Associations Between Family Functioning, Social Support, and Sarcopenia Among Community-Dwelling Older Adults in China: A Cross-Sectional Study

by

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Defense Date: March 28, 2024

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Thesis submitted in partial fulfillment of the requirements for
the degree of Master of Science in the Department of
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ABSTRACT

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Abstract

Introduction

Sarcopenia, an age-associated disorder characterized by the loss of skeletal muscle mass and function, is becoming increasingly prevalent among older adults in China. High levels of family and social support have been reported to be associated with enhanced health outcomes among the elderly. However, the evidence regarding the protective impact of these factors on sarcopenia remains limited and controversial. Furthermore, only a limited number of studies have examined the prevalence of possible sarcopenia in China. The current study aimed to (1) estimate the prevalence of possible sarcopenia, (2) evaluate the perceived family functioning and social support, and (3) examine the associations between family functioning, social support, and sarcopenia.

Methods

Cross-sectional data from 624 community-dwelling older participants aged 60 years and older in Suzhou, China were collected via structured interviews. Possible sarcopenias were defined in accordance with the criteria of the 2019 Asian Working Group for Sarcopenia. Family functioning was assessed using six positive items from the McMaster Family Assessment Device – General Functioning Subscale (GF6+). Social support was evaluated based on the Social Support Rating Scale (SSRS). Univariable and multivariable logistic regression was conducted to examine the association between family functioning, social support, and sarcopenia.

Results

The prevalence of possible sarcopenia was 10.58%. Females with sarcopenia were more likely to report depression ($P<0.05$). The mean scores of GF6+ and the total scores were 1.36 ± 0.61 and 32.96 ± 8.47, respectively. Female participants exhibited higher mean scores for GF6+ ($P<0.05$) and higher total scores for SSRS compared to male participants ($P<0.05$). No statistically significant associations between family functioning, social support, and sarcopenia were detected.

Conclusion

Our study revealed sex differences in the perception of family functioning and social support among Chinese older adults. However, we did not find statistically significant associations between family functioning, social support, and sarcopenia. More research should be conducted in this novel field to facilitate the early screening and prevention of sarcopenia in China.

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1. Introduction

The world is experiencing an aging demographic trend. Nearly every country is undergoing an increase in both the number and proportion of elderly within their populations, and the pace of increase is accelerating. By 2050, an estimated 2.1 billion of the world's population will be aged 60 and above, with approximately two-thirds residing in low- and middle-income countries [1]. The global trend of aging poses a public health threat particularly especially in developing countries such as China, due to the growing burden of non-communicable diseases and pressure on health systems associated with aging. China, with the worlds largest aging population, is a notable example of this trend. In China, 254 million people were aged 60 years or older in 2019. The number is projected to rise to 402 million by 2040, constituting about 28% of the population [2]. Such a dramatic demographic transition presents multifaceted public health challenges. For instance, in 2019, about 2 in 3 older adults in China were afflicted with at least one noncommunicable disease such as hypertension and diabetes [3]. In recent years, China has been pursuing innovative strategies to establish a community-based and aging-friendly health care system with enhanced access to integrated care and the main focus is on the control and prevention of chronic diseases.

As individuals grow older, there is a yearly decline in skeletal muscle mass ranging from approximately 0.1% to 0.5% beginning at age 30. After reaching the age of 65, this decline accelerates dramatically, accompanied by a simultaneous decrease in strength [4]. The skeletal muscle disorder that occurs with aging, characterized by the loss of skeletal muscle mass and function, is known as sarcopenia. It can lead to adverse health consequences [5, 6]. Falls and fractures are two major health outcomes of sarcopenia. For example, research found that men and women with sarcopenia were about 4 and 2 times more likely to fall compared to those without sarcopenia [7]. Sarcopenia is also associated with a variety of comorbidities, including osteoporosis, obesity, osteopenia, and type II diabetes [7]. In addition, sarcopenia can lead to weakness and a decline in independence in daily activities as it diminishes normal functions such as walking and physiologic decrements including reduced metabolic rate and maximal oxygen intake [8, 9]. The adverse health outcomes, comorbidities, and loss of independence and productivity related to sarcopenia among older adults would consequently lead to higher hospitalization, nursing home admission, disability, and mortality, posing significant public health challenges. These consequences directly result in elevated costs for individuals, society, and healthcare systems. In terms of the economic consequences of sarcopenia at the country level, a study in the United States indicated that estimated direct healthcare costs associated with sarcopenia were 18.5 billion dollars in 2000, comprising around 1.5% of the country's total healthcare expenditures [10]. If the sarcopenia prevalence could be reduced by 10%, 1.1 billion dollars in US healthcare expenditures would be saved each year.

Today, sarcopenia has become a global health issue with high prevalence due to population aging [11]. The estimated global prevalence of sarcopenia in individuals aged ≥ 60 years is between 10% and 27%, depending on the classification and cut-off point used [12]. The estimated prevalence of sarcopenia in the Asian population and Chinese community-dwelling people ranges from 5.5 to 25.7%, and 11 % to 14%, respectively [13, 14].

There are a variety of guidelines for sarcopenia classification. The European Working Group on Sarcopenia in Older Adults (EWGSOP) [15], the International Working Group on Sarcopenia (IWGS) [16], the Foundation for the National Institutes of Health (FNIH) Sarcopenia Project, and the Asian Working Group for Sarcopenia (AWGS) [14] are four validated assessment tools that are commonly used across the globe [17]. These assessment tools diagnose sarcopenia based on low muscle mass and muscle strength, and/or impaired physical function. In Asia, the AWGS diagnostic criteria were widely acknowledged and used. The AWGS 2019 guideline presents the latest edition of recommendations issued by the AWGS. The AWGS 2019 guideline is tailored to the Asian population and differs slightly from the other guidelines such as the EWGSOP 2018 in terms of diagnostic strategies. For instance, the EWGSOP 2018 emphasizes muscle strength as the primary indicator [15]. However, in the AWGS 2019, the reduction in muscle strength is considered a consequence of reduced muscle mass rather than a criterion for diagnosing sarcopenia. Instead, it incorporates low muscle strength together with low physical function as criteria for assessing severe sarcopenia. An analysis comparing different screening tools for sarcopenia revealed that the AWGS 2019 is more appropriate and accurate for diagnosing sarcopenia in the older Chinese population [18].

Moreover, the AWGS 2019 separates the algorithms for community and hospital settings for the first time [14]. It proposes the concept of “possible sarcopenia”, defined as either low muscle strength or low physical performance only. This definition can be used in primary healthcare or community health promotion contexts. It can facilitate early lifestyle interventions in diet and exercise lifestyle interventions regardless of the clinical diagnosis. In hospital settings, sarcopenia is defined as either low muscle strength or low physical performance, and low skeletal muscle mass as well.

The investigation into possible sarcopenia is particularly meaningful because it can provide valuable insights and evidence on the early identification, prevention, and management of sarcopenia. This has been neglected as no previous public health campaigns set reducing sarcopenia as the direct goal [7]. However, only a few research have investigated the presence of possible sarcopenia in the Chinese older population, especially in community settings. Two of them focused on the general settings. Both Wu et al. (2021) and Chen, Ho, and Chau (2022) focused on the general older population ≥ 60 years and used data from the China Health and Retirement Longitudinal Study (CHARLS), a nationally representative survey [19, 20]. Based on different waves, Wu et al. (2021) and Chen, Ho, and Chau (2022) reported the prevalence of possible sarcopenia to be 38.5% and 46.0%. The prevalence seems to be much lower in community-dwelling adults. According to the cross-sectional study by Wang et al. (2022), the prevalence of possible sarcopenia among community-dwelling old adults in Tianjin was 11.11%. However, all the above studies suggested a higher prevalence in females. This potential sex disparity in possible sarcopenia is opposite to that regarding sarcopenia, as a majority of prior studies in China and other countries in Eastern Asia reported a higher prevalence of sarcopenia in males than females [13, 21-24]. The distribution of possible sarcopenia and the sex differences in community settings in China need to be further investigated.

Research on the protective and risk factors for sarcopenia can benefit the control, prevention, and management of sarcopenia. Several risk factors for sarcopenia have been identified by previous researchers, including inadequate nutrition intake, inactivity, and pre-existing diseases [6]. The perceived interpersonal support might be associated with sarcopenia. In general, interpersonal support plays a critical role in maintaining the physical and mental well-being of older adults [24]. Family support and social support are two primary sources of interpersonal support. Those with high levels of family and social support are likely to have lower mortality, reduced risk of mental problems, better chronic disease outcomes, and improved life satisfaction and quality of life [25, 26].

The evidence on perceived interpersonal support and risk of sarcopenia remains scanty and controversial. In terms of family support and sarcopenia, Hai et al. (2017) conducted a cross-sectional study among community-dwelling Chinese elderly and found that sarcopenia had significantly lower family function scores [27]. On the contrary, another case-control study in patients undergoing transcatheter aortic valve implantation reported no association between family support and possible sarcopenia [28]. The findings on the relationship between social support and sarcopenia are controversial as well. To date, there have been three relevant studies and they all focused on community settings. A cross-sectional study and a cohort study were conducted among Chinese older adults and both studies suggested that social support was a protective factor for sarcopenia [29, 30]. In contrast, the study by Simsek et al. (2019) in Turkey did not detect such a relationship [31]. In addition, no current study has explored the role of sex in the above relationships, though prior research indicated that sex might moderate the association between family and friend support and self-reported physical health [32].

The interpersonal support received by older people in China exhibits remarkably unique patterns. In traditional Chinese culture that is deeply rooted in Confucian concepts, filial piety has been regarded as the paramount virtue, and grown children are expected to live and support their aging parents [33, 34]. Collectivism and mutual support and help between family members are important elements of a functional Chinese family. Such tradition is still highly valued in contemporary China. For example, a survey in 2014 revealed that about 40% of the elderly preferred to be looked after by their offspring [34]. In addition, 70% of them expected to age in their own homes rather than nursing homes. Therefore, family support is a primary and important source of social support for older adults in China. However, family size has been shrinking in the past decades, primarily due to the one-child policy. Additionally, younger generations are less likely to live with their parents due to their busy working schedules, varied lifestyles, and migration, especially in urban cities. As a result, the number of empty-nest elderly who live alone or only with their spouses continues to grow. In 2020, an estimated number of 118 million Chinese elderly were empty-nest, which consisted of half of the elderly population.

Although a significant number of community-based organizations and centers for the elderly have been established in China to provide help and support for empty-nest elderly, these institutions are unlikely to fully substitute for the comprehensive support traditionally provided by their families. A well-functioning family plays an essential and irreplaceable role in the daily lives and overall health of the elderly in Chinese culture. According to the research by Shen and Yeatts (2013), the anticipated future support from family members continues to be a significant predictor of life satisfaction among older Chinese adults even with the inclusion of community-based support variables when modeling [35]. Therefore, the weakened and inadequate family care and support received by Chinese older people might negatively affect their health status and can be a trigger for sarcopenia. This suggests that a high level of perceived family functioning may serve as a protective factor. While it cannot completely substitute for family support, social support from friends, colleagues, and communities, etc. still plays a significant role in the well-being Chinese elderly and can be a potential protective factor for sarcopenia [36]. However, as shown previously, there is only limited evidence on the association between family and social support and sarcopenia in China. There is a need for future research to confirm the reproducibility of the previous findings.

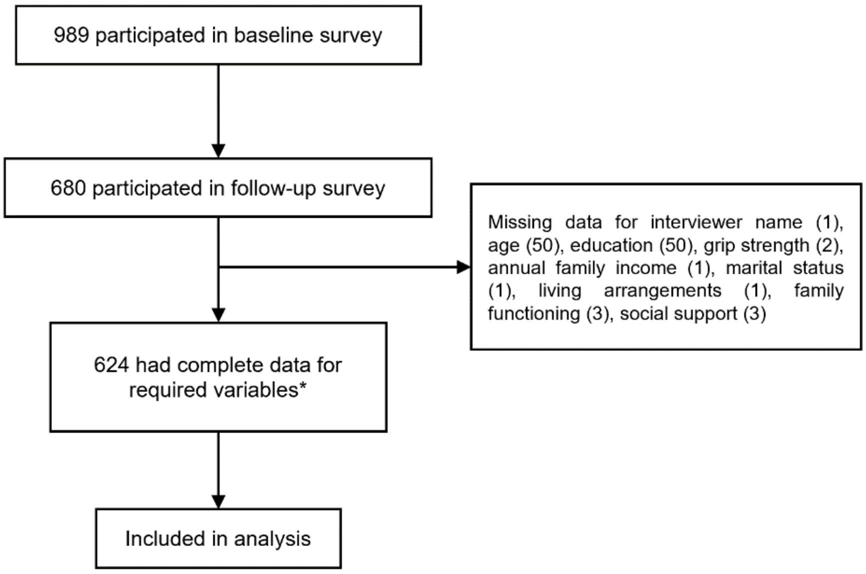
To better understand the correlates of sarcopenia and facilitate early prevention, we carried out a cross-sectional survey among community-dwelling older adults aged 60 years and above. The study aimed to (1) estimate the prevalence of possible sarcopenia, (2) evaluate the perceived family functioning and social support, and (3) examine the associations between family functioning, social support, and sarcopenia. In addition, we also explored the sex differences in the above research aims. We hypothesized that good family functioning and social support could reduce the risk of sarcopenia, and the protective effects might be higher in females.

2. Methods

2.1. Study Population

Data of the current study were derived from the Cohort Study of Comprehensive Intervention for Sarcopenia in Suzhou City, Jiangsu Province. This cohort study aims to (1) establish a sarcopenia demonstration area in Suzhou; (2) develop a sarcopenia risk prediction model suitable for elderly Chinese, along with diagnosis, intervention, and evaluation techniques; (3) initiate training programs for health management specialists in sarcopenia; (4) promote sarcopenia screening and assessment in the management of chronic diseases among the elderly. The research protocol was approved by the Institutional Review Boards of the West China Hospital of Sichuan University and Suzhou Municipal Hospital.

Figure 1 illustrates the sampling procedure of the study. The baseline study was conducted from June to July 2022 among all community-dwelling older adults who participated in the annual physical exam for the elderly at a community health center in Suzhou. The inclusion criteria were: (1) aged 50 years and above, (2) residing in the local community for over 36 months, and (3) willing to participate in the study. Individuals were excluded if having at least one of the following conditions: (1) a terminal disease and a life expectancy of less than six months, (2) a significant disability or mental disorder, (3) prolonged immobility, and (4) inability to participate in the study. In total, 989 respondents initially participated in the baseline survey. The follow-up study conducted in June and May 2023 was participated by 680 baseline respondents, with a follow-up rate of 68.76%. Among the 680 participants, 59 were excluded because of having at least one missing data for variables required for the analysis. A final sample of 624 community-dwelling older adults was used for the analysis.



* Required variables include age, gender, annual family income, educational level, marital status, living arrangements, cognitive impairment, depression, anxiety, grip strength, calf circumference, family functioning, social support, and interviewer name

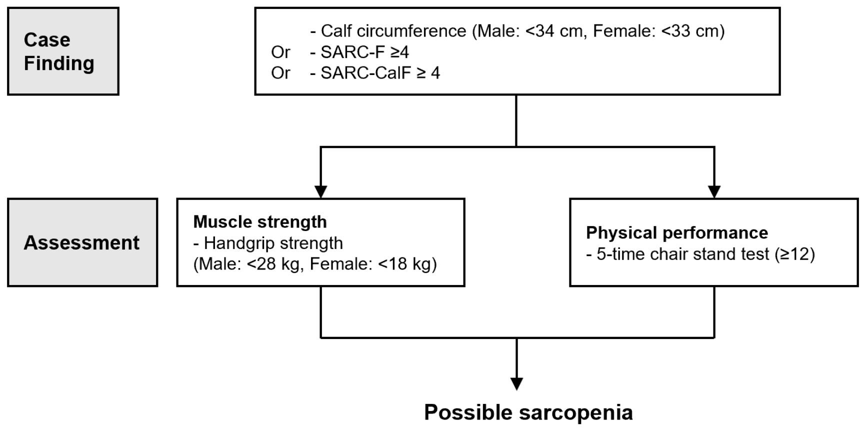
Figure 1. Sampling flow chart

2.2. Data collection

Data were collected from face-to-face structured interviews and physical assessments performed by graduate students and faculty from Duke Kunshan University. They had professional knowledge of global health research and received professional training before the study began. In addition, written informed consent was obtained from all participants before data collection.

2.3. Assessment of sarcopenia

This study applied the 2019 consensus of the Asia Working Group on Sarcopenia (AWGS) for the screening of sarcopenia among follow-up respondents [14]. It provides updated recommendations for the diagnosis, prevention, and treatment of sarcopenia, particularly within Asian populations. In particular, we used the AWGS 2019 diagnostic algorithm for primary health care or community preventative service settings as illustrated in Figure 2. This algorithm helps identify possible sarcopenia that requires early lifestyle intervention through diet and exercise, defined as either low muscle strength or low physical performance. It has been used to detect possible sarcopenia among the older Chinese population in previous research [19, 20, 37].



Possible sarcopenia is defined as either low muscle strength or low physical performance. In our study, we first found cases by calf circumference, and then assessed muscle strength by handgrip strength.

Figure 2. The 2019 algorithm for identifying possible sarcopenia

In our study, possible sarcopenia was defined as low muscle strength. We first found cases according to calf circumference and then assessed muscle strength based on handgrip strength following the AWGS 2019 [14]. Males were considered as having possible sarcopenia if they had a calf circumference of <34 cm and a handgrip strength of <28 kg. For females, possible sarcopenia was detected with a calf circumference of <33 cm and a handgrip strength of <18 kg. The handgrip strength was measured using a handheld dynamometer. Two measurements were conducted separately for each hand. The maximum value recorded from four measures was then used in the subsequent analyses.

2.4. Assessment of family functioning and social support

Family functioning refers to the overall capacity and effectiveness of a family in communication, distribution of responsibilities, fulfillment of its members' needs, and resilience in navigating stressors [38]. We assessed family functioning using the McMaster Family Assessment Device – General Functioning Subscale (FAD-GF) [39]. It evaluates the overall level of family functioning using six positive and negative items, respectively. Specifically, our study used GF6+, a shorter version containing 6 positive items from FAD-GF, to save time and reduce responder fatigue [40]. A mean score >2 indicates problematic family functioning. The GF6+ demonstrates nearly equivalent measurement qualities in identifying healthy or unhealthy family functioning levels as the full GF12+. In addition, the Chinese version of GF6+ was tested among Chinese older adults and demonstrated good validity [41].

Social support is defined as the perception of care, assistance, and encouragement from one's social network, which may comprise friends, family, peers, and the broader community. We measure social support by the Social Support Rating Scale (SSRS) [42].

It was developed originally in Chinese to evaluate the level of social support in various social settings. It contains 10 items in three dimensions, namely subjective support, objective support, and support utilization. The total score of SSRS by adding up all three dimensions ranges from 12 to 66. Prior studies divide the total score into three categories: low (12-23), medium (23-44), and high levels of social support (45-66) [43, 44]. The SSRS suits the Chinese population and has been commonly used among the Chinese elderly with good validity and reliability [42, 45].

2.5. Covariates

Information on socio-demographics and health status were also included in the analysis. Birth year, annual family income, educational level, marital status, and living arrangements were collected in the baseline study in 2022. Cognitive impairment, depression, and anxiety were collected in the follow-up study in 2023.

Cognitive impairment was assessed by the Short Portable Mental Status Questionnaire (SPMSQ) [46]. Cognitive impairment was detected if more than one wrong answer was given by participants. One more error was allowed if participants only had middle school education; two more errors were allowed if participants only had primary school education or less. Depression was measured by the 9-item Patient Health Questionnaire (PHQ-9), a valid scale of depression severity [47]. A total score of ≥5 indicates depression. Anxiety was evaluated by the 7-item Generalized Anxiety Disorder (GAD-7) [48]. It is a valid diagnostic instrument for anxiety with a cut-off point of ≥5.

2.6. Statistical Analysis

We performed all statistical analyses in Stata 17. Continuous variables were presented as mean ± standard deviation. Categorical variables were presented as percentages. T-tests and chi-square tests were performed to examine the difference between the sarcopenia group and the non-sarcopenia group for continuous and categorical variables, respectively. The sex differences in family functioning and social support were examined as well. Univariable and multivariable logistic regression models were built to assess the associations between family functioning, social support, and sarcopenia. In multivariable models, age, annual family income, educational level, marital status, living arrangements, cognitive impairment, depression, anxiety, and interviewer's name were controlled as potential confounders. All analyses were stratified by sex. A two-sided $P<0.05$ was considered as statistically significant.

3. Results

3.1. Characteristics of the study population

Table 1. Characteristics of the study population by sex and sarcopenia status

	Males (n = 279)			Female (n = 345)		
	Sarcopenia n = 26	Non-sarcopenia n = 253	*P*	Sarcopenia n = 40	Non-sarcopenia N = 305	*P*
Age, years, mean (SD)	76.38 (6.49)	72.83 (4.70)	<0.001	76.48 (6.30)	72.29 (4.47)	<0.001
Education, n (%)						
Less than primary	2 (7.69)	21 (8.30)	0.492	12 (30.00)	87 (28.52)	0.802
Primary school	9 (34.62)	58 (22.92)		12 (30.00)	74 (24.26)	
Middle school	7 (26.92)	101 (39.92)		12 (30.00)	102 (33.44)	
High school and above	8 (30.77)	73 (28.85)		4 (10.00)	42 (13.77)	
Marital status, n (%)						
Married	23 (88.46)	242 (95.65)	0.110	30 (75.00)	258 (81.31)	0.343
Divorced/widowed/unmarried	3 (11.54)	11 (4.35)		10 (25.00)	57 (18.69)	
Annual family income, n (%)						
<30,000	1 (3.85)	13 (5.14)	0.716	4 (10.00)	32 (10.49)	0.683
30,000-80,000	15 (57.69)	116 (45.85)		18 (45.00)	156 (51.15)	
>80,000	8 (30.77)	102 (40.32)		12 (30.00)	89 (29.18)	
unknown	2 (7.69)	22 (8.70)		6 (15.00)	28 (9.18)	
Living arrangements, n (%)						
With family	23 (88.46)	242 (95.65)	0.110	34 (85.00)	273 (89.51)	0.392
Alone	3 (11.54)	11 (4.35)		6 (15.00)	32 (10.49)	
Cognitive impairment, n (%)	1 (3.85)	11 (4.35)	0.904	7 (17.50)	25 (8.20)	0.057
Depression, n (%)	4 (16.00)	32 (12.70)	0.640	15 (37.50)	60 (19.67)	0.010
Anxiety, n (%)	1 (4.00)	15 (5.95)	0.690	3 (7.50)	36 (11.80)	0.419
Family functioning						
GF6 + mean scores, mean (SD)	1.33 (0.52)	1.29 (0.51)	0.697	1.39 (0.60)	1.41 (0.69)	0.823
Problematic	6 (23.08)	38 (15.02)	0.283	8 (20.00)	62 (20.33)	0.961
Normal	20 (76.92)	215 (84.98)		32 (80.00)	243 (79.67)	
Social support						
SSRS total scores, mean (SD)	32.54 (8.22)	32.05 (7.93)	0.782	31.43 (8.17)	33.91 (8.86)	0.059
Low	1 (4.55)	29 (13.49)	0.448	6 (17.14)	30 (11.11)	0.515
Medium	20 (90.91)	173 (80.47)		26 (74.29)	207 (76.67)	
High	1 (4.55)	13 (6.05)		3 (8.57)	33 (12.22)	

T-tests were used for continuous variables. Chi-square tests were used for categorical variables.

Data from 624 participants were used for the analysis, including 279 (44.71%) males and 345 (55.29%) females. Table 1 demonstrates the characteristics of the study population by sex and sarcopenia status. The mean age was 73.16 ± 4.99 in males and 72.77 ± 4.90 in females, respectively. Among 624 participants, 66 (10.58%) were classified as having possible sarcopenia. Compared to males, females had a slightly higher prevalence of possible sarcopenia (11.59% vs. 9.32%), though the difference was not statistically significant. In both sex groups, participants with sarcopenia had a higher age (P<0.05). Additionally, females with sarcopenia were more likely to report depression (P<0.05).

3.2. Family functioning and social support

Table 2. Perceived family functioning and social support of the study population by sex

	All participants (n = 624)	**Males (n = 279)**	**Females (n = 345)**	***P***
Family functioning				
GF6+ mean scores, mean (SD)	1.36 (0.61)	1.29 (0.51)	1.41 (0.68)	0.021
Problematic	114 (18.27)	44 (15.77)	70 (20.29)	0.146
Normal	510 (81.73)	235 (84.23)	275 (79.71)	
Social support				
SSRS total scores, mean (SD)	32.96 (8.47)	32.10 (7.94)	33.62 (8.81)	0.037
Low	66 (12.18)	30 (12.66)	36 (11.8)	0.063
Medium	426 (78.60)	193 (81.43)	233 (76.39)	
High	50 (9.23)	14 (5.91)	36 (11.80)	

T-tests were used for continuous variables. Chi-square tests were used for categorical variables. In the analysis of social support, 82 participants (42 males and 40 females) were excluded due to measurement errors caused by one interviewer. Higher mean scores of GF6+ indicate a lower level of family functioning (range 1-4; >2 indicates problematic family functioning), while higher SSRS total scores indicate a higher level of social support (range 12-66; 12-22 indicates low level, 23-44 indicates medium level, 45-66 indicates high level). 42 males and 40 females were excluded from the analysis of social support due to the measurement error caused by one interviewer.

Table 2 shows the scores and status of participants' perceived functioning and social support by different sexes. The mean scores of GF6+ and the total scores among all older adults were 1.36 ± 0.61 and 32.96 ± 8.47, respectively. Compared to males, females tended to have higher mean scores of GF6+ (P<0.05). However, there was no significant difference in the categorical data. According to the GF6+ screening criteria, among all participants, 114 (18.27%) had problematic family functioning, while 510 (81.73%) had normal family functioning. Similarly, the SSRS total scores among female participants were higher than males (P<0.05), though no significant difference was detected. According to the SSRS scoring criteria, among all participants, 66 (12.18%) had a low level of social support, 426 (78.60%) had a medium level of social support, and 50 (9.23%) had a high level of social support.

3.3. Associations between family functioning, social support, and sarcopenia

Table 3. Association between family functioning and sarcopenia

Family functioning	Unadjusted		Adjusted	
	OR (95% CI)	*P*	OR (95% CI)	*P*
All participants				
GF6+ mean scores	1.02 (0.92, 1.54)	0.923	0.88 (0.54, 1.44)	0.603
Problematic	Reference		Reference	
Normal	0.81 (0.43, 1.52)	0.514	0.78 (0.38, 1.63)	0.516
Males				
GF6+ mean scores	1.16 (0.55, 2.48)	0.696	1.67 (0.68, 4.11)	0.266
Problematic	Reference		Reference	
Normal	0.60 (0.22, 1.56)	0.288	0.38 (0.12, 1.17)	0.091
Females				
GF6+ mean scores	0.94 (0.57, 1.56)	0.823	0.62 (0.32,1.18)	0.145
Problematic	Reference		Reference	
Normal	1.02 (0.45, 2.33)	0.961	1.31 (0.47, 3.62)	0.609

Logistic regression was used to estimate the OR and 95%CI between family functioning (continuous and categorical) and sarcopenia. Adjusted covariates included age, annual family income, educational level, marital status, living arrangements, cognitive impairment, depression, anxiety, family functioning, social support, and interviewer name. Higher mean scores of GF6+ indicate a lower level of family functioning.

Table 4. Association between social support and sarcopenia

Social support	Unadjusted		Adjusted	
	OR (95% CI)	***P***	**OR (95% CI)**	***P***
All participants				
SSRS total scores	0.98 (0.95, 1.02)	0.302	0.98 (0.94, 1.03)	0.514
Low	Reference		Reference	
Medium	1.02 (0.44, 2.37)	0.963	0.98 (0.34, 2.81)	0.965
High	0.73 (0.20, 2.66)	0.636	1.03 (0.21, 5.06)	0.973
Males				
SSRS total scores	1.01 (0.95, 1.07)	0.781	1.03 (0.95, 1.12)	0.481
Low	Reference		Reference	
Medium	3.35 (0.43, 25.95)	0.247	5.17 (0.52, 51.53)	0.161
High	2.23 (0.13, 38.49)	0.581	4.67 (0.18, 124.02)	0.357
Females				
SSRS total scores	0.97 (0.93, 1.01)	0.119	0.96 (0.90, 1.02)	0.194
Low	Reference		Reference	
Medium	0.63 (0.24, 1.65)	0.346	0.34 (0.08, 1.50)	0.154
High	0.45 (0.10, 1.98)	0.294	0.36 (0.05, 2.81)	0.332

Logistic regression was used to estimate the OR and 95%CI between social support (continuous and categorical) and sarcopenia. Adjusted covariates included age, annual family income, educational level, marital status, living arrangements, cognitive impairment, depression, anxiety, family functioning, social support, and interviewer name. Higher SSRS total scores indicate a higher level of social support. 82 participants (42 males and 40 females) were excluded from the analysis due to the measurement error caused by one interviewer.

The association between family functioning and sarcopenia is presented in Table 3. Overall, no significant association was detected. After adjustment, there was a trend that those with normal levels of family functioning were less likely to have sarcopenia among males (OR, 0.38; 95% CI, 0.12-1.17). On the contrary, females tended to have sarcopenia if having normal family functioning (OR, 1.31; 95% CI, 0.47-3.62).

Table 4 shows the association of social support with sarcopenia. In general, the associations were non-significant both before and after adjustment. After adjusting for potential confounders, there was a tendency that males with medium (OR, 5.17; 95% CI, 0.52-51.53) and high levels of social support (OR, 4.67; 95% CI, 0.18-124.02) were more likely to develop sarcopenia, compared to those with low levels of social support. However, females with medium (OR, 0.34; 95%CI: 0.08, 1.50) and high (OR, 0.36; 95%CI, 0.05-2.81) levels of social support seem to have a lower risk of sarcopenia.

4. Discussion

In recent years, China is experiencing accelerating population aging and an increasing burden of age-related diseases. Sarcopenia, known as the progressive loss of muscle mass and strength, is becoming prevalent in Chinese older adults [49]. Possible sarcopenia, proposed by the AWGS in 2019, is defined as either low muscle strength or low physical performance [1]. It can be used in primary care or community-based settings to facilitate earlier screening and lifestyle interventions. Using the AWGS 2019 definition, we examined the presence of possible sarcopenia among Chinese community-dwelling elderly aged ≥60 years. Additionally, research has indicated that interpersonal support can contribute to better physical and mental well-being of older adults [50]. Although previous research suggested that high levels of family and social support were protective factors against sarcopenia, the evidence is still limited. Therefore, this study also evaluated the relationships between family functioning, social support, and possible sarcopenia, and the potential sex disparities.

In our community-dwelling sample, the prevalence of possible sarcopenia was 9.32% in males and 11.59% in females. The results were similar to a prior study conducted in Tianjin, in which the prevalence of possible sarcopenia among community-dwelling older participants was reported as 8.33% in males and 12.47% in females [37]. However, it is worth noting that the prevalence of possible sarcopenia might be higher in the general older population. Wu et al. (2021) used 2015 data from the China Health and Retirement Longitudinal Study (CHARLS), which is a nationally representative survey, and reported that the sex-specific prevalence of possible sarcopenia in men and women was 36.3% and 40.7%, respectively [20]. Using the same dataset but with different waves, Chen, Ho, and Chau (2022) found that the prevalence of possible sarcopenia was 40.8% in males and 51.3% in females [19]. Both studies focused on the older population aged 60 years and above. The difference can be explained in multiple aspects. First, all of our participants were residents of urban areas, while the above population-based studies also included those in rural areas. The health disparities between the urban and rural elderly are a major health issue in China. In general, urban older residents have higher health expenditures and better healthcare access, resulting in enhanced health outcomes, which include a lower prevalence of sarcopenia [51-53]. Furthermore, our measure of possible sarcopenia has a lower sensitivity. We screened possible sarcopenia based exclusively on low muscle mass due to a lack of data on the indicator of low physical performance. However, both population-based research mentioned above identified possible sarcopenia as either low muscle strength or low physical performance.

Despite the distinctions in overall prevalence, our observations regarding sex disparities in prevalence were consistent with those reported in previous studies. Generally, females exhibited a higher prevalence of possible sarcopenia compared to males. Interestingly, when it comes to sarcopenia, the sex disparity manifests in an opposite trend, as a majority of existing studies in China and other countries in Eastern Asia reported a higher prevalence of sarcopenia in males than females [13, 21-24]. Wu et al.

(2016) suggested that there might be two mechanisms of declined muscle quality related to aging among Asian men and women [24]. The reduced muscle quality in men may largely be attributed to the loss of skeletal muscle. However, in women, this reduction can also be significantly affected by an increase in body fat and central adiposity. More studies are required to further investigate the sex differences in the prevalence of possible sarcopenia and sarcopenia and the underlying mechanisms

In China, a family-oriented country, traditional family structure is greatly valued, and family support is a primary source of social support for older adults [33]. Family dysfunction has been reported to be associated with reduced quality of life and a higher risk of mental disorders and suicide [54, 55]. We investigated the level of family functioning among the older participants using GF6+. Among all participants, 18.27% had problematic family functioning, which was higher than a previous study that measured older people's family functioning based on the Family APGAR scale [27]. Interestingly, we found that female older adults tended to report significantly higher mean scores of GF6+, indicating an elevated level of family dysfunction. To the best of our knowledge, the sex difference in perceived family functioning has not been reported by previous studies. This might be explained by the traditional family norms in China where women are considered predominantly as caregivers rather than housekeepers [56]. Compared to males, females generally undertake more household chores and are less involved in decision-making in families, and this gap tends to increase as they age [56, 57]. They might perceive lower family functioning as their roles and contributions might be undervalued and their opportunities for participation in family decisions are limited. However, it should be noted that results lost significance when we categorize family functioning into two levels.

The association between good family functioning and reduced risk of sarcopenia among Chinese community-dwelling elderly was reported by a prior study [27]. However, no association between family functioning and sarcopenia was detected in the present study. Some possible reasons are as follows. Firstly, while their study used the Family APGAR scale that categorizes family functioning into three distinct levels, our study used GF6+ which dichotomizes family functioning. This variation in measurement might lead to differences in capturing sophisticated family dynamics. The categorization of GF6+ mean scores could potentially oversimplify the complexities of family functioning, thus not adequately reflecting the subtle variations that the Family APGAR might capture. Consequently, this could result in our insignificant findings. Secondly, our data were collected through structured interviews. When asked and witnessed by an interviewer, our respondents might be more likely to provide socially desirable answers that they thought the interviewers expected to hear [58]. Hence, it is likely that perceived family dysfunction was generally underreported in our study, and the potential destination in family functioning by the status of sarcopenia could be insufficiently observed. Although no significant associations were found, we observed an interesting trend that males with normal family functioning and females with problematic family functioning reported sarcopenia less frequently. Further investigation into the above trend is needed.

In addition to family support, social support also plays a vital role in the well-being of older adults. In this study, we measured social support using SSRS and found that the average total scores were 32.96 ± 8.47 in our community-dwelling older participants, which was lower than in some existing studies [30, 59]. According to prior research, women generally have higher social support than men as they have a more diverse social network and a higher number of intimate friends [55, 60, 61]. We also identified a similar sex difference, as females had significantly higher SSRS total scores, which indicated a higher level of social support, though the significance disappeared when social support was categorized.

Our study did not detect any significant relationship between social support and sarcopenia, which is contrary to the findings of two recent studies. To be specific, the cross-sectional research conducted by Bian et al. (2023) in Shanghai reported a negative relationship between high-level social support and sarcopenia [30]. The cohort study by Li et al. (2024) also demonstrated similar results [29]. The discrepancy in educational levels could be a main factor in explaining why our results appeared insignificant. Only 55.93% of our sample had an educational level of secondary school and above, compared to 93.73% in Bian et al.'s study [30]. The lower educational background of our participants might lead to challenges in fully comprehending the questions or accurately conveying responses. In addition, the participants in our study were older than those in Bian et al. and Li et al.'s research. Both lower education attainment and older age are associated with response order effects, which could negatively impact the validity of survey responses [62].

Although no significant relationship was observed, our results showed a tendency that females who had higher levels of social support were less likely to report sarcopenia. However, males with higher levels of social support were more likely to report sarcopenia. More research is needed to confirm and explain the above tendencies.

This study has several strengths. It is the first study to investigate sarcopenia in community-dwelling older adults in Suzhou. Moreover, it is one of the first studies to screen possible sarcopenia in primary health care and community settings in China. In addition, it provides valuable insights into the sex differences in perceived family functioning and social support among older adults, and the association between these two sources of interpersonal support and sarcopenia.

This study also has a few notable limitations. First, the cross-sectional nature of the data restricted our ability to infer causal relationships. Second, there was a possibility of bias in our results due to unaccounted confounders such as chronic diseases. Third, the recruitment of participants was from a single community in Suzhou, which indicates that the study findings had limited generalizability to other regions in China especially rural China. Furthermore, there was a limitation in the sensitivity of our sarcopenia measurement approach. In this study, the screening for potential sarcopenia among participants was conducted solely based on muscle strength, while the AWGS 2019 suggested using either muscle strength or physical activity. This could potentially omit cases with low physical performance but normal muscle strength. Finally, there was a loss of data on social support due to measurement errors that could have been prevented.

Given the above limitations, longitudinal study designs should be utilized in the future to overcome the limitations of the cross-sectional design and explore possible casual relationships. A more comprehensive and rigorous data collection can help reduce confounding effects and provide a more holistic understanding of factors related to sarcopenia. It can contribute to a more valid precise and accurate identification of cases of possible sarcopenia as well. In addition, expanding the geographical scope of the research recruitment to encompass varied communities and regions of China, including rural areas, would enhance the generalizability of the findings.

5. Conclusion

To conclude, this explanatory study found potential sex differences in the perception of family functioning and social support. In addition, the study provided exploratory insights into the association between family functioning, social support, and sarcopenia, stratified by sex. The study findings indicate that more research should be conducted in this novel field to help better understand the correlates of sarcopenia and facilitate the early screening and prevention of sarcopenia in China.

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