Original Article

Population-based Estimates for the Prevalence of Self-reported Olfactory and Taste Dysfunction among Older Adults in China

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Abstract

Objective Olfactory and taste functions decline with age and are associated with altered risk of major chronic diseases and mortality. However, large-scale national epidemiological data on the prevalence of olfactory and taste dysfunction among older adults in China are lacking. This study aimed to estimate the prevalence of self-reported olfactory and taste dysfunction among older adults in China.

Methods Using data from the Chinese Elderly Digestive Function and Nutritional Needs Survey, a nationwide cross-sectional study conducted from 2023 to 2024, the main analysis included 18,889 participants aged 60 years and older (9,435 males and 9,454 females). Additionally, 6,345 middle aged participants (45–59 years) were recruited as controls. Self-reported olfactory and taste dysfunction were defined through self-reported questionnaires, which asked participants whether they had experienced problems with their sense of smell or taste for three consecutive months. Prevalence across different subgroups, stratified by sex, region, residence, and socioeconomic status (SES), was also calculated. Weighted logistic regression models were used to evaluate potential risk factors.

Results Among older adults, the prevalence of self-reported olfactory dysfunction was 9.10%, and taste dysfunction was 5.67%, relative to 3.69% and 2.78% in the middle-aged group, respectively. Prevalence increased with age, reaching 12.5% for slef-reported olfactory dysfunction and 8.37% for taste dysfunction among adults aged ≥ 80 years. Among older adults reported olfactory dysfunction, 65.7% reported anosmia, 17.0% reported parosmia, and 17.2% reported both symptoms; among those with taste dysfunction, 39.5% reported dysgeusia, 38.4% reported taste loss, and 22.1% reported both symptoms. Advanced age, female sex, residence in western and central regions, presence of chronic conditions, and poorer self-rated health were independently asscociated with higher prevalence of both olfactory and taste dysfunction, while living alone was associated with olfactory dysfunction as well.

Conclusion This nationally representative study showed that the prevalence of self-reported olfactory and taste dysfunction among Chinese adults aged 60 years and older were 9.10% and 5.67%, respectively. Prospective studies are warranted to investigate the underlying mechanisms and risk factors for chemosensory disturbances.

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INTRODUCTION

Olfactory and taste functions are essential components of chemosensory health and play a critical role in quality of life, influencing food preferences, nutrition status, social interactions, and even safety[1-3]. It is well established that a substantial proportion of older adults experience olfactory and taste dysfunction with increasing age, which could lead to serious consequences[4]. For example, growing evidence suggested that olfactory and taste impairments were predictors of neurodegenerative diseases[5], stroke[6], cardiovascular diseases and even mortality[7,8].

Population-based studies have reported that smell and taste problems are common in middle-aged and older adults, although prevalence estimates vary substantially across populations and assessment approaches. In the United States, nationally representative data from the National Health and Nutrition Examination Survey (NHANES) have shown a considerable burden of self-reported smell and taste alterations among adults aged 40 years and older, while studies incorporating objective testing have generally reported higher prevalence estimates than self-reported measures[9,10]. In South Korea, nationwide survey data have also demonstrated that subjective olfactory dysfunction is prevalent and associated with demographic and health-related factors[11]. However, evidence from China remains comparatively limited. Existing Chinese studies have often been restricted to local, regional, or rural populations, and nationally representative data on olfactory and taste functions among older adults are scarce[12].

Therefore, we conducted a large-scale nationwide epidemiological study in the Chinese middle-aged and older adult from 2023 to 2024, including a representative sample of community-dwelling older adults from 21 randomly selected provinces across China. We aimed to estimate the prevalence of self-reported olfactory and taste dysfunctions, with a primary focus on adults aged 60 years and older, and to examine demographic, socioeconomic, geographic, lifestyle, and health-related factors associated with these dysfunctions.

MATERIALS AND METHODS

Study Design and Participants

The Chinese Elderly Digestive Function and Nutritional Needs Survey (CEDNS) was a nationally representative, cross-sectional survey conducted from December 2023 to Febuary 2024, aimed at exploring the epidemiology of digestive function among older adults in China. Participants, aged 45 years and older, were recruited from 21 of the 31 provinces in mainland China. A stratified multistage random cluster sampling method was employed across 87 survey sites, considering regional distribution (eastern, central, and western China), urban/rural residence, sex, and age. Further details of the CEDNS methodology are provided in the Supplementary Methods. Briefly, survey sites were selected from eastern, central, and western China according to population distribution; within each survey site, three residential communities or administrative villages were selected using probability proportional to size sampling; and eligible residents were then randomly sampled within strata defined by age and sex. The sampling design also accounted for urban and rural residence. A total of 18,889 participants aged 60 years and older (9,435 males and 9,454 females) were included, along with 6,345 middle-aged participants (aged 45 to 59 years) who were recruited as controls. The study was approved by the ethical review committees of the Chinese Center for Disease Control and Prevention (202333). Written informed consent was obtained from all study participants by interviewers before data collection began. For the current analysis, participants with incomplete olfactory and taste function data (n = 314) were excluded, resulting in a final sample of 25,234 participants (12,579 males and 12,655 females).

Data Collection

Face-to-face questionnaires were administered by trained health workers to collect data on demographic characteristics, socioeconomic status (SES), medical history, and self-reported digestive function, including olfactory and taste function, chewing ability, dental health, swallowing function, gastrointestinal health, and constipation. Additional

information on food frequency questionnaire and prepackaged food preferences was also gathered. Data on participants' demographic and socioeconomic factors, such as sex, age, residence, region, marital status, living arrangement, education level, income level, and occupation, were recorded. A chronic condition score was calculated based on six self-reported chronic diseases - cancer, hypertension, diabetes, cardiovascular diseases, stroke, and chronic obstructive pulmonary disease, with one point assigned for each disease, resulting in a total possible score ranging from 0 to 6. Self-rated health status was also assessed.

Assessment of Olfactory and Taste Function

Perceived olfactory function and taste function were assessed using two questions[13]: "Have you experienced any problems with your sense of smell/taste for three consecutive months, such as being unable to smell/taste or noticing that things smell/taste differently than they should?" If participants responded 'yes,' they were asked to specify the condition: (1) loss of olfactory/taste function (inability to detect any odors/flavors); (2) distorted olfactory/taste function (odors or flavors perceived differently than usual); or (3) both conditions. Self-reported olfactory or taste dysfunction was defined as experiencing these problems for at least three consecutive months. Participants with dysfunction were further classified into parosmia/anosmia or dysgeusia/taste loss.

Statistical Analysis

All statistical analyses were performed in R software version 4.2.3 (R Foundation for Statistical Computing, Vienna, Austria). Descriptive analyses were conducted for each age group (45–59, 60–69, 70–79, and ≥ 80 years), with categorical variables presented as percentage and continuous variables as means with standard deviations (SD). Weighting coefficients were applied to account for differential probabilities of sample selection, post-stratification adjustments, and nonresponse, ensuring that the sample structure reflected the 2020 Chinese population census. Due to the observed differences in olfactory and taste dysfunction among various age groups, analyses were stratified by age within the older adult population (60–69, 70–79, and ≥ 80 years), with prevalence rates among middle-aged participants (45–59 years) reported for comparison. The prevalence of olfactory and taste dysfunction, including their specific subtypes, was further assessed across subgroups categorized by sex, region, residence (urban vs. rural), and SES.

Multivariable logistic regression analyses were performed to identify independent associations between self-reported olfactory or taste dysfunction (and their individual subtypes) and controls without dysfunction. All relevant independent variables were included in the regression models, including age (continuous, per 10 y), sex (male; female), residence (urban; rural), region (eastern; central; western), marital status (married; divorced/separated/never married; widowed), living arrangement (living with spouse; living with children or others; living alone), education level (never attended school; primary school; junior high school; senior high school or above), monthly disposable income (< 1,000 CNY; 1,000–3,000 CNY; and ≥ 3,000 CNY), occupation (Blue collars; White collars; house working and others), chronic condition score (continuous, ranged from 0–6), and self-rated health (good; normal; bad). Results were presented as adjusted odds ratios (*ORs*) with 95% confidence intervals (*CIs*).

RESULTS

A total of 25,234 Chinese adults participated in the study, including 18,889 older adults aged 60 years or above and 6,345 middle-aged adults aged 45 to 59 years. Males accounted for 49.8% (*n* = 12,579) of the sample, while 57.4% (*n* = 14,485) resided in urban areas, and 37.8% (*n* = 9,546) were from the eastern region of China (Table 1).

The overall prevalence of self-reported olfactory dysfunction among Chinese older adults aged 60 years and older was 9.10% (95% *CI*: 8.02% to 10.2%), while the prevalence of self-reported taste dysfunction was 5.67% (95% *CI*: 4.63% to 6.71%) (Figures 1 and 2). Among older adults with self-reported olfactory dysfunction, 65.7% reported anosmia, 17.0% reported parosmia, and 17.2% exhibited both symptoms. Meanwhile, among those with self-reported taste dysfunction, 39.5% had dysgeusia, 38.4% experienced taste loss, and the prevalence of overlapping symptoms was 22.1%. The prevalence of both dysfunctions increased with age. For self-reported olfactory dysfunction, the prevalence was 3.69% in those aged 45–59 years and 12.5% in those aged 80 years and older. Similarly, self-reported taste dysfunction prevalence was 2.78% in the 45–59 years age group and 8.37% in those aged 80 years and older (Figures 1 and 2).

Furthermore, the prevalence of both self-reported olfactory and taste dysfunction was higher in females compared to males and higher among

Table 1. Descriptive characteristics of study participants according to age groups

Characteristic	Middle aged adults (*N* = 6,345)	Older adults (*N* = 18,889)		
	45–59 y (*N* = 6,345)	60–69 y (*N* = 6,356)	70–79 y (*N* = 6,365)	≥ 80 y (*N* = 6,168)
Age (y)				
Mean (SD)	52.9 (4.19)	64.5 (3.04)	73.6 (2.75)	83.8 (3.50)
Males	3,144 (49.6%)	3,159 (49.7%)	3,177 (49.9%)	3,099 (50.2%)
Residence				
Urban	3,667 (57.8%)	3,660 (57.6%)	3,642 (57.2%)	3,516 (57.0%)
Rural	2,678 (42.2%)	2,696 (42.4%)	2,723 (42.8%)	2,652 (43.0%)
Region				
Eastern	2,387 (37.6%)	2,419 (38.1%)	2,376 (37.3%)	2,364 (38.3%)
Central	2,192 (34.5%)	2,175 (34.2%)	2,197 (34.5%)	2,127 (34.5%)
Western	1,766 (27.8%)	1,762 (27.7%)	1,792 (28.2%)	1,677 (27.2%)
Marital status				
Married	5,975 (94.2%)	5,689 (89.5%)	5,073 (79.7%)	3,474 (56.3%)
Divorced/Separated/Never married	251 (4.0%)	175 (2.8%)	122 (1.9%)	96 (1.6%)
Widowed	119 (1.9%)	492 (7.7%)	1,170 (18.4%)	2,598 (42.1%)
Living arrangement				
Living with spouse only	3,104 (48.9%)	3,661 (57.6%)	3,527 (55.4%)	2,208 (35.8%)
Living in a multigenerational household	2,779 (43.8%)	2,086 (32.8%)	1,960 (30.8%)	2,569 (41.7%)
Living alone	360 (5.7%)	558 (8.8%)	843 (13.2%)	1,299 (21.1%)
Living with others	102 (1.6%)	51 (0.8%)	35 (0.5%)	92 (1.5%)
Education level				
Never attended school	559 (8.8%)	1,279 (20.1%)	1,837 (28.9%)	2,503 (40.6%)
Primary school	1,854 (29.2%)	1,857 (29.2%)	2,641 (41.5%)	2,211 (35.8%)
Junior high school	2,533 (39.9%)	1,985 (31.2%)	1,275 (20.0%)	840 (13.6%)
Senior High school or above	1,399 (22.0%)	1,235 (19.4%)	612 (9.6%)	614 (10.0%)
Monthly disposable income				
< 1,000 CNY	1,405 (22.1%)	2,246 (35.3%)	2,850 (44.8%)	3,323 (53.9%)
1,000–3,000 CNY	2,917 (46.0%)	2,821 (44.4%)	2,405 (37.8%)	1,817 (29.5%)
≥ 3,000 CNY	2,023 (31.9%)	1,289 (20.3%)	1,110 (17.4%)	1,028 (16.7%)
Occupation				
White collars	676 (10.7%)	514 (8.1%)	530 (8.3%)	628 (10.2%)
Blue collar	4,095 (64.5%)	4,116 (64.8%)	3,819 (60.0%)	3,069 (49.8%)
House working	782 (12.3%)	1,035 (16.3%)	1,197 (18.8%)	1,209 (19.6%)
Others	792 (12.5%)	691 (10.9%)	819 (12.9%)	1,262 (20.5%)
Chronic condition score				
Mean (SD)	0.51 (0.78)	0.85 (0.97)	1.09 (1.05)	1.11 (1.05)
Self-health rate				
Good	4,093 (64.5%)	3,395 (53.4%)	3,021 (47.5%)	2,699 (43.8%)
Normal	1,932 (30.4%)	2,451 (38.6%)	2,591 (40.7%)	2,644 (42.9%)
Worse	320 (5.0%)	510 (8.0%)	753 (11.8%)	825 (13.4%)

Note. SD, standard deviation.

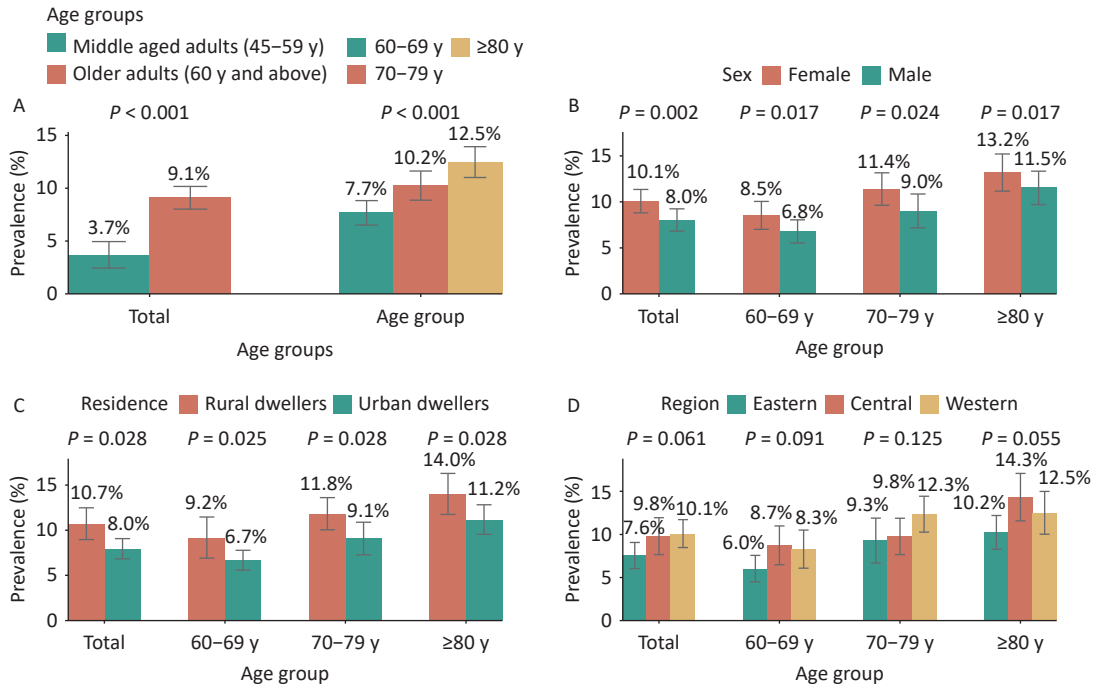

Figure 1. Prevalence (%) of olfactory dysfunction according to age, sex, residence (urban/rural) and region distribution (eastern, western, and central). (A) Prevalence across age groups; (B) Prevalence by sex within each age group; (C) Prevalence by urban and rural residence across age groups; (D) Prevalence by region (central, eastern, western) within each age group. *P*-values were calculated using chi-square.

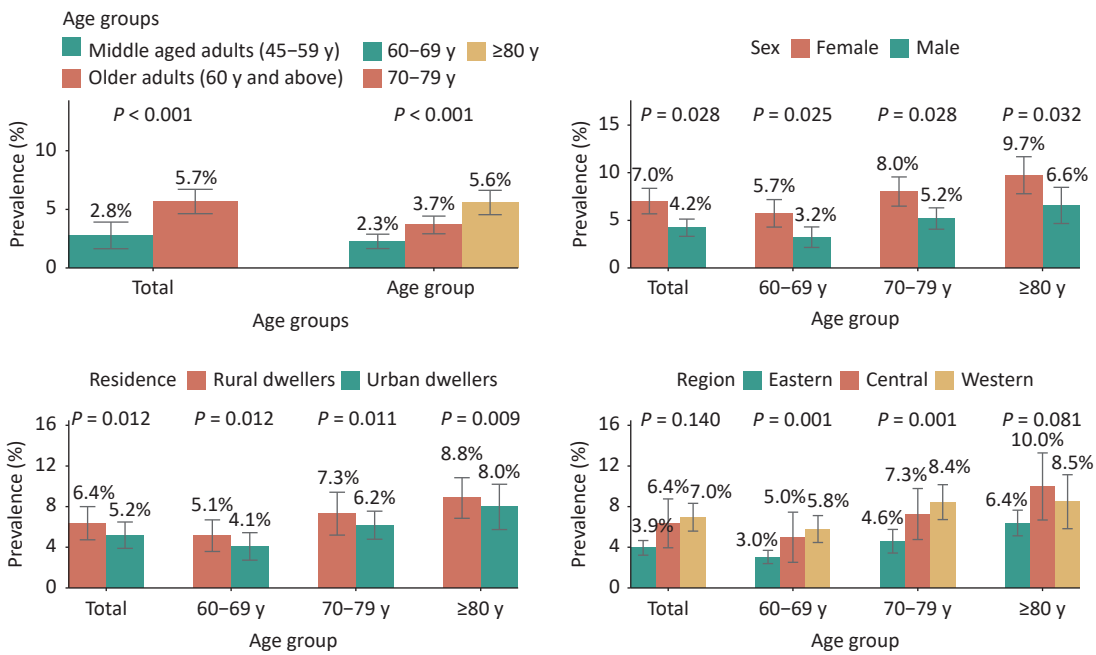

Figure 2. Prevalence (%) of taste dysfunction according to age, sex, residence (urban/rural) and region distribution (eastern, western, and central). (A) Prevalence across age groups; (B) Prevalence by sex within each age group; (C) Prevalence by urban and rural residence across age groups; (D) Prevalence by region (central, eastern, western) within each age group. *P*-values were calculated using chi-square.

rural residents than urban dwellers ($P < 0.05$ for all). The overall prevalence was 8.04% (95% *CI*: 6.83% to 9.25%) in males and 10.09% (95% *CI*: 8.82% to 11.35%) in females for self-reported olfactory dysfunction, and of 4.23% (95% *CI*: 3.32% to 5.13%) in males and 7.02% (95% *CI*: 5.68% to 8.36%) in females for self-reported taste dysfunction. Similarly, the prevalence of both self-reported olfactory and taste dysfunction was higher among rural residents compared to urban dwellers, with self-reported olfactory dysfunction reported in 10.7% (95% *CI*: 8.97% to 12.48%) of rural residents and 6.36% (95% *CI*: 4.73% to 8.00%) of urban dwellers, while self-reported taste dysfunction was reported in 7.95% (95% *CI*: 6.83% to 9.08%) of rural residents and 5.19% (95% *CI*: 3.88% to 6.49%) of urban dwellers. For both self-reported olfactory and taste dysfunction, the overall prevalence was highest in the western region, though in the ≥ 80 years age group, the central region showed a higher prevalence than both the eastern and western regions (Figures 1 and 2). Similar patterns were also shown in subtypes of self-reported olfactory and dysfunction (Supplementary Tables S1 and S2).

The prevalence of self-reported olfactory dysfunction and taste dysfunction was higher among older Chinese adults experiencing socioeconomic deprivation. For example, among older adults, widowed participants exhibited a higher prevalence of reporting both olfactory dysfunction (12.6%, 11.0% to 14.24%) and taste dysfunction (7.74%, 5.96% to 9.52%) compared to married individuals (*P*-difference < 0.05). Similarly, participants who lived alone, had never attended school, and had lower disposable income showed a higher prevalence of these dysfunctions compared to their counterparts (Tables 2 and 3).

We also examined associations between various factors and self-reported olfactory dysfunction (parosmia and anosmia) and taste dysfunction (dysgeusia and taste loss) (Suplementary Figure S1 and Suplementary Table S3). Among older adults, older age was significantly associated with a higher risk of having both self-reported olfactory and taste dysfunction, with an *OR* of 1.09 (95% *CI*: 1.00 to 1.19) for olfactory dysfunction per 10-years increase in age and 1.16 (95% *CI*: 1.05 to 1.29) for taste dysfunction. Additionally, being female was linked to higher risks of self-reported taste dysfunction (*OR* = 1.51, 95% *CI*: 1.22 to 1.86) but not with olfactory dysfunction compared to males. Central (*OR* = 1.32, 95% *CI*: 1.02 to 1.72) and Western (*OR* = 1.35, 95% *CI*: 1.03 to 1.79) region dwellers, living alone (*OR* = 1.46, 95% *CI*: 1.05 to 2.01), having chronic conditions (*OR* = 1.17, 95% *CI*: 1.09 to 1.26), and reporting worse self-rated health status (*OR* = 1.62, 95% *CI*: 1.35 to 1.95) were significantly associated with higher risks of self-reported olfactory dysfunction compared to their respective counterparts. For self-reported taste dysfunction, significant associations were observed with residence in the central regions (*OR* = 1.65, 95% *CI*: 1.13 to 2.43), western regions (*OR* = 1.78, 95% *CI*: 1.37 to 2.31), having chronic conditions (*OR* = 1.15, 95% *CI*: 1.03 to 1.28), and worse self-rated health status (*OR* = 2.42, 95% *CI*: 1.85 to 3.17). The similar patterns were also found in the subtypes of olfactory and taste dysfunction, with or without statistical significance (Suplementary Table S3).

DISCUSSION

In this nationally representative sample of Chinese adults aged 60 years and older, self-reported olfactory and taste dysfunction were common. The overall estimated prevalence of self-reported olfactory and taste dysfunction was 9.10% and 5.67%, respectively, among adults aged 60 years and older. Significant differences in the prevalence of olfactory and taste dysfunction were observed across subgroups defined by age, sex, region, and residence. Notably, the prevalence of both self-reported olfactory and taste dysfunction was higher in older adults with lower SES, including those who were widowed, living alone, had lower education levels, and had lower disposable income. In multivariable analyses, older age, residence in central and western regions, chronic conditions, and poor self-rated health were associated with higher odds of both self-reported olfactory and taste dysfunction.

Our nationally representative estimate of the overall prevalence of self-reported olfactory dysfunction (9.10%) among older adults was lower than that reported in other populations, where prevalence (primarily based on self-reported dysfunction defined by questionnaires) ranged from 16.8% to 21.6%[7,14,15], but somewhat higher than the estimates reported by some other studies (0.95% to 2.5%)[11,16,17]. Specifically, a regional study conducted in the Central US among older adults (aged 53 years and older) reported a comparable prevalence of 9.5% for self-reported olfactory dysfunction[18]. However, the questionnaires used by previous studies were different from ours, and compared with the objective measurements, self-reported olfactory

dysfunction generally has lower sensitivity, particularly at older ages, and our prevalence estimate may therefore underestimate the prevalence of objectively measured dysfunction. Differences in the criteria used to define dysfunction and variations in study populations likely contribute to those discrepancies. For example, using the subjective self-reported questionnaire (defined as occurrence of smell problems over the past year), the NHANES reported an overall prevalence of 20.1% for olfactory dysfunction among U.S. adults aged 40 and older, noting an age-related decline in olfactory function[15]. In contrast, the National Health Interview Survey (NHIS) found that only 1.4% of U.S. adults reported chronic problems with their sense of smell[19]. Differences in olfactory assessment methods may substantially contribute to the variation in prevalence estimates across studies. Studies on olfactory dysfunction in Asia are still relatively limited. A national study from Korea reported a prevalence of 6.4% for self-reported olfactory dysfunction among 12,618 participants aged 40 years and older[11]. Meanwhile, a regional community-based cross-sectional study in China's

Table 2. Prevalence (%) of self-reported olfactory dysfunction according to age and sociodemographic status

Sociol economic status (SES)	Middle aged adults	Older adults	Older adults			*P*-Difference [a]
	45–59 y	(60 y and older)	60–69 y	70–79 y	≥ 80 y	
Marital status						
Married	3.68 (2.41, 4.96)	8.45 (7.36, 9.55)	7.22 (6.06, 8.37)	9.96 (8.54, 11.38)	12.03 (10.19, 13.88)	< 0.001
Widowed	1.96 (−0.80, 4.71)	12.63 (11.01, 14.24)	12.96 (9.79, 16.13)	11.71 (9.10, 14.32)	13.27 (11.40, 15.14)	
Divorced/Separated/Never married	4.73 (1.66, 7.79)	8.30 (3.76, 12.84)	8.77 (2.19, 15.35)	7.79 (3.09, 12.49)	6.57 (1.33, 11.80)	
Living arrangement						
Living with spouse	3.94 (2.68, 5.19)	8.38 (7.17, 9.59)	7.52 (6.12, 8.93)	8.80 (7.36, 10.23)	12.57 (10.29, 14.85)	<0.001
Living with Children or others	3.30 (1.68, 4.91)	8.81 (7.41, 10.22)	6.52 (4.83, 8.21)	11.94 (9.63, 14.24)	11.92 (10.09, 13.74)	
Living alone	5.48 (2.62, 8.34)	13.08 (10.54, 15.62)	13.49 (8.54, 18.45)	12.42 (9.13, 15.71)	13.37 (10.69, 16.06)	
Education level						
Never attended school	5.52 (2.71, 8.33)	11.98 (10.31, 13.65)	10.68 (8.39, 12.97)	12.15 (9.50, 14.80)	14.05 (11.69, 16.42)	0.003
Primary school	5.43 (3.50, 7.35)	9.65 (8.29, 11.02)	8.28 (6.24, 10.32)	10.43 (8.38, 12.48)	12.28 (10.26, 14.30)	
Junior high school	3.03 (1.73, 4.34)	6.95 (5.36, 8.53)	6.37 (4.48, 8.27)	8.03 (6.05, 10.01)	9.16 (6.98, 11.33)	
Senior High school or above	2.37 (1.15, 3.59)	6.88 (3.99, 9.77)	6.21 (3.04, 9.39)	8.03 (3.86, 12.19)	10.57 (7.35, 13.78)	
Income						
< 1,000 CNY	5.93 (3.63, 8.24)	10.88 (9.42, 12.34)	8.96 (7.10, 10.83)	11.96 (9.99, 13.92)	13.90 (11.99, 15.8)	<0.001
1,000–3,000 CNY	3.47 (2.42, 4.52)	8.06 (6.80, 9.31)	7.37 (5.77, 8.97)	8.68 (7.25, 10.12)	10.95 (8.73, 13.18)	
≥ 3,000 CNY	2.70 (1.30, 4.10)	7.13 (5.63, 8.64)	5.97 (4.55, 7.39)	8.54 (5.49, 11.60)	9.88 (7.48, 12.27)	
Occupation						
White collars	2.44 (0.45, 4.43)	8.33 (3.11, 13.55)	7.21 (−0.15, 14.58)	9.26 (4.64, 13.87)	10.39 (7.36, 13.43)	0.309
Blue collars	4.26 (2.57, 5.95)	8.43 (7.21, 9.66)	7.27 (5.86, 8.68)	9.32 (7.81, 10.82)	12.31 (10.64, 13.97)	
House working	3.72 (1.76, 5.69)	10.13 (7.51, 12.76)	9.16 (6.67, 11.65)	13.18 (10.18, 16.17)	12.65 (9.60, 15.70)	
Others	1.97 (0.86, 3.09)	8.33 (3.11, 13.55)	8.03 (4.35, 11.71)	10.78 (6.95, 14.62)	13.63 (10.28, 16.97)	

Note. [a] *P*-values were calculated using chi-square.

Ningxia province observed a prevalence of 4.7% for self-reported olfactory dysfunction among participants with a mean age of 34 years. This study also identified age-related decline in olfactory function and a higher prevalence in females compared to males—patterns consistent with our current findings[20]. However, both studies focused on younger populations, utilized different olfactory assessment questionnaires, which may account for variations in prevalence estimates.

Only a limited number of epidemiological studies have estimated the prevalence of taste dysfunction. Data from NHANES (adults aged > 40 years) and NIHS (adults aged > 18 years) reported a prevalence of 9.5% and 0.6%, respectively, based on self-reported taste impairment[15,19]. Our questionnaire was the same as that used in NHIS, measuring perceived taste dysfunction lasting for at least 3 consecutive months. This stricter criterion may explain the lower prevalence compared to NHANES, which assessed any taste problems occurring over the past year. Most studies that assess both self-reported olfactory and taste function have found that the prevalence of olfactory dysfunction was

Table 3. Prevalence (%) of self-reported taste dysfunction according to age and sociodemographic status.

Sociol economic status (SES)	Middle aged adults	Older adults	Older adults			*P*-Difference [a]
	45-59 y	(60 y and older)	60–69 y	70–79 y	≥ 80 y	
Marital status						
Married	2.75 (1.62, 3.89)	5.29 (4.27, 6.30)	4.32 (3.32, 5.32)	6.44 (5.25, 7.62)	8.20 (6.08, 10.32)	0.009
Widowed	0.95 (−0.45, 2.36)	7.74 (5.96, 9.52)	6.37 (3.50, 9.24)	7.67 (5.22, 10.12)	8.75 (6.89, 10.60)	
Divorced/Separated/Never married	4.21 (0.48, 7.93)	5.54 (1.28, 9.80)	5.63 (−0.54, 11.81)	5.69 (0.09, 11.29)	4.58 (0.05, 9.10)	
Living arrangement						
Living with spouse	3.12 (1.93, 4.32)	5.11 (4.10, 6.12)	4.28 (3.20, 5.36)	5.92 (4.53, 7.31)	7.80 (5.89, 9.70)	0.026
Living with children or others	2.16 (0.92, 3.40)	5.75 (4.18, 7.31)	4.21 (2.51, 5.92)	7.58 (5.28, 9.89)	8.22 (6.02, 10.42)	
Living alone	5.84 (1.79, 9.89)	7.92 (5.64, 10.20)	7.18 (2.57, 11.80)	7.58 (4.86, 10.30)	9.55 (7.27, 11.84)	
Education level						
Never attended school	5.93 (2.49, 9.37)	8.18 (6.57, 9.79)	7.07 (4.86, 9.28)	8.48 (6.51, 10.45)	9.71 (7.84, 11.58)	0.003
Primary school	3.43 (1.60, 5.27)	5.13 (3.92, 6.34)	3.76 (2.12, 5.39)	6.04 (4.69, 7.39)	7.41 (5.27, 9.56)	
Junior high school	2.89 (1.60, 4.17)	4.80 (3.47, 6.12)	4.03 (2.63, 5.43)	6.50 (4.32, 8.68)	6.87 (4.64, 9.09)	
Senior High school or above	1.06 (0.39, 1.73)	4.25 (2.15, 6.35)	3.98 (1.58, 6.37)	3.76 (0.63, 6.89)	7.96 (3.97, 11.96)	
Income						
< 1,000 CNY	5.13 (2.58, 7.68)	7.29 (6.03, 8.54)	6.15 (4.81, 7.49)	7.87 (6.12, 9.62)	9.17 (7.71, 10.63)	0.004
1,000–3,000 CNY	2.36 (1.55, 3.17)	4.34 (3.19, 5.48)	3.35 (2.06, 4.65)	5.41 (4.05, 6.76)	7.95 (4.75, 11.14)	
≥ 3,000 CNY	1.98 (0.84, 3.12)	4.76 (3.35, 6.17)	4.05 (2.35, 5.75)	5.71 (3.68, 7.75)	6.18 (3.73, 8.64)	
Occupation						
White collars	1.40 (0.31, 2.48)	5.36 (2.38, 8.33)	4.94 (0.81, 9.07)	5.88 (2.16, 9.60)	5.75 (2.74, 8.77)	0.962
Blue collars	3.04 (1.47, 4.60)	5.64 (4.43, 6.84)	4.41 (3.19, 5.63)	6.98 (5.55, 8.41)	8.59 (6.85, 10.34)	
House working	4.56 (2.62, 6.49)	5.62 (3.99, 7.25)	5.00 (2.74, 7.26)	6.73 (4.15, 9.31)	7.78 (4.89, 10.67)	
Others	1.15 (0.13, 2.18)	5.36 (2.38, 8.33)	3.86 (2.07, 5.65)	5.36 (3.37, 7.35)	9.58 (6.07, 13.09)	

Note. [a]*P*-values were calculated using chi-square.

higher than that of taste dysfunction[7,15,19]. However, studies using objective measures often showed the opposite, with taste disorders being more prevalent than olfactory dysfunction, suggesting that taste dysfunction may frequently go unnoticed in daily life[10,21].

In the current study, the prevalence of both self-reported olfactory and taste dysfunction was higher in females than in males, which contrasts with findings from studies conducted in Western countries using objective tools[10,22,23]. The higher prevalence of perceived dysfunction among women should be interpreted cautiously, because it may reflect sex differences in symptom awareness and health-reporting behavior rather than a higher burden of objectively measured chemosensory impairment. Previous research has demonstrated significant sex differences in health-reporting behaviors, with females more likely to report poorer health across various outcomes compared to males[24]. We also found that individuals with lower SES (widowed, living alone, having no formal education, or lower disposable income) had a higher prevalence of olfactory and taste dysfunction. These findings align with previous research on the impact of socioeconomic factors[3,9,23,25,26]. Previous studies have suggested that differences in healthcare access, occupational exposures, and other socioeconomic conditions may partly contribute to the association between lower SES and chemosensory dysfunction[27]. Moreover, chronic conditions were associated with a higher prevalence of self-reported olfactory and taste dysfunction, consistent with previous studies reporting associations of cardiovascular disease, diabetes, stroke, cancer, and hypertension with chemosensory problems[28-31]. However, medication use was not comprehensively assessed in our study and may partly contribute to the observed association between chronic conditions and chemosensory dysfunction. We also observed geographical variation in self-reported chemosensory dysfunction, with higher prevalence among older adults living in central and western China than among those in eastern China. These associations remained after adjustment for individual-level demographic, socioeconomic, and health characteristics, suggesting that the regional differences may not be explained solely by differences in population composition. One possible explanation is regional variation in environmental exposures. Air pollution shows substantial spatial heterogeneity across China, with areas of high $PM_{2.5}$ concentrations reported in central China and parts of western China[32]. Previous epidemiological studies have also linked long-term particulate matter exposure with poorer olfactory function, providing a possible pathway through which environmental conditions may contribute to geographical variation in olfactory dysfunction[33]. Regional differences in nutritional status may also be relevant, particularly for taste function. National nutrition survey data have shown a higher prevalence of inadequate micronutrient intake in central and western China than in eastern China, while deficiencies in nutrients such as zinc have been associated with impaired taste function[34]. In addition, healthcare resources remain unevenly distributed across China, with greater concentration of medical resources in the eastern region. Such differences may affect the prevention and management of conditions that contribute to chemosensory dysfunction, although their influence on self-reported symptoms is likely complex[35]. Importantly, environmental exposures, micronutrient status, and regional healthcare resources were not directly assessed in our study. These explanations therefore remain speculative and should be examined in future studies incorporating both individual- and area-level characteristics.

Existing research consistently reported good specificity (the correct identification of normal function) but lower sensitivity (the correct identification of dysfunction) for self-reported olfactory and taste ability[9,14,36,37]. This discrepancy is particularly evident among older adults, who often struggle to recognize the decline in their chemosensory functions[15,38]. Thus, our estimates may underestimate the prevalence of objectively measured dysfunction, particularly among the oldest participants. Misclassification may also have affected the observed associations with demographic and health characteristics. If such misclassification was largely nondifferential across exposure groups, the associations would generally be expected to be attenuated; however, differences in symptom recognition or reporting by age, sex, SES, or health status could result in differential misclassification, for which the direction of bias is less predictable. Future studies combining self-reported symptoms with objective chemosensory testing are needed to better characterize the burden and associated factors of olfactory and taste dysfunction in older adults.

This is the first nationally representative study to estimate the prevalence of self-reported olfactory and taste impairment among men and women aged 60 years and older in China. Our findings also

identified several demographic and health characteristics associated with self-reported chemosensory dysfunction. Notably, our analysis suggested that self-reported chemosensory dysfunction was relatively common among older Chinese adults. However, this study has several limitations. First, the survey was conducted from December 2023 to February 2024, approximately one year after the large nationwide SARS-CoV-2 wave in China during December 2022–January 2023[39]. Smell and taste dysfunction related to COVID-19 usually develops during acute infection and resolves within weeks to months in most patients[40], making it unlikely that the dysfunction captured in this survey reflects the acute phase of that wave. However, persistent chemosensory dysfunction lasting 12 months or longer has been reported in a subset of previously infected individuals[40,41], and smaller epidemic waves and reinfections occurred during 2023. Because SARS-CoV-2 infection history was not collected, COVID-19-related dysfunction could not be distinguished from dysfunction due to aging or other causes, and some of the observed cases may still have been related to previous infection. If persistent post-infectious dysfunction differed across age, regional, or socioeconomic groups, the associations with these factors may also have been affected. Second, Olfactory and taste dysfunction were assessed by self-report rather than objective testing. Self-reported measures generally have lower sensitivity than objective tests, and older adults in particular often do not recognize gradual chemosensory decline[38]. Our prevalence estimates are therefore likely to underestimate the prevalence of objectively measured dysfunction, especially in the oldest age groups. Such misclassification is also unlikely to be random, as awareness and reporting of sensory impairment may vary with age, cognitive function, education, and socioeconomic conditions[42]. If underreporting were similar across groups, the observed associations would generally be attenuated toward the null; if it differed across groups, associations could be biased in either direction. Studies combining self-reported symptoms with objective chemosensory testing are needed to better quantify the burden and correlates of olfactory and taste dysfunction in older populations. Third, the cross-sectional study design limits our ability to establish temporality or causality for the observed associations. Finally, residual and unmeasured confounding cannot be excluded. Several established correlates of chemosensory dysfunction, including smoking, alcohol consumption, medication use, previous COVID-19 infection, sinonasal diseases, neurological disorders, occupational exposures, and environmental factors, were not comprehensively available in our dataset. Some of these factors follow the same demographic and regional patterns as the dysfunction itself; for example, smoking prevalence differs markedly by sex and region and could account for part of the corresponding differences in prevalence. The multivariable results should therefore be interpreted as adjusted associations rather than independent effects.

CONCLUSION

This study, based on a nationally representative sample of the Chinese population, highlights that a significant proportion of older Chinese adults experience olfactory or taste dysfunction. The prevalence was higher among older adults, females, rural residents, individuals living in central and western regions, and those with lower SES. Indentified factors which were associated with altered prevalenc of olfactory and taste dysfunction included aging, sex, region, living alone, chronic condition scores, and self-rated health. Given that chemosensory loss can serve as an early indicator for frailty and neurodegenerative diseases, these findings underscore the need for greater clinical awareness and screening. Future prospective studies are needed to more clearly establish the links between these and other potential risk factors and the development of chemosensory disturbances.

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Data Sharing The dataset are available from the corresponding author upon reasonable request. The supplementary materials will be available in www.besjournal.com.

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