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ETHNIC GROUPS DIFFERENCES IN THE PREVALENCE OF SARCOPENIA USING THE AWGS CRITERIA

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Abstract: *Objectives:* To estimate the prevalence of sarcopenia in different ethnic groups and the association with cultural life styles in west China. *Design:* A cross-sectional study. *Settings:* The communities in Yunnan, Guizhou, Sichuan, and Xinjiang provinces. *Participants:* 4500 participants aged 50 years or older in west China were enrolled in this study. Sarcopenia was defined according to the diagnostic algorithm of the Asia Working Group for Sarcopenia (AWGS). *Measurements:* We measured gait speed, handgrip strength and muscle mass by using bioelectrical impedance analysis (BIA) for all eligible participants. Life-style information were collected by reviewers. Relationships between sarcopenia and ethnic groups were analyzed using univariate and multivariate analyses. *Results:* We found 869 (19.31%) adults aged 50 years old or older were sarcopenia. The mean age is 62.4±8.3 years. The main ethnic groups enrolled in this study is Han, Tibetan, Qiang, Yi and Hui. The crude prevalence of sarcopenia is 22.3% in Han, 18.2% in Tibetan, 11.8% in Qiang, 34.7% in Yi and 26.7% in Hui. Compared to Han, after adjusting sex and age, Qiang has a lower prevalence of sarcopenia (odds ratio [OR]: 0.44, 95% CI 0.35-0.55), Yi has a higher prevalence of sarcopenia (OR: 1.78, 95% CI 1.29-2.43). While adding adjusting other potential cofounders, sarcopenia is still less prevalent in Qiang (OR: 0.44, 95% CI 0.34-0.57). *Conclusions:* The crude prevalence of sarcopenia is 22.3% in Han, 18.2% in Tibetan, 11.8% in Qiang, 34.7% in Yi and 26.7% in Hui. Sarcopenia was less prevalent in Qiang compared with Han. Further studies to determine related factors of sarcopenia among different ethnic groups are recommended.

Key words: Sarcopenia, prevalence, west China, ethnic groups.

Introduction

Sarcopenia was first named in 1989 by Irwin Rosenberg with a definition of progressive and generalized loss of muscle mass and muscle strength with advancing age (1). The 2010 European Working Group (EWGSOP) published a sarcopenia definition that it is a progressive and generalized skeletal muscle disorder that is associated with an increased likelihood of adverse outcomes including falls, fractures, physical disability and mortality (2). Now in 2018 definition, EWGSOP2 defines that a sarcopenia diagnosis is confirmed by the presence of low muscle quantity or quality. Moreover, if low muscle strength, low muscle quantity/quality and low physical performance are all detected, sarcopenia is considered severe (3). As a result of differences in ethnicity, genetic background, and body size, the EWGSOP criteria might not apply to Asians. Therefore, the Asian Working Group for Sarcopenia (AWGS) published guidelines for diagnosing sarcopenia in 2014 which participants with low muscle mass as well as low muscle strength or physical performance were considered to have sarcopenia (4).

The incidence of sarcopenia reported in different countries varies greatly depending on the method of measurement, the population surveyed, and the diagnostic criteria selected. According to the criteria of the EWGSOP2, the sarcopenia indicators of combined low muscle strength and low muscle quantity were present in 4.6-14.5% of men and 6.7-14.4% of women in a total of 2,099 ambulatory community-dwelling older adults, aged 70-84 years (5). While the prevalence of sarcopenia estimated by AWGS criteria ranges between 4.1% and 11.5% of in the elderly over 60 years old. The prevalence rates were higher in Asian studies that used the European Working Group on Sarcopenia in older people cut-offs (6). Besides, the prevalence of sarcopenia vary a lot in different ethnics. A recent study found that the prevalence of sarcopenia was 59.6% in Asians, 21.3% in Black and 39.9% in White men by EWGS criteria in 600 haemodialysis patients (7). Another study in Singapore found that compared with Malay and Indian, Chinese ethnicity were associated with higher risk of sarcopenia (OR 2.08, 95% CI 1.16–2.86) (8).

China is the most populous country with a large aging population. Besides, China is a multi-ethnic country with 56 ethnic groups. Approximately 91.5% of people in China are Han (9) and are distributed countrywide. Sichuan, one of the western provinces with a large population, is also multi-ethnic. The main ethnic groups in Sichuan province is Han which occupies 95.02% of the population in Sichuan. The other ethnic groups include Qiang, Yi, and Tibetan. Different ethnic groups have different living environments, lifestyles and eating habits. The prevalence of sarcopenia in the ethnic groups of western

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China is unknown. Screening and assessment of sarcopenia may provide an opportunity for early detection, intervention, and monitoring to reduce morbidity, prevent disability, and enable more effective use of health care resources in minority areas.

In this study, we collected cross-sectional data from the West China Health and Aging Trend (WCHAT) study. The data collected included demography, medical history, comorbidities, diet, health status, comprehensive geriatric assessments, laboratory examinations and physical examinations. According to the diagnostic algorithm of AWGS, we aimed to 1) evaluate the prevalence of sarcopenia in different ethnic groups according to the recommended criterion of the AWGS and the related factors like social demographic factors, life style factors, nutrition status, physical activities and chronic diseases. 2) investigate the association between sarcopenia and ethnic groups.

Methods

The current research is a cross-sectional analysis including baseline data of WCHAT study which was approved by the Ethical Review Committee (reference: 2017-445). And this project was registered with registration number (ChiCTR 1800018895).

Study participants

All participants aged 50 and over were enrolled. Participants were recruited by convenience and asked verbally by the researchers about their willingness to take part in the study and informed consent was signed. To minimize the risk of selection bias, no specific inclusion criterion was required. Our method of sampling is multi-stage cluster sampling and the response rate was 50.2% in the baseline data collection. In this study, 4,500 participants who did bioelectrical impedance analysis (BIA) which were analyzed in the current study.

Data collection

Trained interviewers collected questionnaire data through face-to-face, one-on-one personal interviews. Trained technicians performed the anthropometric and bioimpedance measurements.

Sarcopenia assessment

Sarcopenia was measured by the recommended diagnostic algorithm of the Asia Working Group for Sarcopenia (AWGS). Muscle mass was measured by bioimpedance analysis using an Inbody 720 (BioSpace, Seoul, Korea), which was a well-accepted parameter for the diagnosis of sarcopenia (10, 11). This method was previously validated in a Chinese population (12). Low muscle mass was defined as an appendicular skeletal muscle mass index (ASMI, ASM/height2) of 7.0 kg/m^2 in men and 5.7 kg/m^2 in women which was assessed using a dynamometer (EH101; Camry, Zhongshan, China) (13). During the test, subjects held the grip dynamometer with their dominant hand, stood upright, kept their feet naturally separated (shoulder-width apart) and their arms could naturally droop. At the beginning of the test, the subjects gripped the handle to their full capacity. Intermittent gripping, swinging of the arms, squats, or contact with other body parts was prohibited. Test were performed on two independent occasions and the largest value was recorded. Usual walking speed was measured over 4 m. Subjects stood at the starting point and upon the starting command, walked forward at an average pace to the 4-meter line. The walking time was recorded (14). And the cut-off value of gait speed was 0.8 m/s (10).

The Questionnaire

Trained interviewers administered a questionnaire containing information regarding demographics, social support, life-styles, sleeping quality, physical activity level, and medical history. Smoking, alcohol consumption and tea-drinking status were categorized as current yes and no, respectively. Sleeping quality was assessed using the Pittsburgh sleep quality index (PSQI). Scores >5 are considered as poor self-reported sleep quality and have a sensitivity of 89.6% and specificity of 86.5% in distinguishing good vs. poor sleepers (15). The presence or absence of disease was based on the subjects' report of their physician's diagnoses, supplemented by the identification of drugs brought to the interviewers. Chronic diseases include coronary heart disease, hypertension, stroke and diabetes mellitus. Nutrition status was graded using MNA-SF on a scale of 0-14, with 0~7 indicate poor nutrition status, 8~11 indicate mild poor nutrition status, 12~14 indicate good nutrition status and this is already validated in China (16). Depressive symptoms were assessed using the 15-item Geriatric Depression Scale (GDS-15). The scale, which has been identified as having a high correlation with the original GDS in the Chinese population (17). In the present study, GDS-15 scores≥5 indicate depressive mood (17). Anxiety symptoms were assessed using generalized anxiety disorder 7-item scale (GAD-7), which contains 7 questions with a total score of 21. A score≥5 was considered as anxiety (18). Categories of physical activities included walking (4.0 MET), indoor housework (3.5 MET), outdoor housework (5.0 MET), dancing (4.5 MET), playing ping-pong (4.0 MET) and other regular exercises (5.0 MET). The energy consumption (kcal/week)=MET*Times per week*Minute per time*Weight(kg)/60. This energy consumption was measured by a validated China Leisure Time Physical Activity Questionnaire (CLTPAQ) (19). Low physical activity was identified as being ≤20th percentage of energy consumption per week in different gender groups.

Statistical analyses

The normality of variables was initially studied by using R version 3.6.1. We examined differences in baseline sample characteristics by ethnic groups using Chi-square tests for categorical variables and one-way analysis of variance (ANOVA) for continuous variables. Associations with a p-value of 0.1 or less in the univariate analysis were selected

for the multiple regression analysis. Covariates selected for the full model included age, sex, education level, marriage status, living alone, have religious faith, life-style factors, chronic comorbidity burden, nutrition status, depressive status, and anxiety status. This analysis was conducted using logistic regression with dummy variables using Han ethnic group as the reference group. A value of P<0.05 was considered to be statistically significant.

Results

Overall, 4,500 participants aged 50 or older (1,627 men and 2,873 women) were enrolled in the study. The mean age of the group was 62.4 (SD:8.3). Of total participants, 869 (19.31%) participants met the diagnosis of sarcopenia by the AWGS algorithm with a prevalence of 17.8% in females and 22.1% in males. The main ethnic groups enrolled in this study is Han (1,937 participants), Tibetan (1,233 participants), Qiang (1,050 participants), Yi (213 participants) and Hui (60 participants).

Figure 1 shows the sarcopenia prevalence in different ethnic groups divided by age and gender. It shows sarcopenia prevalence has an age increasing pattern in almost every ethnic group. And there exist distinct differences of sarcopenia prevalence among different ethnic groups. Compared with Han, Qiang shows a lower sarcopenia prevalence and Yi shows a higher sarcopenia prevalence both in male and female in every age group.

Figure 1
The sarcopenia prevalence in different ethnic groups divided by gender and age were shown

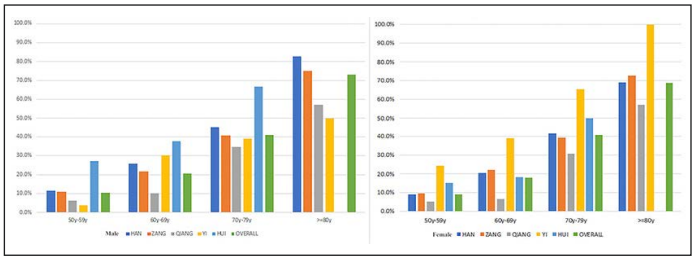

Table 1 shows the characteristics of sociodemographic information, life-style factors, housework, the prevalence of chronic diseases, depression and anxiety among different ethnic groups. We set Han as a reference group and it shows that Yi has a significantly higher percentage of living alone, lower physical activity, smoking, drinking alcohol, poor nutrition status, depressive status and anxiety status (p<0.05). While Yi has a lower percentage of religious faith, indoor housework and drinking tea compared to Han. There is no significant difference in the age, sex, marriage status, sleep quality and chronic disease between Yi and Han. Besides, Qiang has a lower percentage of living alone, lower physical activity, poor sleepers and chronic disease burden, but has a higher percentage of religious faith, drinking tea and alcohol, dance, indoor and outdoor housework compared to Han (p<0.05). And the prevalence of depression and anxiety in Qiang was higher than Han (28.4% and 25.7%, respectively). There is no significant difference in the age, sex and marital status between Qiang and Han. Moreover, Tibetan only has a higher percentage of religious faith and tea-drinking, but a lower percentage of smoking and diabetes compared to Han. And Hui only has a higher percentage of religious faith, tea-drinking, diabetes and coronary heart disease compared to Han. Overall, there were significant differences in the proportion of individuals with the prevalence of sarcopenia (p<0.001) among different ethnic groups. The crude prevalence of sarcopenia is 22.3% in Han, 18.2% in Tibetan, 11.8% in Qiang, 34.7% in Yi and 26.7% in Hui.

Table 2 shows the sociodemographic influences on ethnic groups disparities in sarcopenia. In the unadjusted model, it shows that compared to Han, Tibetan and Qiang has a lower prevalence of sarcopenia, while Yi has a higher prevalence of sarcopenia. In model 1 which adjusted sex and age, Qiang has a lower prevalence of sarcopenia (odds ratio [OR]: 0.44, 95% CI 0.35-0.55), Yi has a higher prevalence of sarcopenia (OR: 1.78, 95% CI 1.29-2.43) compared to Han. While adding adjusting marriage status, living alone, have religious faith and life-style factors (smoking, drinking alcohol and tea, sleeping quality) in model 2, sarcopenia is still less prevalent in Qiang (OR: 0.46, 95% CI 0.36-0.58) and more prevalent in Yi (OR: 1.61, 95% CI 1.15-2.24) compared with Han. In the adjusted model 3 which adding adjusting doing housework, dance, whether having chronic diseases, depression or anxiety, sarcopenia is still less prevalent in Qiang (OR: 0.48, 95% CI 0.37-0.61) and more prevalent in Yi (OR: 1.47, 95% CI 1.05-2.06) compared with Han. After adding adjusting nutrition status in model 4, we found that Yi is no more independently associated with sarcopenia which indicated that increase presence of sarcopenia in Yi compared to the Han was attributable to the increased risk of poor nutrition status among Yi. However, the prevalence of sarcopenia is consistently independently associated with Qiang which showed a lower prevalence compared with Han in model 4 (OR: 0.44, 95% CI 0.34-0.57). Moreover, the prevalence of sarcopenia in Tibetan and Hui have no difference compared with Han in these four models.

Discussion

The present study was the first one to investigate the ethnic groups differences in the prevalence of sarcopenia in China and we found profound differences of sarcopenia prevalence among different ethnic groups. In anthropology, an ethnic group is a kind of group that sharing the same ancestry, cultural traditions and common history which culturally distinguish that group from other groups (20). As a big country, China has a population of 1.3 billion which occupies nearly 20% of the world population, including the wide-ranging Han and the other 55 minority ethnic groups with different living

Table 1
Baseline Characteristics of Study Participants (N =4500)

Characteristics	Overall n=4500	Han n=1937	Tibetan n=1233	Qiang n=1050	Yi n=213	Hui n=60	p
Age, mean±SD, (range)	62.4±8.3 (50-95)	62.9±8.9 (50-95)	60.6±7.5 (50-85)*	63.2±7.7 (50-87)	63.9±8.0 (50-86)	61.1±8.4(50-81)	<.001
Female, n (%)	2873 (63.8)	1304 (67.3)	706* (57.3)	684 (65.1)	138 (64.8)	37 (61.7)	<.001
Marital status,							*<.001*
Single, n (%)	31(0.7)	5(0.3)	22(2.0)*	4(0.4)	0(0.0)	0(0.0)	
Married, n (%)	3593 (84.0)	1573 (84.8)	924 (82.5)	875 (85.1)	172 (83.5)	43 (72.9)	
Divorced, n (%)	67(1.6)	22(1.2)	17(1.5)	24(2.3)	3(1.5)	1(1.7)	
Widowed, n (%)	584 (13.7)	255 (13.7)	157 (14.0)	125 (12.2)	31 (15.0)	15 (25.4)	
Live alone, n (%)	210 (4.7)	94 (4.9)	62 (5.0)	32 (3.0)*	19 (8.9)*	2 (3.3)	.004
Religious faith, n (%)	1324 (29.4)	265 (13.7)	769 (62.4)*	236 (22.5)*	16 (7.5)*	36 (60.0)*	<.001
Life-styles							
Drink tea, n (%)	2045 (48.1)	686 (37.1)	820 (73.5)*	463 (45.3)*	38 (18.7)*	35 (60.3)*	<.001
Drink alcohol, n (%)	1071 (25.2)	379 (20.5)	216 (19.4)	407 (39.8)*	55 (27.0)*	12 (20.7)	<.001
Smokers, n (%)	738 (17.3)	335 (18.1)	151 (13.5)*	171 (16.7)	67 (32.8)*	13 (22.4)	<.001
Poor sleepers,							
(PQSI<5),n (%)	2015 (47.2)	923 (49.8)	484 (43.4)	472 (46.0)*	110 (53.7)	23 (39.0)	.004
Nutrition status, n (%)							.001
MNA-SF<7	91 (2.3)	33 (1.9)	19 (1.9)	26 (2.6)	12(6.9)*	1(1.8)	
8≤MNA-SF≤11	2212 (54.8)	979 (55)	547 (53.3)	540 (54.6)	108 (61.7)*	35 (61.4)	
12≤MNA-SF≤14	1730 (42.9)	767 (43.1)	460 (44.8)	423 (42.8)	55 (31.4)*	21 (36.8)	
Dance, n(%)	937 (20.8)	298 (15.4)	181 (14.7)	434 (41.3)*	11 (5.2)	10 (16.7)	
Indoor housework, n(%)	2950 (69.6)	1299 (70.6)	683 (61.6)	812 (79.5)*	109 (53.4)*	41 (71.9)	<.001
Outdoor housework, n(%)	1794 (41.2)	710 (38.8)	362 (32.7)	563 (55.3)*	82 (40.2)	22 (38.6)	<.001
Low physical activity, n(%)	851 (18.9)	398 (20.5)	301 (24.4)	81 (7.7)*	59 (27.7)*	10 (16.7)	<.001
Chronic disease, n(%)	1921 (45.0)	883 (47.7)	530 (47.5)	386 (37.6)*	95 (46.3)	26 (44.1)	<.001
Hypertension, n(%)	1067 (23.7)	493 (25.5)	275 (22.3)	244 (23.2)	41 (19.2)	14 (23.3)	0.099
Diabetes, n(%)	309(6.9)	163(8.4)	58(4.7)*	60(5.7)*	19(8.9)	8(13.3)*	<.001
Coronary heart disease, n(%)	137 (3.0)	56 (2.9)	31 (2.5)	38 (3.6)	8 (3.8)	4 (6.7)*	0.331
Lung disease, n(%)	203 (4.5)	86 (4.4)	67 (5.4)	34 (3.2)	13 (6.1)	3 (5.0)	0.155
Depressive status, n (%)	1045 (23.2)	370 (19.1)	298 (24.2)	298 (28.4)*	63 (29.6)*	14 (23.3)	<.001
Anxiety status, n (%)	842 (18.7)	306 (15.8)	213 (17.3)	270 (25.7)*	46 (21.6)*	7 (11.7)	<.001
Sarcopenia, n (%)	869 (19.3)	431 (22.3)	224 (18.2)	124 (11.8)*	74 (34.7)*	16 (26.7)	<.001
ASMI, mean±SD (kg/m^2)	6.62 (0.94)	6.50 (0.89)	6.80 (1.00)	6.79 (0.88)	6.32 (1.08)	6.57 (1.03)	<.001
grip strength, mean±SD (kg)	21.97 (8.65)	21.85 (8.36)	21.73 (9.16)	22.80 (8.50)	19.90 (8.60)	23.02 (8.71)	<.001
walking speed, mean±SD(m/s)	0.85 (0.27)	0.85 (0.28)	0.85 (0.31)	0.87 (0.19)	0.79 (0.31)	0.87 (0.21)	<.001

Note. Means ± standard deviation was shown. Data are shown using % or mean (standard deviation). P values were calculated with chi-squared tests and one-way analysis of variance (ANOVA) for categorical and continuous variables, respectively. * means a significant difference compared with Han($p<0.05$).

environment, lifestyle, diet, culture and so on. As the tight relationship between these factors and sarcopenia (21), people with diverse ethnic groups offer us good opportunities to visit and understand the effect of various ethnic groups culture lifestyles on sarcopenia.

The present study provided epidemiological data on the sarcopenia prevalence in China ethnic groups and we found many differences in the sociodemographic information, life-style factors, nutrition status, chronic disease status among different ethnic groups. Specifically, our results showed the prevalence of sarcopenia in Tibetan is lower than Han in the unadjusted model. However, after adjusting age and sex, the association was not significant any more as we found the mean age in Tibetan was younger and the female percentage is lower than Han. Research has shown that sarcopenia was associated with age and has a doseage effect (22). Besides, it was approved

Table 2
Multivariate analysis for ethnic groups differences in sarcopenia (n=4500)

Ethnic groups	Unadjusted OR (95%CI), p value	Model 1, OR (95%CI), p value	Model 2, OR (95%CI), p value	Model 3, OR (95%CI), p value	Model 4 OR (95%CI), p value
Han	1.0	1.0	1.0	1.0	1.0
Tibetan	0.78(0.65-0.93), .006	0.90(0.74-1.08), 0.257	0.97(0.77-1.23), 0.817	0.93(0.74-1.19), 0.579	0.90(0.69-1.16), 0.407
Qiang	0.47(0.38-0.58), <.001	0.44(0.35-0.55), <.001	0.46(0.36-0.58), <.001	0.48(0.37-0.61), <.001	0.44(0.34-0.57), <.001
Yi	1.86(1.38-2.52), <.001	1.78 (1.29-2.43), <.001	1.61(1.15-2.24), .005	1.47(1.05-2.06), .025	1.13(0.77-1.67), 0.526
Hui	1.27(0.71-2.27), 0.420	1.52 (0.83-2.80), 0.179	1.55(0.83-2.89), 0.172	1.38(0.72-2.63), 0.333	1.33(0.67-2.64), 0.423

Note. Abbreviations: OR, odds ratio; CI, confidence interval; Model 1: adjusted for age and sex; Model 2: adjusted for age, sex, marriage status, living alone, have religious faith and life-style factors (smoking, drinking alcohol and tea, sleeping quality); Model 3: adjusted for age, sex, marriage status, living alone, have religious faith and life-style factors (smoking, drinking alcohol and tea, sleeping quality), housework, dance, chronic disease, depressive status and anxiety; Model 4: adjusted for age, sex, marriage status, living alone, have religious faith and life-style factors (smoking, drinking alcohol and tea, sleeping quality), housework, dance, chronic disease, depressive status and anxiety, nutrition status.

that women were more vulnerable to severe sarcopenia in old age than men (21). Interestingly, in Tibet, many families believes in Buddhism which account about 64% in our study. The special religious activity of Tibetan included kowtow and turning prayer wheel. Kowtow was done more than 2000 times in one week and turning prayer wheel was done more than two hours each time. These two activities were improved to be healthy to improve muscle strength (23). Even though Tibetan was living in a high altitude and cold area which was not good for survival, the prevalence of sarcopenia in Tibetan was similar to Han.

While we found that Qiang always has a lower prevalence of sarcopenia compared to Han in the four regression models. This might be the following reasons. Firstly, Qiang like dancing and we also found much higher percentage of dancing in Qiang than other ethnic groups. The culture dance in Qiang was called "Salang" in which that people dance in a circle with movements of axial rotation of the body and flexible circle of legs (24). They treat dancing as a daily activity and dance for at least two hours every day (24). Many studies have improved exercise can improve muscle strength and physical performance (25-27). Exercise is required to induce autophagy, which results satellite cell activation, muscle mass maintenance, fiber type switching, and muscle adaptation in old age (28). Secondly, the percentage of tea drinker in Qiang was found to be higher than Han in our study. Tea plays an important role in the life of the Qiang group and was considered as a necessity of daily diet. Recent reserch found that green tea polyphenols have the potential to improve skeletal muscle metabolism in obese mice by improving glucose homeostasis, reducing lipid peroxidation, and increasing rate limiting enzymes of oxidative phosphorylation (29). Thirdly, we found that Qiang has a significant lower prevalence of chronic disease than Han, especially the diabetes mellitus. Research found that in community-dwelling Chinese elderly, diabetes mellitus was significantly associated with increased risks of sarcopenia (30). Diabetes mellitus is characterized by insulin resistance, inflammation, advanced glycation end-product accumulation and increased oxidative stress which can negatively affect various aspects of muscle health (31). However, after adjusting all these factors, the prevalence of sarcopenia in Qiang was still lower than Han. Further studies should be done to evaluate the potential genetic and non-genetic mechanisms underlying the decreased likelihood of sarcopenia among the Qiang ethnic group.

For the Yi ethnic group, we found the prevalence of sarcopenia was always higher than Han in the first three models. While the presence of poor nutrition status accounted for the increased risk of sarcopenia among Yi compared to Han since adding adjusting the nutrition status in model 4, the association between Yi and sarcopenia was not significant anymore. This improves that malnutrition is a very important risk factor related to sarcopenia, and a recent study had improved the importance of malnutrition since it has been shown to be associated with an approximately fourfold higher risk of developing sarcopenia/severe sarcopenia during a four-year follow-up (32). What's more, there existed a significantly higher percentage of smoking in Yi compared to Han. A previous meta-analysis had indicated that cigarette smoking as an isolated factor that may contribute to the development of sarcopenia (33). In skeletal muscle, components of cigarette smoking increase oxidative stress either directly or by activation of nicotinamide adenine dinucleotide phosphate (NADPH) and oxidase (NOX) to produce reactive oxygen species (ROS) (34). Besides, cigarette smoking-induced oxidative stress may lead to phosphorylation of p38 MAPK, which in turn activates the NFkB pathway that triggers upregulation of the muscle-specific E3 ubiquitin ligases, leading to muscle protein degradation (35). Specifically, Yi was living in Liang-shan where was famous for flue-cured tobacco (36). Besides, a cultural kind of cigarette in Yi was called "waterpipe smoking". It is a way of smoking tobacco in which air is passed over heated charcoal, which located in the head of the hookah underneath the charcoal, producing smoke. The smoke is entrained down the stem of the waterpipe and bubbles through water by the action of puffing on the waterpipe

hose before being inhaled by the smoker (37). Recent research found that waterpipe smoking was more harmful than cigarette as it generated high concentrations of 4–100 nm nanoparticles mainly composed of sugar derivatives (38). Besides, smokers would get more harmful substances using waterpipes smoking since each inhalation takes a longer time and data showed that taking a sip of waterpipes smoking is equivalent to smoking a whole cigarette (38).

Limitations

Nonetheless, this study presents some limitations. It is derived from a cross-sectional study which was not possible to conclude the existence of a causal association between sarcopenia and ethnic groups in the elderly. And although regression models were adjusted for many variables like social demographic factors, life style factors, nutrition status, physical activities and chronic diseases, other potential confounders like dietary habit and annual income are still needed to be adjusted. And we conducted a centralized investigation, not a household survey in which most of the participants are relatively healthy people.

Conclusions

This study demonstrated that the prevalence of sarcopenia varies among different ethnic groups aged 50 years old and older in west China and was associated with different cultural life styles. Compared to Han, Yi has a higher incidence of sarcopenia mostly related to malnutrition. While Qiang has a lower incidence of sarcopenia compared to Han which need further research of genetic and non-genetic mechanisms. This was a first study to investige the Chinese ethnic groups differences in the prevalence of sarcopenia. As China was a multi-ethnic country, this study could give us a hint to explore the role of some special cultural lifestyles on the preventation of sarcopenia.

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Conflicts of Interest: The authors report no conflicts of interest in this work.

Ethnical statements: The current research was approved by the Ethical Review Committee of West China Hospital of Sichuan University with the committee's reference number 2017(445) and the registration number is ChiCTR 1800018895.

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