first line tool to find sarcopenia in individuals [28].

Reis NR et al., reported that out of 153 elderly individuals, 13.72% were classified as sarcopenic. SARC-F questionnaire suggested sensitivity of 60.0% and specificity of 80.92% with an area on the curve was 0.70. They concluded that SARC-F can be used in community and hospital environments as a quick sarcopenia screening tool [29]. This questionnaire is also able to predict future adverse outcomes with comparable power to the EWGSOP, IWGS and AWGS guidelines. It is not dependent on cut-off values that may depend on body size and different lifestyle [30].

Beaudart C et al., (2018) created a French version of SARC-F and demonstrated excellent inter-rater reliability (ICC value-0.90), test-retest reliability (ICC value-0.86) 306 patients showed sensitivity from 22.1-75% [19]. Drey M et al., had shown sensitivity (63%) and specificity (47%) for sarcopenia patients [14].

In the Japanese version of SARC-F the kappa coefficient was 0.66. For men and women, the sensitivities were 14.6% and 33.3%, the specificities were 85.8 and 72.4% [16]. The Spanish version of SARC-F has internal consistency, Cronbach alpha value=0.77. From 90 eligible subjects the prevalence rate was 17.8% with sensitivity 78.3% and specificity 50.8% [17]. The Polish version of SARC-F showed cronbach's alpha coefficient was 0.78 [31]. Different language translated versions of SARC-F with reliability ICC values and specificities, sensitivities and positive and negative values have been mentioned in [Table/Fig-6] [14-17,19-21,31-33].

Hence the present study's results suggest good content and face validity of the Gujarati translated version of SARC-F questionnaire. So, this questionnaire is valid to use for screening sarcopenia in individuals.

### Limitation(s)

The DEXA scan and other AWGS guidelines confirm sarcopenia, which is considered as the gold standard for sarcopenia. As it was a costly procedure, concurrent validity was not calculated. Only test-retest reliability was found for the Gujarati translated version of SARC-F. Studies can be done in future to find concurrent validity, other reliability of the Gujarati translated version of SARC-F questionnaire.

### CONCLUSION(S)

The Gujarati translated version of SARC-F suggests good content validity and excellent face validity. This questionnaire can be used to easily screen sarcopenia from the population. It is a quick tool to check the individual having risk of sarcopenia. With increase in age reduced muscle mass can hamper the daily functional abilities and force the person to be bed bound in later stages. Easy screening will be useful in treating the condition and delay the frailty and functional dependency in patients.

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- For any images presented appropriate consent has been obtained from the subjects. NA

#### PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Jun 16, 2022
- Manual Googling: Jul 08, 2022
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