## RESEARCH



# The quality of life and related factors in older adults with possible sarcopenia and sarcopenia in rural areas of Xinjiang, China: a cross sectional study

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## Abstract

**Background** Studies have shown that sarcopenia prevalence in the Chinese population aged over 60 years was 14%. The quality of life of older adults with sarcopenia has drawn increasing attention. Sarcopenia-related quality of life has not been well studied. We explored the quality of life of patients with sarcopenia and the related influencing factors in Xinjiang.

**Methods** This study was conducted from July–September 2023 in the northern and southern regions of Xinjiang, China. Possible sarcopenia and sarcopenia were diagnosed according to the AWGS 2019. The Sarqol® questionnaire was used to evaluate quality of life. A linear regression model with a stepwise method was used to identify quality-of-life-associated factors for possible sarcopenia and sarcopenia.

**Results** A total of 987 older adults were enrolled,18.5% had possible sarcopenia, and 15.1% had sarcopenia. Quality of life scores: possible sarcopenia 26.46–92.55 (56.31 ± 14.69), sarcopenia 30.74–90.93 (56.91 ± 13.45). The indicators for which the difference analysis were meaningful, in the group with possible sarcopenia are gender, inhabiting information, ACCI score, hearing loss, social support level and self-rated risk of falling. In the sarcopenia group are gender, ACCI score, hearing loss, vision loss, self-rated health status, number of remaining teeth, self-rated risk for falling, and dysphagia status. The risk factors for quality of life in patients with possible sarcopenia were gender and hearing loss, whereas self-rated of general health, self-rated of poor health, self-rated of very poor health and falls were risk factors in the sarcopenia group.

**Conclusion** This study focused on quality of life and factors in older adults with possible sarcopenia or sarcopenia. The research results showed that in order to prevent the decline in the quality of life of older adults with sarcopenia, it is very important to regularly examine the oral health status of the older adults, prevent the occurrence of chronic

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diseases.Multimodal interventions address common sensory impairments.Carry out aging-friendly renovation of the home environment and conduct balance training to prevent the occurrence of falls among the older adults.

Keywords Possible sarcopenia, Sarcopenia, Sarqol questionnaire, Quality of life

## Background

Sarcopenia is a major geriatric syndrome characterized by a reduction in muscle mass, loss of muscle strength, and/or reduced physical performance [1]. According to the Asian Working Group for Sarcopenia 2019 (AWGS 2019), the diagnostic outcome of sarcopenia can be categorized as possible sarcopenia, sarcopenia, or severe sarcopenia. One meta-analysis showed [2] that the prevalence of sarcopenia in the Chinese population aged 60 years was 14%, with a greater likelihood of this condition in females than in males. The occurrence of possible sarcopenia and sarcopenia was associated with numerous adverse outcomes, such as falls, disability, and severe life-threatening conditions [3]. One study suggested that people with possible sarcopenia have multiple chronic diseases, limb dysfunction, and a significantly increased risk of death [4]. One longitudinal cohort study involving 2982 older adults reported that older adults with sarcopenia had a greater risk of cognitive impairment than did those with possible sarcopenia or no sarcopenia [5]. Moreover, sarcopenia was associated with the development of multiple chronic diseases, including type 2 diabetes [6], respiratory diseases [7], and cardiovascular diseases [8]. A recent study of multiple comorbidities of sarcopenia suggested higher rates of hospitalization in patients with comorbidities, which severely reduces the quality of life of sarcopenia patients, even leading to death [9]. The occurrence of possible sarcopenia and sarcopenia severely impair the physical function of the older adults, leading to a decline in their quality of life and affecting their ability to achieve healthy aging [10]. Therefore, there is an urgent need to determine the current situation of the quality of life of elderly people with possible sarcopenia and that of elderly people with sarcopenia, so as to improve the health status of the elderly.

In recent years, the quality of life of older adults with possible sarcopenia and sarcopenia have attracted increasing attention. A meta-analysis revealed that, compared with older adults without sarcopenia, those with sarcopenia have lower quality of life scores. Compared with older adults with sarcopenia living in communities, those living in care facilities have greater differences in quality of life [11]. Research on the quality of life of older adults with sarcopenia in mainland China has focused mainly on older adults with sarcopenia who have other comorbidities [12]. Only a few studies have specifically focused on older adults with possible sarcopenia. However, both of possible sarcopenia and sarcopenia can progress to severe sarcopenia. Therefore, early attention to these two stages is helpful for early detection and diagnosis, and can delay the occurrence and development of possible sarcopenia and sarcopenia. It can improve the quality of life of older adults [13].

In Xinjiang, limited research has been conducted on the quality of life related to sarcopenia [14]. Xinjiang is located in northwestern China, at the heart of the Eurasian continent. This region is divided into two parts, with the customary division being the region south of the Tianshan Mountains, which is southern area of Xinjiang, and northern area of Xinjiang. North Xinjiang has a temperate continental arid and semiarid climate, whereas southern Xinjiang has a temperate continental climate [15]. The two regions differ significantly in terms of natural conditions, resource endowments, economic development, social governance, and population structure, especially in terms of the rate of aging [16]. Xinjiang has a multiethnic population of approximately 20 million [17]. Owing to the unique geographical conditions and population composition, the aging process is different in Xinjiang. Therefore, the primary objectives of this study were to understand the quality of life of older adults with possible sarcopenia and sarcopenia in the northern and southern regions of Xinjiang.

With progressive advancements in sarcopenia-related quality of life (QoL) research, scholars have developed the Sarcopenia and Quality of Life (SarQoL®) questionnaire [11], a disease-specific instrument tailored to assess QoL impairments directly attributable to sarcopenia. In contrast to generic multidimensional tools such as the 36-item Short-Form Health Survey (SF-36) and Euro-Qol Five Dimensions Questionnaire (EQ-5D). The Sar-QoL<sup>®</sup> focuses on sarcopenia-related physical challenges and psychosocial impacts. This specialized design makes it more precise for clinical use, supported by validation studies showing its reliability across diverse cultures and populations [11]. The questionnaire comprises 22 questions, including 55 items with 7 domains. This questionnaire has been translated into 35 languages. The internal consistency of the scale is 0.87, which indicates good retest reliability [18].

Research on the quality of life of older adults with possible sarcopenia or sarcopenia is still relatively limited. Our study utilized the SarQoL<sup>\*</sup> questionnaire to assess the quality of life of older adults with possible sarcopenia and sarcopenia in rural areas of Xinjiang. It also explored the factors influencing the quality of life at these two stages. The findings from this questionnaire offer valuable insights and serve as a reference for potential future policy adjustments and shifts in public health focus.

This study presents a research hypothesis that the quality of life in patients with possible sarcopenia and sarcopenia is not optimal. The quality of life is affected by physiological, psychological and other factors. These factors also interact with each other and together affect quality of life.

## Methods

## **Study participants**

The present study was conducted from July to September 2023 in the northern and southern regions of Xinjiang, China. This study employed a multistage stratified random cluster sampling method for research participant selection. Stratified sampling was conducted based on the basis of the administrative division of Xinjiang, China. Ultimately, older adults aged 60 years or above from six villages in Yining County, Yili Kazakh Autonomous Prefecture, and six villages in Shache County, Kashgar Prefecture, were selected as research participants. We initially screened 1,018 participants. Yining County contributed 481 participants.Shache County contributed 537 participants. Twenty-one participants from Shache County and 10 participants from Yining County did not complete the questionnaire or physical measurement. Eventually, a total of 987 older adults were included.

## Sociodemographic characteristics

The characteristics of the participants with possible sarcopenia and sarcopenia included gender, age, individual monthly income, marital status, inhabitation information, education level, hearing loss, vision loss, self-rated health, and residual number of teeth.

## Assessment of possible sarcopenia and sarcopenia status

Possible sarcopenia and sarcopenia were diagnosed according to the revised AWGS definition in 2019 [1]. For the assessment of calf circumference, participants had to be in a seated position with their feet on the floor, with the hip and knee flexed at 90° to keep the calf perpendicular to the floor level. One examiner selected the nondominant leg of the participant and used a measuring tape to tightly encircle the thickest part of the calf in a horizontal position and read the number on the tape. Readings were taken in centimeters, with accuracy to one decimal place and a measurement error of <0.5 cm. The diagnostic cutoff values were <34 cm for males and <33 cm for females.

Muscle mass was measured via bioelectrical impedance analysis(Donghuayuan DBA-210, Jilin, China). The skeletal muscle mass index was measured in terms of appendicular skeletal muscle mass (ASM) per height in square meters (ASM/m<sup>2</sup>). The diagnostic cutoff values for men were <7.0 kg/m<sup>2</sup>, and those for women were <5.7 kg/m<sup>2</sup>. Muscle strength was measured via a grip strength meter (China Xiangshan CAMRY EH101). The dominant hand was used to grasp the handle of the maximum force grip strength meter, and three repeated measurements were taken at intervals of 25 s. The highest value obtained from these trials was recorded as the statistical analysis index. The diagnostic cutoff values were <28 kg for men and <18 kg for women. The function of muscles was measured by 6-m gait speed. This test was repeated thrice, and the fastest trial was selected for statistical analysis. The diagnostic cut-off value for sarcopenia was set at <1.0 m/s.

### Assessment of quality of life in sarcopenia patients

The quality of life of sarcopenia patients was estimated via the Sarcopenia Quality of Life (SarQoL<sup>\*</sup>) questionnaire. The questionnaire was developed by Professor Charlotte Reaudart et al. in 2015 [19], comprises 22 questions with a Likert four-point scale and includes seven dimensions: "Physical and Mental Health," "Locomotion," "Body Composition," "Functionality," "Activities of Daily Living," "Leisure activities," and "Fears" [20]. By contacting the professor Charlotte Reaudart, we obtained the calculation method of the quality of life score.

## Assessment of comorbidity status

The Age-adjusted Charlson Comorbidity Index (ACCI) was used to assess comorbidities in older adults [21]. This questionnaire was adjusted for patient age according to the Charlson Comorbidity Index (CCI). The CCI was developed by Charlson et al. in 1987 [22]. It is a quantitative questionnaire that assesses the impact of chronic disease comorbidities on the health of patients. On the basis of the degree of impact each disease has on patient prognosis, a score ranging from 1 to 6 is assigned to the comorbidity burden of the patient. The CCI score of a patient is the sum of the scores for all diseases. The higher the score is, the more severe the comorbidity burden and the poorer the prognosis. The ACCI considers the patient's age, assigning 1 point for the age range of 50-59. For every additional 10 years of age, the score increases by 1 point. According to this ACCI scoring system, the severity of comorbidity can be classified into three grades: mild (1-2 points), moderate (3-4 points), and severe ( $\geq 5$  points) [21].

## Assessment of social support

Social support was assessed via the social support scale developed by Professor Xiao Shuiyuan in 1994. This scale comprises three dimensions and ten items: objective support (three items), subjective support (four items), and utilization of support (three items). The total score for social support was calculated as the sum of the scores of all the items, and the maximum possible score was 66. A score  $\leq 22$  indicates a low level of social support, a score of 23–44 indicates a medium level of social support, and a score of 45–66 indicates a high level of social support [23].

## Assessment of risk of falls

In 2011, the Centers for Disease Control and Prevention developed a universal Fall Risk Self-Assessment Scale for Older Adults as a tool for screening public health promotion and education [24]. This assessment scale has been extensively used in the United States and Malaysia; studies have confirmed its high clinical consistency in yielding accurate assessment results [25]. Moreover, researcher Qingqing Su from Soochow University, China, translated this scale and culturally adapted it in 2018 [26].

## Assessment of dysphagia function

The Eating Assessment Tool-10 (EAT-10), a dysphagia screening scale developed by Belafsky et al. in 2008, comprises 10 items that assess various symptoms, including clinical features, psychological aspects, and social impacts in relation to dysphagia. Each item is categorized into five levels according to severity: 0 (none), 1 (mild), 2 (moderate), 3 (severe), and 4 (very severe). Upon summing the scores of these ten items, a total score  $\geq$  3 indicates potential issues related to swallowing ability and safety [27].

## Assessment of cognitive function

The Mini-Mental State Examination (MMSE) [28] comprises 12 items. These items are classified into six dimensions: orientation, memory, attention and calculation, recall ability, verbal ability, and executive function. Each correct answer is awarded 1 point, whereas incorrect or unknown answers receive 0 points. The range of the overall score on this scale is from 0 to 30, and higher scores indicate better cognitive functioning.

## Statistical analysis

All the data were analyzed by the SPSS software V 23.0 package (IBM Corp., Armonk, NY, USA) and Stata version 14.1 (StataCorp LP, 1985–2015). First, all the data were statistically described. For normally distributed data, we expressed continuous variables as means with standard deviations, whereas for skewed data, we described them as medians with interquartile ranges (IQRs). Using the Kolmogorov–Smirnov test to analyze the normality of data distributions. For categorical variables, we reported them as numbers (percentages). When comparing two groups, we applied Student's t test or the Mann–Whitney U test for continuous variables, depending on normality, and the chi-squared test for categorical variables. We converted categorical variables into dummy

variables and calculated variance inflation factors (VIF) to assess multicollinearity among predictors. To ensure model robustness, we systematically excluded variables with a VIF  $\geq$  5. Then employed multivariate linear regression models to quantify the associations between quality of life outcomes and their determinants in sarcopenia patients, reporting parameter estimates alongside 95% confidence intervals. Statistical significance was set at *P* < 0.05.

## Results

## **Characteristics of participants**

A total of 987 older adults aged 60 years and above were included in this study. The mean age was 68.6 years, and male sex was predominant (52.7% [n=520]). The study population's selection process and characteristics has shown in Fig. 1 and Table 1.

## The prevalence of possible sarcopenia and sarcopenia

Among the 987 participants, 183 (18.5%) had possible sarcopenia, whereas 149 (15.1%) had sarcopenia.

## The quality of life of patients with possible sarcopenia or sarcopenia

As shown in Table 2.In the group with possible sarcopenia, the total score of quality of life was ranged from 26.46 to 92.55 ( $56.31 \pm 14.69$ ). In the sarcopenia group, the total score of quality of life was ranged from 30.74 to 90.93 ( $56.91 \pm 13.45$ ).There was significant difference between the possible sarcopenia group and the sarcopenia group in terms of the locomotion.The total quality of life score and the remaining six dimensions are meaningless.

## Cross-sectional associations between variables and quality of life

Comparisons were made between different variables and quality of life in patients with possible sarcopenia or sarcopenia. In the possible sarcopenia group, gender, inhabiting information, ACCI score, hearing loss, social support level and self-rated risk of falling differed significantly (P < 0.05). In the sarcopenia group, gender, ACCI score, hearing loss, vision loss, self-rated health status, number of remaining teeth, self-rated risk for falling, and dysphagia status were significantly different(P < 0.05) (Table 3).

## Multivariate analysis of factors related to the quality of life of individuals with possible sarcopenia or sarcopenia

The indicators showing significance in the univariate analysis were then selected for linear regression analysis. For the regression analysis of the possible sarcopenia group, the variables included gender, living with spouse, living with children, hearing loss, the ACCI score, and self-rated risk of falling. The variables included in the



Fig. 1 Flowchart of participants in this study

Variables		Non-sarcopenia(n=655)	Possible sarcopenia(n=183)	Sarcopenia(n = 149)
Gender				
	Female	285(43.51)	111(60.66)	71(47.65)
	Male	370(56.49)	72(39.34)	78(52.35)
Age years				
	60–69	415(63.36)	105(57.38)	58(38.93)
	70–79	209(31.91)	65(35.52)	67(44.97)
	>80	31(4.73)	13(7.10)	24(16.10)
Monthly income				
	<2000 Yuan	583(89.01)	175(95.63)	141(94.63)
	2000 Yuan and above	72(10.99)	8(4.37)	8(5.37)
Marital status				
	Married	510(77.86)	137(74.86)	104(69.80)
	Divorce	2(0.31)	3(1.64)	5(3.36)
	Widowed	143(21.83)	43(23.50)	40(26.84)
Inhabiting information				
	Living alone	36(5.50)	13(7.10)	6(4.03)
	Live with spouse	174(26.56)	40(21.86)	28(18.79)
	Live with children and spouse	282(43.05)	71(38.80)	56(37.58)
	Live with children	163(24.89)	59(32.24)	59(39.60)
Education level				
	Illiteracy	215(32.82)	52(28.42)	46(30.87)
	Primary school	314(47.94)	101(55.19)	80(53.69)
	Junior high school	126(19.24)	30(16.39)	23(15.44)
Hearing loss				
	Yes	389(59.39)	84(45.90)	52(34.90)
	No	266(40.61)	99(54.10)	97(65.10)
Vision loss				
	Yes	319(48.70)	87(47.54)	53(35.57)
	No	336(51.30)	96(52.46)	96(64.43)
Self-rated health				
	Good	269(41.07)	64(34.97)	37(24.83)
	General	187(28.55)	54(29.51)	54(36.24)
	Poor	164(25.04)	59(32.24)	43(28.86)
	Very poor	35(5.34)	6(3.28)	15(10.07)
Residual number of teeth				
	≤10 teeth	262(40.00)	107(58.47)	96(64.43)
	11–20 teeth	200(30.53)	53(28.96)	37(24.83)
	>21teeth	193(29.47)	23(12.57)	16(10.74)

## **Table 1** Baseline characteristics of participants (n = 987)

Values are presented as number (%) for categorical variables

Table 7 ( omparison duality of life scores between possible sarcopenia and sarcoper	
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Variables	Possible sarcopenia	Sarcopenia	t/U	<i>p</i> -value
Total score	56.31±14.69	56.91±13.45	-0.389	0.697
Physical and mental health	$57.82 \pm 16.86$	$60.01 \pm 16.80$	-1.183	0.238
Locomotion	$52.00 \pm 17.12$	$55.35 \pm 11.54$	-2.708*	0.007
Body composition	61.58±15.23	$59.55 \pm 14.57$	1.236	0.217
Functionality	$66.50 \pm 19.16$	$67.02 \pm 19.07$	-0.249	0.804
Activities of daily living	49.23±24.77	$47.53 \pm 25.56$	0.611	0.542
Leisure activities	29.71±16.29	$32.80 \pm 19.61$	-1.572	0.117
Fears	$72.06 \pm 17.21$	$71.81 \pm 15.04$	-0.372*	0.710

Values are presented as mean ± standard error for continuous variables.\* Data variances were not uniform and U test was used

## Table 3 Basic characteristics of participants according to the quality of life of possible sarcopenia and sarcopenia

Variable		Possible sarcopenia	Sarcopenia
Gender			
	Male	61.81±15.99	60.16±13.73
	Female	52.74±12.63	53.35±12.27
	t/Z	-3.822	3.178
	<i>p</i> -value	0.000	0.002
Age (years)			
	60–69	$58.56 \pm 15.30$	59.48±12.49
	70–79	53.43±14.02	54.78±12.80
	>80	52.43±9.48	56.67±16.63
	F	0.955	1.933
	<i>p</i> -value	0.530	0.148
Monthly income			
	<2000 Yuan	56.24±14.82	57.03±13.39
	2000 Yuan and above	57.77±12.25	54.87±15.36
	t	-0.288	0.440
	p-value	0.774	0.660
Marital status	F		
	Married	57.28±14.63	57.38±12.80
	Divorce	58.81 + 29.95	54.40 + 20.33
	Widowed	53.02 + 13.59	56 01 + 14 46
	F	1 429	0.237
	n-value	0.242	0.790
Inhabiting information	p talae	0.2.12	0., 20
in delting memorialen	Living alone	52 12 + 12 09	6667+651
	Live with spouse	60.99 + 16.61	5845+1245
	Live with children and spouse	57 29 + 14 31	58 32 + 13 05
	Live with children	52.86 + 13.49	53.86 + 14.21
	F	2 995	2 460
	n-value	0.032	0.065
Education level	p value	0.052	0.005
Education level	Illiteracy	54 63 + 14 94	5781+1200
	Primary school	57.87 + 15.11	56 83 + 13 94
		53.95 + 12.46	$55.05 \pm 15.91$
	F	1 301	0.242
	n-value	0.275	0.785
Hearing loss	p value	0.275	0.705
	Yes	5996+1482	60 78 + 12 33
	No	53 21 + 13 92	54 84 + 13 63
	t	3 174	2618
	n-value	0.002	0.010
Vision loss	p value	0.002	0.010
101011033	Voc	57 54 + 15 32	61 10 + 13 78
	No	55 10 + 14 08	54.60 ± 12.76
	t	1 080	2 803
	n-value	0.281	0.004
Self-rated health	p value	0.201	0.004
Sen face field	Good	59 15 + 13 74	6745+1148
	Conoral	56.68 + 16.14	$57.40 \pm 12.41$
	Poor	$50.00 \pm 10.14$ 53 07 + 1/ 39	50 82 ± 11 05
	Very poor	45 56 + 2 04	J0.05 ± 11.05 //6.07 ± 0.70
	F	7 591	TU.27 ± 2.72
	-value	0.055	0.000
Residual number of teeth	p value	0.055	0.000
nesidua namber or teeth			

## Table 3 (continued)

Variable		Possible sarcopenia	Sarcopenia
	≤ 10 teeth	54.53±13.83	54.68±13.15
	11–20 teeth	58.65 ± 14.73	$60.20 \pm 13.17$
	>21teeth	59.16±17.71	62.72±13.41
	F/H	3.149	4.084
	<i>p</i> -value	0.207	0.019
ACCI			
	Moderate	57.93±15.31	59.15±12.43
	Poor	53.49±13.19	$53.69 \pm 14.29$
	t	1.983	2.477
	<i>p</i> -value	0.049	0.014
Social support			
	Good	48.94±9.69	61.24±8.20
	Medium	54.94±15.31	$56.32 \pm 13.75$
	Poor	59.73 ± 12.95	58.76±12.75
	F/H	6.021	0.544
	<i>p</i> -value	0.049	0.581
Fall			
	Yes	59.87±14.71	66.71±11.23
	No	53.21 ± 14.03	51.18±11.17
	t	3.132	8.170
	<i>p</i> -value	0.002	0.000
EAT-10			
	Dysphagia	56.75±14.38	$58.84 \pm 13.49$
	Normal	53.96±16.30	$49.27 \pm 10.34$
	t	0.937	3.622
	<i>p</i> -value	0.350	0.000
Cognitive disorder			
	Yes	57.48±14.26	$56.84 \pm 12.48$
	No	54.57±15.23	$56.99 \pm 14.45$
	t	1.318	-0.065
	<i>p</i> -value	0.189	0.949

Values are presented as mean ± standard error for continuous variables

regression analysis for the sarcopenia group were gender, hearing loss, vision loss, self-rated of general health, self-rated of poor health, self-rated of very poor health, remaining teeth at 11–20, remaining teeth is greater than 20, the ACCI score, self-rated risk of falling, and the EAT-10 score.

Linear regression analysis was performed to examine the relevant factors, and the outcomes are presented in Figs. 2 and 3. The regression analysis equation for possible sarcopenia presented an R<sup>2</sup> value of 0.179 and a Durbin–Watson statistic of 1.893. Notably, gender ( $\beta$  = -8.208, *P*<0.001), and hearing loss ( $\beta$  = -5.406, *P*<0.05) emerged as factors influencing the quality of life of this study's population sample.

The linear equation analysis yielded an  $R^2$  value of 0.472 for the sarcopenia group, and the Durbin–Watson statistic was 1.697, suggesting that self-rated of general health ( $\beta$ =-7.512, *P*<0.001), self-rated of poor health ( $\beta$ =-10.797, *P*<0.001), self-rated of very poor health ( $\beta$ =-13.327, *P*<0.001) and falls ( $\beta$ =-10.146, *P*<0.001)

emerged as factors influencing the quality of life of this study's population sample. The results are presented in Table 4*and* Table 5.

The results of the sensitivity analysis showed that there was no difference in the regression analysis results of the group with possible sarcopenia. However, for the sarcopenia group, in the regression analysis, having 11 to 20 remaining teeth was an influencing factor.

## Discussion

According to the results of this study.Comparing the total scores of Sarqol<sup>®</sup> and the scores of each dimension between the possible sarcopenia group and the sarcopenia group, there were differences in the locomotion dimension. The differential analysis showed that there were differences in gender, ACCI and hearing loss between the two groups. There were differences in inhabiting information, social support, and self-rated risk of falling in the possible sarcopenia group.In the sarcopenia group, there were difference between vision loss,



Fig. 2 Linear regression analysis of factors affecting quality of life in older people with possible sarcopenia



Fig. 3 Linear regression analysis of factors affecting quality of life in older people with sarcopenia

self-rated health status, number of remaining teeth, selfrated risk for falling, and dysphagia status.In the linear regression analysis, gender and hearing loss were identified as risk factors among possible sarcopenia group and sarcopenia group.In sarcopenia group, self-rated health was identified as risk factor. This study showed that the total score of the quality of life of the older adults in the possible sarcopenia group was  $56.31 \pm 14.69$ , and the total score of the quality of life of the older adults in the sarcopenia group was  $56.91 \pm 13.45$ . There was a difference in the locomotion dimension between the two groups. Sarcopenia is

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Variable	В	β	t	<i>P</i> value	95%CI	VIF
Gender	-8.208	-0.274	-3.790	0.000	-12.4833.934	1.118
Living with spouse	2.657	0.075	1.013	0.313	-2.521-7.834	1.174
Living with children	0.064	0.002	0.027	0.979	-4.677-4.804	1.259
Hearing loss	-5.406	-0.184	-2.537	0.012	-9.6111.201	1.126
ACCI	-2.562	-0.084	-1.213	0.227	-6.730-1.606	1.034
Self-rated risk of falling	-3.821	-0.130	-1.789	0.075	-8.037-0.394	1.134

Table 4 Associated factors of quality of life for possible sarcopenia

VIF: variance inflation factors

Table 5 Associated factors of quality of life for sarcopenia

Variable	В	β	t	P value	95%Cl	VIF
Gender	-3.326	-0.124	-1.894	0.060	-6.798-0.146	1.109
Hearing loss	0.731	0.026	0.353	0.725	-3.368-4.831	1.409
Vision loss	-1.826	-0.065	-0.907	0.366	-5.804-2.153	1.338
Self-rated of general health	-7.512	-0.269	-3.328	0.001	-11.9753.049	1.698
Self-rated of poor health	-10.797	-0.365	-4.241	0.000	-15.8315.763	1.920
Self-rated of very poor health	-13.627	-0.306	-4.047	0.000	-20.2856.969	1.481
Remaining teeth at 11–20	3.905	0.126	1.935	0.055	-0.086-7.896	1.097
Remaining teeth is greater than 20.	2.137	0.049	0.753	0.453	-3.474-7.748	1.114
ACCI	-1.271	-0.047	-0.716	0.475	-4.782-2.239	1.099
Self-rated risk of falling	-10.146	-0.365	-4.994	0.000	-14.1646.129	1.387
EAT-10	-1.643	-0.049	-0.714	0.476	-6.194-2.907	1.228

VIF: variance inflation factors

considered to be the main factor contributing to many adverse health outcomes. Compared with other studies, the quality of life score of the possible sarcopenia group was higher, while the quality of life score of the sarcopenia group was lower [29, 30]. Some studies have shown that the association between possible sarcopenia and all-cause mortality persists during a 9-year follow-up period, and was significantly associated with a higher risk of developing diseases such as heart disease and stroke, leading to a decrease in individual functional independence [31]. In another study with a one-year followup period, it was found that there was an association between sarcopenia and an increased risk of hospitalization [32]. Comparing with patients with possible sarcopenia, patients with sarcopenia have a gradual decline in muscle function, resulting in a decrease in their mobility and an increasing reliance on assistive devices for movement [33]. At the same time, skeletal muscle is not only a part of the motor system, but also an endocrine organ [34]. Sarcopenia can also cause changes in the emotions and cognition of the older adult, and is significantly associated with a higher risk of depression and a decline in cognitive ability [35, 36]. Thus, it seriously affects the quality of life.

Our study demonstrated that in the sarcopenia group, the oral status of older adults and dysphagia were the risk factors affecting their quality of life. With age, oral health tends to deteriorate, and tooth loss is a common health issue among middle-aged and older adults. Previous research has indicated that the number of natural teeth was closely associated with chewing ability and nutritional intake in older adults [37]. Furthermore, older adults with fewer than 20 natural teeth are at greater risk of sarcopenia, even severe sarcopenia [38]. Sarcopenia is associated with a decrease in the muscle mass related to swallowing, leading to the atrophy of the tongue muscles, a reduction in tongue pressure and mouth-opening force, which gives rise to dysphagia [39-41]. This condition causes malnutrition in the older adult and deteriorates the quality of life of senior citizens with sarcopenia. A systematic review by Pragati Kaurani et al. demonstrated a significant correlation of tooth loss with dietary intake, which consequently affects the nutritional status of older adults; tooth loss also influences cholesterol intake [42]. The number of remaining teeth and normal function, as well as grip strength, are positively correlated in older adults [43], which significantly impacts the quality of life of this population [44]. Timely improvement in the oral health status of older adults with sarcopenia, as well as addressing the aforementioned oral health issues, can effectively enhance nutritional status and improve overall quality of life.

In our study, the presence of comorbidities negatively impacted the quality of life of older adults with possible sarcopenia. Previous studies have consistently demonstrated a negative correlation between comorbidities and quality of life, further underscoring their synergistic effect with attitudes toward aging in increasing the risk of falls and subsequently reducing overall well-being [45]. Specifically, cardiovascular diseases such as hypertension, atrial fibrillation, and stroke among older adults have been shown to significantly influence quality of life [46]. A Japanese cohort study involving 1,211 adults revealed the associations of several baseline comorbidities with an accelerated decline in patients' quality of life over the subsequent 12 months [47]. Comorbidity status further served as reliable predictors for future functional impairment in older adults. Furthermore, this association between comorbidities and functional changes strengthens over time [48].

There were differences in quality of life scores between the possible sarcopenia group when comparing those with and without hearing impairment. Additionally, quality of life scores in the sarcopenia group showed differences when comparing individuals with and without hearing or visual impairments. These findings align with previous research [49, 50]. Studies indicated that [51], comparing with single sensory impairment, combined sensory impairment has a more significant negative impact on patients' daily living activities, social functioning, and mobility, exerting a greater cumulative negative effect on quality of life. This cumulative negative impact may also contribute to sarcopenia development [52].

The results of one previous meta-analysis [53] demonstrated that older adults with sarcopenia have an elevated risk of falls and fractures. The present study illustrates that falls significantly impact the quality of life of older adults with sarcopenia. There is a direct correlation between the likelihood of falls and a decline in quality of life. Falls among older adults can lead to severe adverse consequences, such as reduced mobility, increased susceptibility to fall-related pneumonia, lower extremity venous thrombosis, and increased hospitalization rates. Once an older adult experiences a fall, they develop a fear of falling, which subsequently reduces their engagement in physical exercise as a preventive measure against future falls [54]. Nonetheless, even if fractures resulting from falls heal successfully, older adults often struggle to regain their previous level of physiological functioning fully [55]. With age, individuals become more susceptible to osteoporosis and other complications resulting from the loss of bone mass. A greater risk of various adverse outcomes is noted in older adults with sarcopenia, following a fall due to decreased muscle mass, which, in turn, affects the amount of muscle mass surrounding the skeleton and consequently affects their quality of life. Thus, it is crucial to prevent falls among older adults with sarcopenia to reduce the likelihood of adverse outcomes and prevent further deterioration in their quality of life.

In this study, we utilized the Sarqol<sup>®</sup> questionnaire as an assessment tool to evaluate the quality of life among older adults with sarcopenia on the basis of the AWGS2019 criteria. The participants were categorized into two groups: the possible sarcopenia group and the sarcopenia group. We used linear regression equations to identify factors affecting their respective quality of life. However, these factors were not identical between the two groups. We also found several limitations in this study. Firstly, the sample of rural older adults selected in this study may have selection bias, and it is not possible to fully cover all older adults with different characteristics, living environments and health status.Therefore, the extrapolation of the results to the wider older adults should be cautious, and the generalizability is limited to a certain extent.Secondly, the average age of the participants in this study was 68.6 years, which may have affected the results in a large number of relatively younger participants.

### Conclusions

This study focused on quality of life and its associated factors influencing possible sarcopenia or sarcopenia. The significance of this study is primarily the necessity of emphasizing oral health status, comorbidities, sensory impairment and fall-related factors that influence quality of life. In older adults with possible sarcopenia and sarcopenia health management.Firstly, regular oral health examinations and disease treatment ensure basic physiological functions, followed by standardized restoration of missing teeth to maintain masticatory function. Comprehensive chronic disease prevention strategies (e.g., diabetes, cardiovascular disease management) reduce systemic health risks. Multimodal interventions address common sensory impairments (vision/hearing abnormalities). Carry out aging-friendly renovation of the home environment and conduct balance training to prevent the occurrence of falls among the older adults.Additionally, future studies should focus on managing possible sarcopenia by implementing exercise training for older adults and promoting changes in dietary behavior as effective measures to halt disease progression while enhancing the quality of life of older adults.

#### Abbreviations

Age-adjusted Charlson Comorbidity Index ACCI ASM Appendicular skeletal muscle mass AWGS Asia Working Group of Sarcopenia Charlson Comorbidity Index FAT-10 Eating Assessment Tool-10 EQ-5D EuroQol Five Dimensions Questionnaire Interguartile ranges IORs MMSE Mini-Mental State Examination SarQoL® Sarcopenia Quality of Life SF-36 36-item Short-Form VIF Variance inflation factors

## Author contributions

Che YJ: Conceptualization, Methodology, Formal analysis, Writing-original draft. Xia HL: Conceptualization, Writing-original draft. Zhang N, Yu S, Guo KY: Methodology, Formal analysis. Tang Y: Writing-review&editing. Sun M: Project administration, Supervision. Yan P: Conceptualization, Funding acquisition, Project administration, Supervision.

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#### Data availability

The data supporting the findings of this study are included in the supplementary materials.

## Declarations

#### Study supervision

All the authors approved the final article.

#### **Conflict of interest**

All the authors declare that they have no conflicts of interest to declare.

#### Ethics approval and consent to participate

The study was conducted according to the ethical standards of the Declaration of Helsinki; all procedures were approved by the Institutional Review Board (IRB number: XJYKDXR20220725029) of Xinjiang Medical University, China. Written informed consent was obtained from all participants.

#### **Consent for publication**

Not applicable.

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