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ORIGINAL ARTICLE

Validity and reliability of Sarcopenia Quality of Life® Indonesia questionnaire in sarcopenic patients

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Abstract

Background: Sarcopenia significantly impairs quality of life (QoL). The Sarcopenia Quality of Life® (SarQol®) questionnaire provides a sarcopenia-specific instrument for the assessment of QoL. The aim of this study was to cross-culturally adapt the SarQol® to an Indonesian language questionnaire and to confirm its validity and reliability as a tool to measure QoL in Indonesian-speaking elderly patients with sarcopenia.

Methods: This cross-sectional study translated and cross-culturally adapted the SarQol® questionnaire, followed by evaluating the psychometric properties of the final cross-culturally adapted SarQol® Indonesia questionnaire.

Results: Fifty-nine elderly Indonesian subjects (29 sarcopenic and 30 nonsarcopenic) with a mean age of 72.2 ± 6.3 years were included in this study. SarQol® Indonesia questionnaire overall provides a good discriminative value [60.61 ± 14.34 vs. 73.60 ± 13.17, $p = 0.001$], good internal consistency (Cronbach's α coefficient = 0.896 and McDonald's ω coefficient = 0.906, both with good correlation to the questionnaire individual domains), acceptable construct validity, and good test–retest reliability (intraclass correlation coefficient: 0.962 [95% confidence interval: 0.883–0.987]).

Conclusions: The SarQol® Indonesia questionnaire provides a conceptual and literally equivalent questionnaire content to its original source with good discriminative value, good internal consistency, acceptable construct validity, and good test–retest reliability. The SarQol® Indonesia questionnaire is ready to be used to measure QoL in Indonesian elderly sarcopenic individuals.

KEYWORDS

cross-cultural adaptation, quality of life, Sarcopenia, SarQol, validation

Key points

- Significant findings of this study: SarQol® Indonesia has a good discriminative value, good internal consistency, acceptable construct validity, and good test–retest reliability.
- What this study adds to the advances in the research field of rheumatology and immunology: SarQol® Indonesia may be used to better evaluate the quality of life of sarcopenic patients in Indonesia. This tool can help clinicians to improve their management of Indonesian sarcopenic patients and also their quality of life.

1 | INTRODUCTION

Sarcopenia is an age-related clinical disorder defined by progressive and generalized loss of skeletal muscle mass accompanied by loss of function (lower muscle strength and/or physical performance). Sarcopenia may be observed in all individuals, including those who are apparently healthy, well-nourished, and physically active individuals, starting at the age of 60 or 65 years, without reference to comorbidity.[1–3] Sarcopenia is a geriatric syndrome that has been linked to several negative outcomes, such as functional disability, increased risk of falls and fractures, increased risk of hospitalization, and death. Thus, sarcopenia remains a major health burden on Indonesia's elderly population.[4,5]

As of 2020, there is currently 26.82 million (9.92%) elderly population (aged 60 years or older) in Indonesia. Furthermore, this number is expected to rise each year until the elderly make up 19.8% of the Indonesian population in 2045.[6,7] According to several studies,[8–10] the prevalence of sarcopenia in Indonesia ranges from 9.1% to 53.0%, with the prevalence of frailty ranging from 17.0% to 36.7%.

Sarcopenia significantly impairs quality of life (QoL). A systematic review and meta-analysis[11] reported lower QoL in sarcopenic subjects based on generic QoL questionnaires, such as 36-Item Short Form Health Survey (SF-36) or EuroQol-5 dimension (EQ-5D) or EuroQol-visual analog scales (EQ-VAS). In SF-36, sarcopenic subjects mainly reported lower physical function[12–15] and general health,[13–15] while other studies[14–16] also reported lower scores in other SF-36 domains. In EQ-5D, sarcopenic subjects reported a lower index score and a higher rate of having problems in EQ-5D individual domains, mainly mobility, self-care, and usual activity.[17,18] Sarcopenic subjects also had a lower EQ-VAS score compared to nonsarcopenic subjects.[18]

Evaluating QoL in sarcopenia may help to monitor treatment efficacy and disease progression as sarcopenia significantly impairs QoL. Furthermore, using disease-specific measurement may result in a better evaluation of QoL. As of now, there is no validated disease-specific tool for sarcopenia QoL measurement in Indonesia. Beaudart et al.[19,20] developed and validated Sarcopenia Quality of Life (SarQoL®, www.sarqol.org), a 22-question self-reported sarcopenia-specific questionnaire. SarQoL® has been translated and validated in several languages,[21–29] showing proof of a valid and reliable questionnaire for measuring QoL in the sarcopenic population.

The purpose of this study was to cross-culturally adapt SarQoL® to an Indonesian language questionnaire and to confirm its validity and reliability as a tool to measure QoL in Indonesian-speaking elderly patients with sarcopenia.

2 | METHODS

2.1 | Study population

Elderly people (aged 60 years and older) who were able to stand without support, either from previous sarcopenia studies or volunteer recruitment, were included for the cross-sectional study from Dr. Cipto Mangunkusumo Hospital, Jakarta, Indonesia, from February 2020 to January 2022. Terwee et al.[30] recommends a minimum sample of 50 sarcopenic and 50 nonsarcopenic patients for questionnaire validation. However, there have been several similar validation studies on SarQol® that used a sample of less than 50, such as in the Dutch SarQol® validation[23] (30 sarcopenic subjects) and Ukranian SarQol® validation[31] (28 sarcopenic subjects). Thus, we deemed a sample size of 30 sarcopenic and 30 nonsarcopenic subjects acceptable for our study.

The exclusion criteria are as follows: immobilization, amputation of one or more limbs, presence of any electronic implant, cognitive impairment, or inability to cooperate/understand/complete the questionnaire, presence of any acute illness, or exacerbation of any of the participant's previous conditions, weight > 100 kg, and history of Parkinson's or other conditions causing tremors. All participants were given information about the objectives and procedures of the study, then the participants signed a written informed consent form. The general variables analyzed include age, gender, educational level, and marital status. Anthropometric parameters (height, weight, body mass, calf, thigh, hip, waist, upper arm circumference) and blood pressure were measured using standard methods by trained examiners.

The protocol for this research (No. 20-02-0191) had received ethical approval from the Ethics Committee of Faculty of Medicine, Universitas Indonesia, with the approval number KET-195/UN2.F1/ETIK/PPM.00.02/2020 on the date February 24, 2020, and has been extended once until February 23, 2022, with the approval number ND-118/UN2.F1/ETIK/PPM.00.02/2021. We have also received consent to conduct our research from Dr. Cipto Mangunkusumo Hospital with the approval number LB.02.01/2.6.1/0292/2021. All participants also voluntarily signed a written informed consent form during recruitment.

2.2 | Assessment of sarcopenia

To diagnose sarcopenia, we used the criteria from the Asian Working Group for Sarcopenia (AWGS).[1] AWGS recommends the presence of both decreased muscle mass and decreased muscle function (either reduced muscle strength or reduced physical performance) for the diagnosis of sarcopenia. Meanwhile, to diagnose severe sarcopenia, there must be decreased muscle mass, reduced muscle strength, and reduced physical performance. For muscle mass assessment, we used bioelectrical impedance analysis (BIA) Tanita MC-780MA. During BIA measurement, participants were asked to stand bare foot, while waiting for the results to be printed. The muscle mass of the four extremities were added up to get appendicular skeletal muscle mass (ASM). Next, the ASM was divided by the square of the patient's height in meters to obtain ASM index (ASMI) value (kg/m^2). Muscle mass was deemed decreased if ASMI < 7.0 kg/m^2 in males and <5.7 kg/m^2 in females. Decreased muscle function was defined as low muscle strength or low physical performance. For muscle strength

assessment, we used the hydraulic hand dynamometer Jamar J00105 (Jamar) to measure the participant's handgrip strength. The handgrip strength was measured while the patient was seated on the dominant hand with the elbow flexed at 90°, the wrist and forearm in a neutral position, shoulder adducted and neutrally rotated. Participants were allowed a total of three tries, with the highest result documented as the patient's handgrip strength. Low muscle strength was defined as handgrip strength <28 kg for males and <18 kg for females. Physical performance was measured with a 6-m walk test. During the 6-m walk test, participants were instructed to walk across a 6-m straight line in their usual walking pace. Low physical performance was defined as a 6-m walk speed <1.0 m/s.

2.3 | Procedure

Cross-cultural adaptation

The SarQol® Indonesia questionnaire consists of 55 items in 22 questions that were divided into seven domains: (1) physical and mental health; (2) locomotion; (3) body composition; (4) functionality; (5) activities of daily living; (6) leisure activities; and (7) fear. Each question is rated on a 3-, 4-, and 5-point Likert scale. The total score ranges from 0 to 100. A lower score meant a lower QoL. The SarQol® Indonesia questionnaire can be viewed in Supporting Information S1: File 1. The cross-cultural adaptation process of SarQol® Indonesia went through five phases as follows[32]:

Initial translations: The original questionnaire was translated from the original language (English) to Indonesian language. This step was conducted by two independent bilingual translators whose first language is the Indonesian language. One of them has a medical background, while the other one is a novice in the medical field. Both translators have provided a written report with comments highlighting all uncertainties or challenging phrases, as well the rationale for choosing a specific language choice.

Synthesis of translations: The two translators then met and compared their translations. Any differences were resolved through a discussion until a consensus was reached to produce a single version of the translation.

Backward translations: The translated questionnaire (Indonesian) was then retranslated into the original language (English) by two independent bilingual translators, both novices in the medical field, whose mother tongue is English. These two translators were unaware of the original version of SarQol.

Expert committee review: An expert committee reviewed and compared the backward translation against the original version of the questionnaire to search for substantial inconsistency, resulting in the prefinal version of the SarQol® Indonesia. This expert committee consisted of two methodologists, one health professional, one English language professional, and four translators (the initial and backward translators).

Prefinal version test: The SarQol® Indonesia questionnaire was pretested in 15 sarcopenic patients to better understand the problem with understanding and answering each question. The feedback from the fifth phase of testing was analyzed by the expert committee to finalize the SarQol® Indonesia questionnaire.

Psychometric validation

1. Discriminative power: The participants were divided into sarcopenic and nonsarcopenic subjects based on the diagnosis criteria mentioned above. The questionnaire should be able to discriminate between the QoL of sarcopenic and nonsarcopenic subjects. We hypothesized that the SarQol® Indonesia score is lower in sarcopenic subjects.
2. Internal consistency: Internal consistency evaluates the homogeneity of the SarQol® Indonesia questionnaire components. Internal consistency was evaluated using Cronbach's α coefficient and McDonald's ω coefficient.[33,34] For both Cronbach's α coefficient and McDonald's coefficient, a value greater ≥0.70 indicates a high level of internal consistency.[35,36] The Cronbach's α coefficient and McDonald's ω coefficient were also assessed when each domain is deleted to show each domain's impact on reliability. Internal consistency was also evaluated by assessing the correlation of the total SarQol® Indonesia score to its individual domain. A correlation above 0.81 is considered excellent, between 0.61 and 0.80 is considered very good, between 0.41 and 0.60 is considered good, between 0.21 and 0.40 is considered acceptable, and below 0.20 is considered insufficient.[37]
3. Construct validity: Investigate the validity of the SarQol® Indonesia questionnaire using the evaluation of convergent and divergent validity. Besides the SarQol® Indonesia questionnaire, sarcopenic subjects were required to complete two other questionnaires, SF-36 and EQ-5D-VAS. SF-36[38] is composed of 36 items measuring eight health-related QoL domains, including physical functioning, role limitation due to physical problems, bodily pain, general health, vitality, social functioning, role limitation due to emotional problems, and mental health, which are scored on a scale from 0 QoL (worst) to 100 QoL (best) in each domain. EQ-5D[39] records self-reported problems in five domains, including mobility, self-care, usual activities, pain/discomfort, and anxiety/depression, which we also converted into a scale from 0 (worst) to 100 (best). EQ-VAS records a self-reported assessment of health status, also scored on a scale of 0 (worst) to 100 (best) health status. Convergent validity evaluates correlations between SarQol® Indonesia and the domains of other questionnaires that, in theory, should be similar. We hypothesized that SarQol® Indonesia would correlate well with several SF-36 domains (physical function, role limitation due to physical problems, bodily pain, general health, and vitality), several EQ-5D domains (mobility, usual activity, and self-care), and EQ-VAS. Divergent validity, on the other hand, evaluates correlations between SarQol® Indonesia and the domain of other questionnaires that, in theory, should be different. We hypothesized that SarQol® Indonesia would either correlate poorly or not correlate with several SF-36 domains (social functioning, role limitation due to

emotional problems, and mental health) and two EQ-5D domains (pain/discomfort, and anxiety/depression). Construct validity is considered acceptable if >75% of the hypotheses are confirmed.[30]

4. Test–retest reliability: To measure the test–retest reliability of the SarQol® Indonesia questionnaire, sarcopenic subjects who did not feel any changes in their general health were asked to fill in the questionnaire a second time in a 2-week interval. We used the intraclass correlation coefficient (ICC) to analyze the reliability between the first and second scores of the overall questionnaire and with each individual domain of the SarQoL® Indonesia. An ICC over 0.7 was considered as acceptable reliability.[30]
5. Floor and ceiling effects: Floor and ceiling effects are defined as a condition when a high percentage of respondents had the lowest or the highest score, respectively. Floor and ceiling effects higher than 15% were considered to be significant. Floor and ceiling effects indicated limited content validity.[30]

2.4 | Statistical analysis

All analyses were performed using IBM SPSS for Windows version 20.0 (IBM Corp.), with a level of significance of $\alpha = 0.05$. The results were considered statistically significant at the 5% critical level ($p < 0.05$). The normality of distribution of quantitative variables was tested with the Shapiro–Wilk test. Normally distributed quantitative variables were reported as mean ± standard deviation. Quantitative variables with nonnormal distribution were reported as median (25th percentile–75th percentile). Qualitative variables were reported as absolute and relative frequencies (%). The discriminative power of SarQol® Indonesia between sarcopenic and nonsarcopenic subjects were tested with an independent sample t test or Mann–Whitney U test for quantitative variables, depending on the distribution of data, and qualitative variables were tested with the χ^2 test. To adjust for potential confounding factors, such as age and body mass index (BMI), a linear regression will be used. For internal consistency, Cronbach's α coefficient and McDonald's coefficient were used. For the correlation test, normally distributed variables were tested with Pearson's correlation coefficient, and nonnormally distributed data were tested with Spearman's correlation coefficients. For test–retest reliability, the ICC was used.

3 | RESULTS

3.1 | Subject Characteristics

A total of 59 elderly subjects aged 60 years or older were included in the analysis, 29 (49%) of whom had sarcopenia. The subjects were recruited from previous sarcopenia studies or volunteer recruitment. Out of the 29 sarcopenic subjects, only 20 subjects filled out all three required questionnaires (SarQol® Indonesia, SF-36, and EQ-5D-VAS), and only 15 subjects responded to the second call for the test–retest analysis. The recruitment and sampling process has been summarized in Figure 1.

The mean age of patients in this study was 72.2 ± 6.3 years. Thirty-six (61%) of the subjects recruited were women. Table 1 shows detailed subject characteristics and analysis of differences based on sarcopenia status.

Sarcopenic subjects tended to be older, have lower BMI, and smaller body circumferences (calf, thigh, hip, waist, and upper arm circumference) compared to nonsarcopenic subjects. Other parameters, including sex and educational degree, did not seem to differ between the two groups. Muscle mass (ASMI) and muscle functional status (handgrip strength, gait speed) tended to be lower in the sarcopenic group. SARC-F, a simple tool for the assessment of sarcopenia, had an overall higher score in sarcopenic subjects. Severe sarcopenic subjects tended to be female, have lower BMI, and lower educational degree. The ASMI, handgrip strength, and gait speed also tended to be lower in severe sarcopenic group compared to nonsevere sarcopenic group. Severe sarcopenic subjects demonstrated higher strength, assistance in walking, rise from a chair, climb stairs, and falls (SARC-F) scores compared to nonsevere sarcopenic subjects.

3.2 | Discriminative power

Sarcopenic subjects had a significantly lower overall SarQol® Indonesia score compared to nonsarcopenic subjects (60.61 ± 14.34 vs. 73.60 ± 13.17, $p = 0.001$). The overall SarQol® Indonesia score remained significantly lower in sarcopenic subjects compared to nonsarcopenic subjects even after adjusting for potential confounding factors such as age and BMI. Sarcopenic subjects also had significantly lower scores in all SarQol® Indonesia individual domains (Table 2). The overall score, D4 functionality, and D5 activities of daily living were also significantly lower in severe sarcopenic subjects compared to nonsevere sarcopenic subjects (Table 3).

3.3 | Internal consistency

Overall, SarQol® Indonesia had a high level of internal consistency (Cronbach's α coefficient: 0.896; McDonald's ω coefficient: 0.906). The internal consistency remained high even with deletion of one domain of SarQol® Indonesia at a time. The Cronbach's α coefficient ranged from 0.864 (without D4 functionality) to 0.912 (without D6 leisure activity), while the McDonald's ω coefficient ranged from 0.874 (without D4 functionality) to 0.918 (without D6 leisure activity) (Table 4). The correlation of each SarQol® Indonesia domain to its overall score shows significantly good to excellent correlations for all domains (Table 5).

3.4 | Construct validity

For convergent validity, the total score of SarQol® Indonesia shows significant positive correlations with some domains of the SF-36 questionnaire: excellent correlation with SF-36 physical functioning ($r = 0.817$, $p < 0.001$), good correlation with SF-36 role limitation due to physical problem

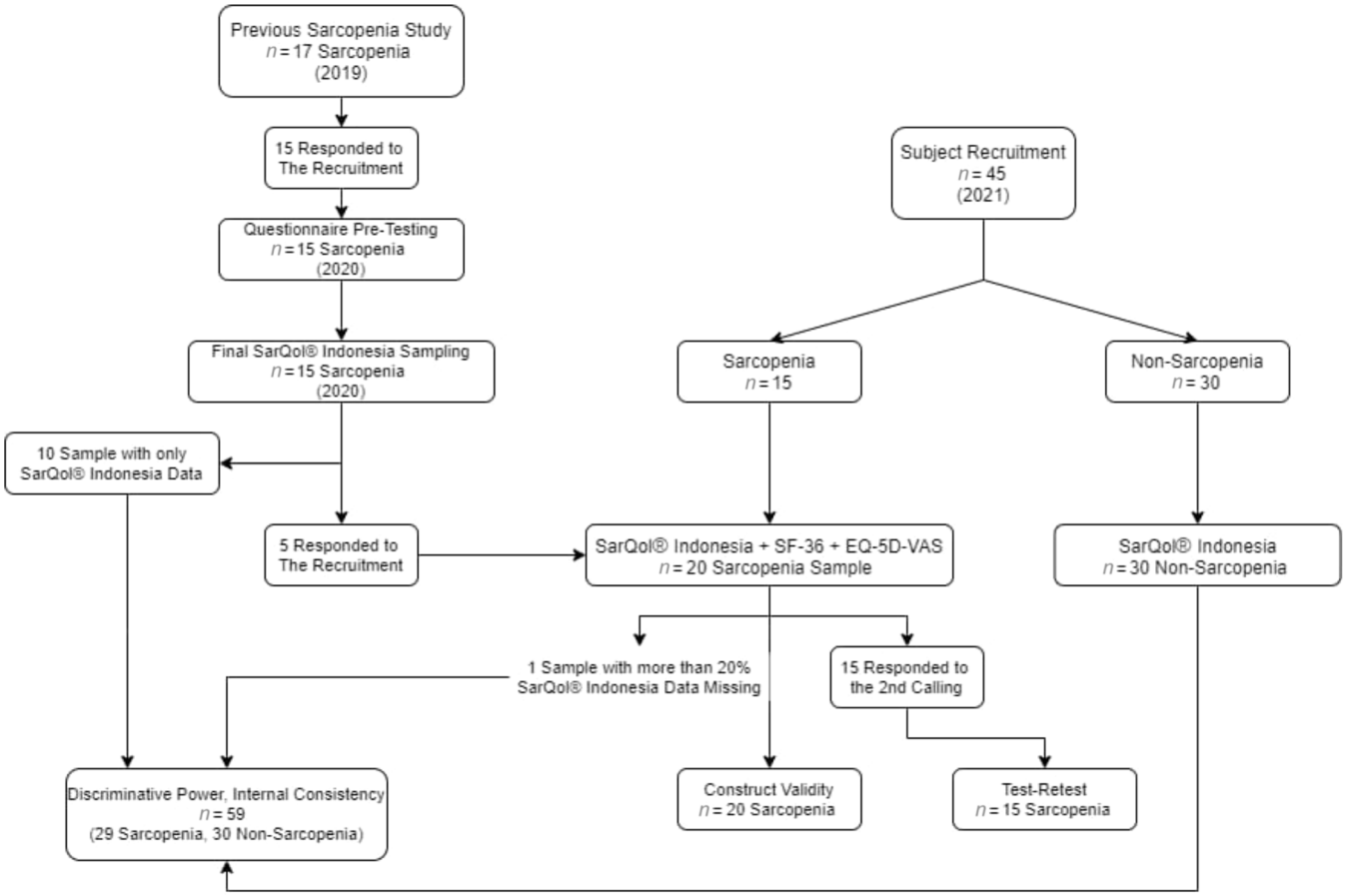

FIGURE 1 Flowchart of the SarQoL® Indonesia questionnaire validation process.

($r = 0.502$, $p = 0.024$), and good correlation with SF-36 general health ($r = 0.584$, $p = 0.007$). The total score of SarQol® Indonesia also shows significant positive correlations to several domains of the EQ-5D questionnaire: very good correlation with EQ-5D mobility ($r = 0.675$, $p = 0.001$), very good correlation with EQ-5D usual activity ($r = 0.655$, $p = 0.002$), and very good correlation to EQ-5D self-care ($r = 0.619$, $p = 0.004$). However, no correlations were found between the total score of SarQol® Indonesia and SF-36 bodily pain ($r = 0.437$, $p = 0.054$), SF-36 vitality ($r = 0.235$, $p = 0.318$), and EQ-VAS ($r = 0.285$, $p = 0.223$).

For divergent validity, no correlations were found between the total score of SarQol® Indonesia and SF-36 social functioning ($r = 0.311$, $p = 0.182$), SF-36 role limitation due to emotional problem ($r = 0.087$, $p = 0.715$), SF-36 mental health ($r = -0.241$, $p = 0.306$), EQ-5D pain/discomfort ($r = 0.332$, $p = 0.153$), and EQ-5D anxiety/depression ($r = 0.069$, $p = 0.773$).

3.5 | Test–retest reliability

As many as 15 sarcopenic subjects, with no change in their general health, responded to our call and completed the SarQol® Indonesia questionnaire a second time in a 2-week interval. The ICC was 0.962 (95% confidence interval [CI]: 0.883–0.987) for the total SarQol® Indonesia score, showing excellent test–retest reliability. All other domains, except D7 fears, also show excellent test–retest reliability. Only D7 fears domain showed a low reliability with an ICC of 0.447 (95% CI: −0.335 to 0.799) (Table 6).

3.6 | Floor and ceiling effects

No subject presented with either the lowest score (0 points) or the highest score (100 points) in the overall SarQol® Indonesia questionnaire score, therefore, neither floor nor ceiling effects were found.

4 | DISCUSSION

SarQol® is currently the only sarcopenia-specific instrument of QoL assessment. As sarcopenia impairs the QoL significantly,[12–18] this disease-specific instrument may provide a better assessment of the patient's condition and disease progression. As Indonesia has an increasing number of elderly population,[6,7] many of whom may have sarcopenia based on the current prevalence,[8–10] the need for a sarcopenia-specific evaluation tool is necessary. This study was conducted to provide a valid and reliable QoL assessment instrument for the Indonesian elderly with sarcopenia. We cross-culturally adapted the SarQol® questionnaire for use in Indonesia and evaluated its validity and reliability.

In contrast to the European country studies,[19,21–24,26] we used AWGS[1] criteria for the diagnosis of Sarcopenia instead of the European Working Group on Sarcopenia

TABLE 1 Characteristics of sarcopenic and nonsarcopenic elderly Indonesian subjects.

Items	Sarcopenia			Nonsarcopenia ($n = 30$)
	All ($n = 29$)	Severe ($n = 18$)	Nonsevere ($n = 11$)	
Age				
All	75.2 ± 6.1	74.7 ± 6.2	76.0 ± 5.9	69.3 ± 5.3
60–69 years	6 (21)	5 (28)	1 (9)	15 (50)
70–79 years	18 (62)	10 (56)	8 (73)	15 (50)
≥80 years	5 (17)	3 (17)	2 (18)	0
Sex				
Female	20 (69)	14 (78)	6 (55)	16 (53)
Male	9 (31)	4 (22)	5 (45)	24 (47)
Education degree				
Elementary	4 (14)	4 (22)	0	0
Middle school	3 (10)	3 (17)	0	3 (10)
High school	6 (21)	3 (17)	3 (27)	13 (43)
University	16 (55)	8 (44)	8 (73)	14 (47)
BMI (kg/m^2)	18.87 ± 2.54	18.44 ± 2.92	19.57 ± 1.64	24.08 ± 4.17
Calf circumference (cm)	31.0 (28.9–34.2)	30.1 (28.4–34.3)	31.7 (30.9–33.3)	36.5 (34.5–39.6)
Thigh circumference (cm)	43.1 ± 6.8	42.1 ± 7.4	44.7 ± 5.8	52.4 ± 7.6
Hip circumference (cm)	87.6 (84.2–95.8)	87.9 (84.3–96.1)	87.6 (80.8–94.3)	99.8 (93.1–108.6)
Waist circumference (cm)	83.8 (75.2–90.6)	85.7 (73.3–89.3)	83.0 (77.0–91.2)	91.8 (86.0–99.6)
Upper arm circumference (cm)	24 (21.6–27.5)	24.0 (20.4–27.4)	24.0 (21.7–28.0)	28.2 (26.8–32.2)
ASMI (kg/m^2)	5.55 ± 0.72	5.38 ± 0.72	5.84 ± 0.67	7.11 ± 0.98
Handgrip strength (kg)	16.0 (12.0–18.0)	13.0 (11.5–16.0)	18.0 (17.0–20.0)	21.0 (17.7–27.6)
Gait speed (m/s)	0.80 ± 0.27	0.68 ± 0.23	1.01 ± 0.21	0.97 ± 0.29
SARC-F score	2 (1–4)	3.5 (1–5)	1 (0–3)	0 (0–3)

Note: Quantitative variables with normal distribution, results are expressed as the mean ± standard deviation. Quantitative parameters with nonnormal distribution, results are expressed as a median (P25–P75). For qualitative variable, results are expressed as *n* (%).

Abbreviations: ASMI, Appendicular Skeletal Muscle Mass Index; BMI, body mass index; SARC-F: strength, assistance in waking, rise from a chair, climb stairs, and falls.

in Older People[40] criteria for better adjustment to our subject racial physique. The same criteria were also used in the Chinese SarQol® validation study.[25] Using AWGS diagnosis criteria, we had 29 sarcopenic and 30 nonsarcopenic subjects included in the analysis. Sarcopenic subjects were older and had lower anthropometric measurements compared to nonsarcopenic subjects. SARC-F, a simple tool for the assessment of sarcopenia, also shows its ability to differentiate between sarcopenic and nonsarcopenic subjects. Some of these findings are consistent with our sarcopenia previous study.[41] On the other hand, the sex and educational degree were similar between sarcopenic and nonsarcopenic subjects.

The cross-cultural adaptation process was completed without significant problems as we followed the guideline strictly. The expert committee review and input from 15 sarcopenia pretest subjects confirm the SarQol® Indonesia final version had the same content as its original English version despite the cross-cultural adaptation.

Sarcopenic subjects show a reduced global QoL compared to nonsarcopenic subjects included in our study based on overall and all seven SarQol® Indonesia domain scores. SarQol® Indonesia was able to discriminate the QoL between sarcopenia and nonsarcopenic subjects. Both SarQol® Indonesia overall score and all seven of its individual domains showed a significant discriminative power.

SarQol® Indonesia had a high internal consistency, demonstrated by Cronbach's α coefficient of 0.896 and McDonald's ω coefficient of 0.906. Deletion of each domain of SarQol® Indonesia also still showed a high internal consistency. The internal consistency for SarQol® Indonesia was also comparable to the internal consistency of previous similar studies (Chinese: 0.87, Dutch: 0.88, English: 0.88, French: 0.87, Greek: 0.96, Hungarian: 0.89, Persian: 0.88, Polish: 0.92, Romanian: 0.95, Russian: 0.92, Spanish: 0.90, Turkish: 0.88).[42] The correlation of SarQol® Indonesia overall score and its individual domain also showed significantly good to excellent correlation in all domains.

TABLE 2 Discriminative power of SarQol® Indonesia.

Items	Sarcopenia ($n = 29$)	Nonsarcopenia ($n = 30$)	p Value
Overall Score†	60.61 ± 14.34	73.60 ± 13.17	0.001*
D1 physical and mental health†	57.48 ± 14.88	71.07 ± 12.09	<0.001*
D2 locomotion†	54.60 ± 17.73	67.97 ± 19.36	0.008*
D3 body composition‡	60.63 ± 13.44	73.74 ± 12.58	<0.001*
D4 functionality‡	71.15 (54.50–81.44)	83.65 (63.60–93.23)	0.016*
D5 activities of daily living‡	57.69 (45.82–74.15)	81.70 (58.75–87.10)	0.001*
D6 leisure activity‡	33.30 (33.25–49.89)	49.89 (33.30–66.50)	0.008*
D7 fears‡	75.00 (62.50–87.50)	100.00 (75.00–100.00)	0.005*

Abbreviations: SarQol®, Sarcopenia Quality of Life®; SD, standard deviation.
*Statistically significant parameters.
†For quantitative variables with normal distribution, results are expressed as the mean ± SD.
‡Quantitative parameters with nonnormal distribution. A nonparametric statistical test was used; results are expressed as a median (P25–P75).

TABLE 3 Discriminative power of SarQol® Indonesia for severe and nonsevere sarcopenia.

Items	Severe sarcopenia ($n = 18$)	Nonsevere sarcopenia ($n = 11$)	p Value
Overall Score†	56.22 ± 15.61	67.82 ± 9.55	0.032*
D1 Physical and Mental Health†	54.11 ± 15.07	63.00 ± 13.43	0.121
D2 Locomotion†	49.70 ± 18.55	62.63 ± 13.46	0.055
D3 Body Composition†	57.17 ± 13.77	66.28 ± 11.25	0.076
D4 Functionality‡	62.85 (49.04–79.37)	75.00 (69.64–86.50)	0.039*
D5 Activities of Daily Living‡	54.17 (40.45–67.4)	68.30 (57.69–78.30)	0.035*
D6 Leisure Activity‡	33.30 (29.09–33.30)	33.30 (33.25–66.50)	0.134
D7 Fears‡	75.00 (62.50–87.50)	75.00 (62.50–87.50)	0.740

Abbreviations: SarQol®, Sarcopenia Quality of Life®; SD, standard deviation.
*Statistically significant parameters.
†For quantitative variables with normal distribution, results are expressed as the mean ± SD.
‡Quantitative parameters with nonnormal distribution. A nonparametric statistical test was used; results are expressed as a median (P25–P75).

TABLE 4 Internal consistency of SarQol® Indonesia domains.

Items	Cronbach's α coefficient	McDonald's ω coefficient
SarQol® Indonesia questionnaire	0.896	0.906
	Cronbach's α coefficient if domain deleted	McDonald's ω coefficient if domain deleted
D1 physical and mental health	0.869	0.882
D2 locomotion	0.865	0.873
D3 body composition	0.886	0.895
D4 functionality	0.864	0.874
D5 activities of daily living	0.870	0.881
D6 leisure activity	0.912	0.918
D7 fears	0.893	0.903

Abbreviation: SarQol®, Sarcopenia Quality of Life®.

TABLE 5 Correlation of overall score and domains of SarQol® Indonesia.

Items	*r*	*p* Value
D1 physical and mental health	0.841	<0.001*
D2 locomotion	0.893	<0.001*
D3 body composition	0.715	<0.001*
D4 functionality	0.917	<0.001*
D5 activities of daily living	0.914	<0.001*
D6 leisure activity	0.527	<0.001*
D7 fears	0.643	<0.001*

Abbreviation: SarQol®, Sarcopenia Quality of Life®.
*Statistically significant parameters.

TABLE 6 Test–retest reliability of SarQol® Indonesia.

Items	ICC	95% CI
Total score	0.962	0.883–0.987
D1 physical and mental health	0.775	0.272–0.927
D2 locomotion	0.937	0.818–0.979
D3 body composition	0.735	0.187–0.912
D4 functionality	0.968	0.905–0.989
D5 activities of daily living	0.916	0.751–0.972
D6 leisure activity	0.736	0.199–0.912
D7 fears	0.447	−0.335 to 0.799

Abbreviations: CI, confidence interval; ICC, intraclass correlation coefficient; SarQol®, Sarcopenia Quality of Life®.

Regarding convergent construct validity, we found strong positive correlations between overall SarQol® Indonesia score to SF-36 physical function, SF-36 role limitation due to physical problem, SF-36 general health, EQ-5D mobility, EQ-5D usual activity, and EQ-5D self-care. However, no correlations were found between the overall SarQol® Indonesia score to SF-36 bodily pain, SF-36 vitality, and EQ-VAS. Despite other validation studies[21–23,25,26,29] including EQ-5D self-care in convergent validity, we hypothesized that EQ-5D self-care theoretically should correlate well with SarQol® Indonesia based on several studies that showed lower self-care ability in sarcopenic subjects.[17,18] On the other hand, for divergent construct validity, no correlations were found in all the hypothesized parameters (SF-36 social functioning, SF-36 role limitation due to emotional problems, SF-36 mental health, EQ-5D pain/discomfort, and EQ-5D anxiety/depression). Since 11 out of 14 hypotheses were confirmed in this study, we conclude that SarQol® Indonesia has an acceptable construct validity. However, the overall construct validity analysis results may have reduced validity due to a small sample size.[30]

For SarQol® Indonesia reliability, a test–retest reliability analysis was conducted on 15 eligible sarcopenic subjects who completed the questionnaire two times in a 2-week interval. Our study reported an ICC of 0.962 (95% CI: 0.883–0.987) which indicated a high test–retest reliability. Test–retest reliability analyses were also conducted for each SarQol® Indonesia individual domain. All SarQol® Indonesia domain shows acceptable to high test–retest reliability, except D7 fears. For domain 7 "fears," the test–retest reliability was also reported to be low in several previous validation studies.[19,23,26] This result can also be explained by the low number of question items in this particular domain.

The limitation of this study was that we were only able to recruit 29 sarcopenic subjects instead of our aim of 30 sarcopenic subjects. This was mostly caused by the difficulty of subject recruitment due to the high number of COVID-19 pandemic cases in Indonesia. Despite our limited sample size, the results of our study were still significant and managed to prove that SarQol® Indonesia has a satisfactory validity and reliability. Furthermore, there have been several previous studies with a smaller number of sarcopenic subjects compared to our study, such as in the Ukrainian SarQol® validation[31] (28 sarcopenic subjects), English SarQol® validation[21] (14 sarcopenic subjects), and Romanian SarQol® validation[22] (13 sarcopenic subjects). All of these studies have managed to produce satisfactory results and proved the validity of SarQol® despite the small sample size. Another limitation of this study was that we did not perform an exploratory factor analysis. We decided not to conduct the analysis since the original SarQol® study did not perform an exploratory factor analysis, and thus decided to focus more on the cross-cultural adaptation of the original SarQol® for use in Indonesia.

Our study is the second SarQol® validation study in Asia, following China. The results of this study proved that SarQol® can also be used as a valid instrument for measuring sarcopenia QoL in the Asian population. This study also used BIA for measuring the muscle mass component of sarcopenia diagnosis, ensuring an accurate diagnosis based on the AWGS sarcopenia diagnosis criteria.[1]

5 | CONCLUSION

The SarQol® Indonesia questionnaire provides a conceptual and literally equivalent questionnaire content to its original source with good discriminative value, good internal consistency, acceptable construct validity, and good test–retest reliability. The SarQol® Indonesia questionnaire is now available and ready to be used to measure QoL in Indonesia's elderly sarcopenic individuals.

AUTHOR CONTRIBUTIONS

All authors have made substantial contributions in designing the methodology, statistical analysis, and interpretation of the data for this work. All authors have also participated in drafting the article and have approved the final version for submission. All authors also agree to be accountable for all aspects of this work.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Any unpublished data can be requested via email to the corresponding author.

ETHICS STATEMENT

We have received ethical approval from the Ethics Committee of Faculty of Medicine, Universitas Indonesia, with the approval number KET-195/UN2.F1/ETIK/PPM.00.02/2020 on the date February 24, 2020, and has been extended once until February 23, 2022, with the approval number ND-118/UN2.F1/ETIK/PPM.00.02/2021. All participants also voluntarily signed a written informed consent form during recruitment.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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