Sexual activity, sexual satisfaction and their correlates among older adults in China: findings from the sexual well-being (SWELL) study

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Summary

Background Sexual activity is important to the holistic health of older adults. However, the sexual lives of older adults are understudied. We aimed to investigate the prevalence and correlates of sexual activity and sexual satisfaction among older adults in China.

Methods In this multi-centre cross-sectional study, individuals aged 50 years and older were recruited from four regions in China between June 2020 and December 2022. An investigator-administered questionnaire was completed to collect information on socio-demographics, health status (general health and specific health), and sexual health characteristics. Sexual activity (including vaginal, oral, or anal sex) in the past year was treated as sexually active. Sexual satisfaction was measured using a validated five-point Likert scale. Logistic regression was used to assess correlates of sexual activity and sexual satisfaction.

Findings 3001 older adults (1182 women and 1819 men, mean age 60.3 ± 7.8 years) were recruited. Most participants were living in urban areas (1688, 56.2%), in a stable relationship (2531, 84.3%), and satisfied with life (2141, 71.3%). 46.8% of men and 40.7% of women were sexually active. Better self-reported general health status (good: aOR 0.53, 95% CI 0.34–0.82; fair: 0.47, 0.29–0.76; bad or very bad: 0.58, 0.35–0.96; versus very good), no difficulty walking upstairs (0.63, 0.41–0.97), diabetes (0.64, 0.42–0.98), and menopause (0.57, 0.36–0.92), were associated with sexual activity among women. Such an association was not found among men. Among sexually active participants, about three-quarters (men: 73.6%, women: 73.4%) were sexually satisfied. Self-reported general health status (men [good: 0.25, 0.12–0.53; fair: 0.17, 0.08–0.37; bad or very bad: 0.15, 0.06–0.34]; women [good: 0.27, 0.10–0.70; fair: 0.11, 0.04–0.30; bad or very bad: 0.11, 0.04–0.32]), life satisfaction (men: 1.73, 1.22–2.46; women: 2.23, 1.34–3.71) and talking about sexual preferences with a partner (men: 1.77, 1.23–2.56; women: 2.93, 1.69–5.09) were associated with sexual satisfaction.

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Abbreviations: SWELL study, Sexual well-being among older adults in China study; NSHAP, National Social Health and Ageing Project; Natsal, the National Survey of Sexual Attitudes and Lifestyles; ELSA, English Longitudinal Study of Ageing; CDC, Centre for Disease Control and Prevention; PHQ-2, 2-item Patient Health Questionnaire; aOR, Adjusted odds ratio; 95% CI, 95% confidence interval

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Interpretation Older adults who had better health status and talked easily with their partners about their sex life were more likely to report sexual satisfaction. For women, better self-reported general health status and lack of disability were associated with sexual activity. Further research should address measures that improve sexual satisfaction, especially among sexually active older adults.

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Keywords: Aging; Older adults; Sexual behavior; Sexually active; Sexual satisfaction

Research in context

Evidence before this study

The number of older adults (defined as aged 50 years and above) continue to increase in China. Many studies have demonstrated that various factors were associated with sexual behavior characteristics, such as age, general health, and specific health conditions. Prior research mainly concentrated on sexual behavior characteristics in younger adults aged 18–44 years and was conducted in developed settings. Studies assessing sexual behavior characteristics and their influencing factors among older adults in China are still lacking.

Added value of this study

As far as we know, our analysis is the first study to elucidate the correlates of sexual behavior characteristics among older adults aged 50 years and older in China. About half of the older adults in our study remained sexually active, and most were satisfied with their sex life. We found that health characteristics (including general and mental health) were associated with sexual behavior characteristics (i.e., sexual activity and sexual life satisfaction), but there is a sex difference in the effect on sexual activity. However, our study also demonstrated that poor health status did not mean active or satisfying sex life disappeared. Besides, we found that participants who talked easily with their partners about their sex life were more likely to report sexual satisfaction. These findings, based on representative data from the SWELL study, provide insights into sexual activity and sexual satisfaction among older adults and may contribute to achieving overall health and well-being among older adults in China.

Implications of all the available evidence

Sexual health promotion could be a component of holistic healthcare for older adults with poor health status. Communication about sex between partners was crucial, even the potential touch point for achieving sexual satisfaction. Our findings should help healthcare practitioners to consider incorporating health education programs about sexual behavior characteristics into public health services to promote the overall well-being of older adults.

Introduction

Sexual health is an important indicator of health and well-being across the life course.[1] As a component of sexual health, sexual activity has been shown to be associated with a number of benefits for health among older adults,[2] including maintaining higher physical activity/energy levels,[3] improving mental and physical health outcomes,[1] reducing all-cause mortality,[4] and facilitating the ageing process.[3] Sexual activity declines with increasing age and this may be one reason why older adults' sexual activity has been neglected.[5] As the global population continues to age, the topic of sexual activity and overall sexuality in older adults has become increasingly relevant. For a growing number of older adults, sexual activity remains an important part of their lives.[6] Therefore, exploring the complexities of sexual activity in older adults is a challenging and crucial area in research and healthcare settings.

Studies showed that even though the frequency might change, adults remain sexually active in older age. For example, the National Social Health and Ageing Project (NSHAP) in America,[7] the National Survey of Sexual Attitudes and Lifestyles (Natsal) in Britain,[8] and English Longitudinal Study of Ageing (ELSA) in England[9] all describe the sexual activity of older adults. As vulnerable populations, the sexual health of older adults may be particularly compromised.[10] Despite the growing discussion around sexuality and sexually transmitted infections among older adults there is limited research available on characteristics of sexual behaviour and their associations among older adults. Some studies demonstrated that various factors were associated with sexual behaviours, such as age,[7] general health (e.g. self-reported health status, and physical capability),[8,9] and specific health conditions (e.g. cardiac or vascular diseases, hypertension, diabetes, bone or muscle diseases, and depressive symptoms).[7,11] However, most evidence

from previous studies was conducted in high-income countries, and most of these studies about sexual health excluded older adults or mixed older adults and other populations.

China is striding towards an aging society. Data from the National Census of China in 2021 showed that 260 million people in China were over the age of 60, accounting for 18.7% of the country's total population.[12] By 2050, older adults will account for 26.1% of the country's total population.[13] The rapidly increasing numbers of people were living long, healthy, and potentially sexually active lives. As part of the healthy ageing goal, understanding their sexual activity and sexual satisfaction is paramount. However, Chinese old adults are embarrassed or even feel immoral to talk about their sexual needs.[14] It has led to a situation where the sexual needs of older people are often easily ignored in Chinese tradition. So, in the past decades, there was a lack of large-scale surveys that focused on sexual health among older adults in China. In this context, the sexual well-being among older adults in China (SWELL) study, which is a multicentric cross-sectional study focused on older adults aimed at elucidating the current status of sexual health, has emerged. Older adults experience potential biological and social changes during 50–60 years.[15] Considering this transition period, we defined older adults as 50 years and above in SWELL Study. This study aimed to investigate the prevalence and correlates of sexual activity and sexual satisfaction among older adults in China by analysing the SWELL study dataset.

Methods

Study design and data collection

This study is a multicentre cross-sectional survey called Sexual well-being among older adults in China (SWELL) study, which was conducted from September 2021 to July 2022. Details about the study methodology were described elsewhere.[16] Briefly, a multistage sampling design was used in the SWELL study.[16] Participants were recruited from five cities in four regions in China, including Shanghai [Eastern China], Jinan [Eastern China], Chongqing [Western China], Guangzhou [Southern China], and Tianjin [Northern China]. In-person interviews were conducted to collect data, including demographic characteristics, health characteristics, and sexual health characteristics. The investigators were from the local Centre for Disease Control and Prevention (CDC) or local medical university, and receive standard training for data collection. All participants had given informed consent before the survey.

Study participants

Participants were recruited from subdistricts in each selected city. Participants should meet the following eligibility criteria: 1) aged ≥50 years; 2) have been prior sexually active or initiated prior sexual activities (including oral, vaginal, or anal sex); 3) were able to understand the survey instrument.

Ethical consideration

All participants provided oral informed consent for interviews. The SWELL study was approved by the School of Public Health (Shenzhen), Sun Yat-sen University Research Ethics Committee (approval number SYSU-PHS [2019] 006), and was performed in accordance with the Helsinki Declaration.

Measures

Demographic characteristics

Age, sex (male/female), relationship status (not in a stable relationship/in a stable relationship), education levels (primary school or below, middle school, high school or above), and living area (rural/urban) were included in demographic characteristics. Age was categorized into three age groups (50–59, 60–69, and 70+).

Life satisfaction was measured using a validated five-point Likert scale, which asked participants to rate their agreement with the statement "I am satisfied with my life". The scale ranged from 1 (strongly disagree) to 5 (strongly agree), with higher ratings indicating higher levels of life satisfaction.[17] The scale has been previously used and validated in Chinese populations.[18] Participants who indicated agreement or strong agreement (4–5) were considered to be satisfied with their life.

Health characteristics

General health characteristics. Self-reported general health status was measured by a widely cited and validated question "How do you feel about your health status ?" (1 for very bad to 5 for very good).[19–22] For this study, the responses were re-categorized from the original five categories into four groups (very good, good, fair, and bad or very bad). The physical capability was measured by asking participants whether they had difficulty going upstairs or walking because of health problems.[23]

Specific health characteristics. Participants were asked to report whether they had any of the conditions listed, including hypertension, diabetes (including both type I and type II diabetes), menopause (only for women), and backache, or bone or muscle disease.

Depressive symptoms were measured by the 2-item Patient Health Questionnaire (PHQ-2).[24] Probable depressive symptoms were defined as a summed score that was ≥3.[25] The PHQ-2 has been previously used and validated in Chinese populations,[26] and it was found to have good reliability (Cronbach $\alpha = 0.80$).[27] The internal consistency was good in the PHQ-2 scale applied in the current sample (Cronbach's alpha = 0.83).

Sexual health characteristics. All participants were asked to report sexual activity (including vaginal, oral, or anal sex) in the past year, and in response to the statement

that "Talking about sexual preferences with your partner is always easy" (agreed/disagreed).[28] Sexual activity (including vaginal, oral, or anal sex) in the past year was treated as sexually active.[7] Only sexually active older adults were asked whether they agreed with the statement "I feel satisfied with my sex life" (1–5, disagreed strongly to agreed strongly).[29] Referring to the previous study,[8] those answering that they agreed or agreed strongly were defined as satisfied with their sex life.

Statistical analyses

Descriptive analyses, including percentage, mean, and standard deviation, were presented to characterize the study sample. The Chi-square test was conducted to compare the proportions of characteristics between groups. To account for sex-dependent associations with sexuality,[29] we stratified our analyses by sex. The outcome variables (i.e., sexual activity and sexual satisfaction) in our study were dichotomous, so the associations with outcome variables were analysed by multivariable logistic regression models. The assumptions for conducting logistic regressions (including multicollinearity [addressed by correlation matrixes], linearity [not applicable, all our variables are categorical], independence [assessed by residuals against the order of the observations], and outliers [addressed by absolute standardized residuals], details were shown in the Appendix), were checked and confirmed to be fulfilled. We included all potentially relevant variables in our analysis through variable selection and then looked for statistically significant predictors. Adjusted odds ratio (aOR), and the 95% confidence interval (95% CI) were estimated. The statistical significance was set as $P < 0.05$. The statistical analyses originally planned to be conducted using SPSS v.24.0 and SAS v.9.4 were instead performed using Python version 3.8, (leveraging the following libraries: pandas v2.0.0, numpy v1.24.2, scipy v1.10.1), because of its greater flexibility and functionality in conducting the analyses.

Role of the funding source

The study funder had no role in the study design, data collection, data analysis, data interpretation, or writing of the manuscript. The corresponding author had full access to the data and the final responsibility to submit for publication.

Results

Demographic and health characteristics of the participants

As shown in Table 1, a total of 3001 older adults from five cities participated in the study, among whom 1182 (39.4%) were women, and 1819 (60.6%) were men. The average age was 64.0 ± 8.4 (ranging from 50 to 92). Over half of the participants lived in urban areas (men: 57.3%, women: 54.6%). Most reported their highest education below high school (men: 74.7%, women: 73.4%). The majority of participants were in a stable relationship (men: 87.7, women: 79.1%) and were satisfied with life (men: 71.6%, women: 70.9%). Hypertension was the most prevalent chronic health condition among participants, followed by diabetes. 18.1% of male participants and 24.5% of female participants reported bad or very bad general health status.

Prevalence of sexual activity

Overall, 46.8% of male participants and 40.7% of female participants had sexual activity during the last 12 months (sexually active). There is a negative association between the prevalence of sexual activity and age (Fig. 1). Compare to female older adults, the prevalence of sexual activity among male older adults was higher in each successive age group (Fig. 1).

Correlates of sexual activity

The results of multivariable logistic regression analysis stratified by sex, with being sexually active as an outcome variable, are shown in Table 2.

Among the sociodemographic variables, we observed some similar variables associated with sexual activity in different sex. In particular, for male older adults, age (aged 60–69 years: aOR 0.38, 95% CI 0.30–0.49; aged 70 years and older: 0.16, 0.12–0.22), living in urban areas (0.36, 0.29–0.45) were less prone to be sexually active. Male older adults with higher education (middle school: 1.57, 1.20–2.05; high school and above: 1.82, 1.32–2.49) and being in a stable relationship (4.15, 2.84–6.07) were more likely to be sexually active. Female older adults with older age (aged 60–69 years: 0.38, 0.28–0.51; aged 70 years and older: 0.24, 0.16–0.36), living in urban areas (0.49, 0.36–0.66) were less prone to be sexually active. Having high school and above education (1.72, 1.15–2.58), and being in a stable relationship (7.46, 4.79–11.63) were associated with being sexually active among female older adults.

Furthermore, we found the following items among the health characteristic variables negatively associated with being sexually active among female older adults: poor self-reported general health status (reference group: very good; good: 0.53, 0.34–0.82; fair: 0.47, 0.29–0.76; bad or very bad: 0.58, 0.35–0.96), having difficulty walking upstairs (0.63, 0.41–0.97), having diabetes (0.64, 0.42–0.98), and menopause (0.57, 0.36–0.92).

Prevalence of sexual satisfaction

Of those who were sexually active, about three-quarters of participants (men: 73.6%, women: 73.4%) were satisfied with their sex life. There does not appear to be any association between the prevalence of sexual satisfaction and age (Fig. 1).

Characteristics	Men				Women			
	All age groups	50–59 years	60–69 years	70+ years	All age groups	50–59 years	60–69 years	70+ years
Overall	1819	660	679	480	1182	462	465	255
Demographic characteristics								
City								
Shanghai	495 (27.2)	230 (34.8)	165 (24.3)	100 (20.8)	335 (28.3)	144 (31.2)	120 (25.8)	71 (27.8)
Tianjin	510 (28.0)	229 (34.7)	160 (23.6)	121 (25.2)	266 (22.5)	127 (27.5)	83 (17.8)	56 (22.0)
Guangzhou	195 (10.7)	16 (2.4)	99 (14.6)	80 (16.7)	180 (15.2)	18 (3.9)	93 (20.0)	69 (27.1)
Jinan	137 (7.5)	60 (9.1)	42 (6.2)	35 (7.3)	89 (7.5)	50 (10.8)	22 (4.7)	17 (6.7)
Chongqing	482 (26.5)	125 (18.9)	213 (31.4)	144 (30.0)	312 (26.4)	123 (26.6)	147 (31.6)	42 (16.5)
Living area								
Rural	776 (42.7)	285 (43.2)	289 (42.6)	202 (42.1)	537 (45.4)	216 (46.8)	198 (42.6)	123 (48.2)
Urban	1043 (57.3)	375 (56.8)	390 (57.4)	278 (57.9)	645 (54.6)	246 (53.2)	267 (57.4)	132 (51.8)
Highest education attained								
Primary school or below	440 (24.2)	116 (17.6)	148 (21.8)	176 (36.7)	371 (31.4)	105 (22.7)	137 (29.5)	129 (50.6)
Middle school	919 (50.5)	342 (51.8)	359 (52.9)	218 (45.4)	497 (42.0)	211 (45.7)	207 (44.5)	79 (31.0)
High school or above	460 (25.3)	202 (30.6)	172 (25.3)	86 (17.9)	314 (26.6)	146 (31.6)	121 (26.0)	47 (18.4)
Relationship status								
Not in a steady relationship	223 (12.3)	60 (9.1)	66 (9.7)	97 (20.2)	247 (20.9)	73 (15.8)	86 (18.5)	88 (34.5)
In a steady relationship	1596 (87.7)	600 (90.9)	613 (90.3)	383 (79.8)	935 (79.1)	389 (84.2)	379 (81.5)	167 (65.5)
Satisfied with life								
No	516 (28.4)	185 (28.0)	168 (24.7)	163 (34.0)	344 (29.1)	153 (33.1)	107 (23.0)	84 (32.9)
Yes	1303 (71.6)	475 (72.0)	511 (75.3)	317 (66.0)	838 (70.9)	309 (66.9)	358 (77.0)	171 (67.1)
Health characteristics								
General health								
Self-reported general health status								
Very good	199 (10.9)	90 (13.6)	71 (10.5)	38 (7.9)	139 (11.8)	57 (12.3)	59 (12.7)	23 (9.0)
Good	807 (44.4)	304 (46.1)	328 (48.3)	175 (36.5)	459 (38.8)	176 (38.1)	210 (45.2)	73 (28.6)
Fair	483 (26.6)	157 (23.8)	175 (25.8)	151 (31.5)	295 (25.0)	126 (27.3)	95 (20.4)	74 (29.0)
Bad or very bad	330 (18.1)	109 (16.5)	105 (15.5)	116 (24.2)	289 (24.5)	103 (22.3)	101 (21.7)	85 (33.3)
Difficulty walking upstairs because of a health problem								
No	1583 (87.0)	615 (93.2)	601 (88.5)	367 (76.5)	990 (83.8)	425 (92.0)	406 (87.3)	159 (62.4)
Yes	236 (13.0)	45 (6.8)	78 (11.5)	113 (23.5)	192 (16.2)	37 (8.0)	59 (12.7)	96 (37.6)
Specific health								
Hypertension								
No	1120 (61.6)	431 (65.3)	423 (62.3)	266 (55.4)	782 (66.2)	332 (71.9)	319 (68.6)	131 (51.4)
Yes	699 (38.4)	229 (34.7)	256 (37.7)	214 (44.6)	400 (33.8)	130 (28.1)	146 (31.4)	124 (48.6)
Diabetes								
No	1533 (84.3)	544 (82.4)	587 (86.5)	402 (83.8)	1019 (86.2)	417 (90.3)	396 (85.2)	206 (80.8)
Yes	286 (15.7)	116 (17.6)	92 (13.5)	78 (16.2)	163 (13.8)	45 (9.7)	69 (14.8)	49 (19.2)
Backache, or bone or muscle disease for >3 months								
No	1716 (94.3)	626 (94.8)	644 (94.8)	446 (92.9)	1089 (92.1)	440 (95.2)	420 (90.3)	229 (89.8)
Yes	103 (5.7)	34 (5.2)	35 (5.2)	34 (7.1)	93 (7.9)	22 (4.8)	45 (9.7)	26 (10.2)
Depressive symptoms[a]								
No	1792 (98.5)	646 (97.9)	671 (98.8)	475 (99.0)	1156 (97.8)	453 (98.1)	451 (97.0)	252 (98.8)
Yes	27 (1.5)	14 (2.1)	8 (1.2)	5 (1.0)	26 (2.2)	9 (1.9)	14 (3.0)	3 (1.2)

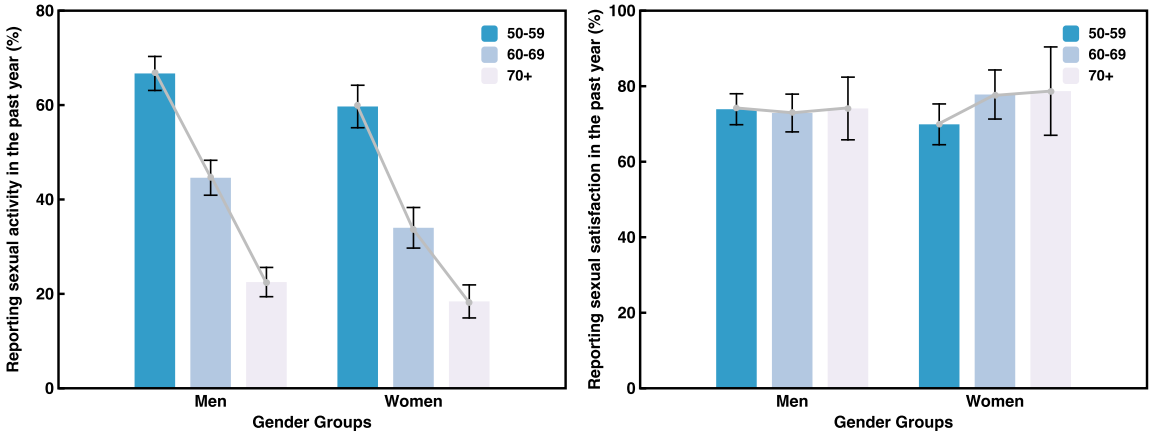
Notes: Sexual activity was defined as one or more occasion of vaginal, oral, or anal sex in the past year. [a]Respondents were asked with 2-item Patient Health Questionnaire (PHQ-2).

Table 1: **Demographic and health characteristics of older adults, by age group and sex.**

Correlates of sexual satisfaction

Table 3 presented the results from multivariable logistic regression analyses on sexual satisfaction, performed separately for sex.

We found the following sociodemographic variables associated with sexual satisfaction among male older adults: living in urban areas (0.58, 0.40–0.84) and having more education (middle school: 2.46, 1.62–3.73; high



Sex	Reporting sexual activity in the past year n (%)		
Men	440 (66.7)	303 (44.6)	108 (22.5)
Women	276 (59.7)	158 (34.0)	47 (18.4)

Sex	Reporting sexual satisfaction in the past year n (%)		
Men	325 (73·9)	221 (72·9)	80 (74·1)
Women	193 (69·9)	123 (77·8)	37 (78·7)

Fig. 1: Reporting of sexual activity (left) and sexual satisfaction (right) in the past year by sex and age.

school and above: 2.82, 1.68–4.71). Unlike the results among male older adults, having high school or above education (2.52, 1.22–5.21) was the only demographic variable associated with sexual satisfaction among female older adults.

Self-reported general health status (reference group: very good; good: 0.25, 0.12–0.53; fair: 0.17, 0.08–0.37; bad or very bad: 0.15, 0.06–0.34), having difficulty walking upstairs (0.58, 0.34–0.99) were negatively associated with sexual satisfaction among male older adults. Similar patterns on similar variables were observed among female participants, although there was a marginal difference. Female older adults with relatively poor self-reported general health status (good: 0.27, 0.10–0.70; fair: 0.11, 0.04–0.30; bad or very bad: 0.11, 0.04–0.32) were less likely to report sexual satisfaction.

In addition, life satisfaction (men: 1.73, 1.22–2.46; women: 2.23, 1.34–3.71) and talking about sexual preferences with a partner (men: 1.77, 1.23–2.56; women: 2.93, 1.69–5.09) were both positive associations with sexual satisfaction.

Discussion

This study aimed to investigate the prevalence and correlates of sexual activity and sexual satisfaction among older adults in China. To our knowledge, this is the first multi-centre study to report sexual health characteristics (including sexual activity and sexual satisfaction) and their correlates among older adults in China. We found that many older adults remained sexually active status. Poor self-reported general health status, limited physical capability (i.e., having difficulty walking upstairs), and menopause were associated with decreased sexual activity among female older adults in China. Furthermore, our study showed a sex difference in the associations between health factors and sexual activity. Better self-reported general health status and talking about sexual preferences with a partner easily are associated with sexual satisfaction among male and female older adults in China. These findings, based on representative data from the SWELL study, expand the literature by focusing on a middle-income context, providing a large sample size of older adults, and increasing insights into sexual activity and sexual satisfaction among older adults.

In our study, about half of the participants remained sexually active. The prevalence of sexual activity was similar to that previously reported in single-centre studies among older adults aged 60 years and older in northern China.[14] Stereotypes culturally devalue older adults as asexual based on negative perceptions of aging.[30,31] However, similar to previous qualitative[32] and quantitative studies based on small-scale samples,[3] the results of this multi-centre and large-scale samples study further strongly refute the stereotype of asexuality among older adults.

There were differences in the prevalence of sexual activity in different age and sex groups. Our results demonstrated that the prevalence of sexual activity among older adults was associated with age, yet a certain proportion of older adults remained sexually active even in their seventh decades of life. Therefore, physicians need to ask older adults about their sexual life to assess their sexual health service needs and give sexual lifestyle advice. Besides, we found disparities with regard to the prevalence of sexual activity among male and female older adults in each successive age group. This

Characteristics	Men (N = 1819)		P	Adjusted OR	P	Women (N = 1182)		P	Adjusted OR	P
	Sexually active					Sexually active				
	No	Yes				No	Yes			
Overall	968 (53.2)	851 (46.8)				701 (59.3)	481 (40.7)			
Demographic characteristics										
Age			**<0.0001**					**<0.0001**		
50–59	220 (22.7)	440 (51.7)		1.00		186 (26.5)	276 (57.4)		1.00	
60–69	376 (38.8)	303 (35.6)		0.38 (0.30–0.49)	**<0.0001**	307 (43.8)	158 (32.8)		0.38 (0.28–0.51)	**<0.0001**
70+	372 (38.4)	108 (12.7)		0.16 (0.12–0.22)	**<0.0001**	208 (29.7)	47 (9.8)		0.24 (0.16–0.36)	**<0.0001**
Living area			**<0.0001**					**<0.0001**		
Rural	329 (34.0)	447 (52.5)		1.00		291 (41.5)	246 (51.1)		1.00	
Urban	639 (66.0)	404 (47.5)		0.36 (0.29–0.45)	**<0.0001**	410 (58.5)	235 (48.9)		0.49 (0.36–0.66)	**<0.0001**
Highest education attained			**<0.0001**					**0.0020**		
Primary school or below	279 (28.8)	161 (18.9)		1.00		248 (35.4)	123 (25.6)		1.00	
Middle school	458 (47.3)	461 (54.2)		1.57 (1.20–2.05)	**<0.0001**	278 (39.7)	219 (45.5)		1.38 (0.98–1.94)	0.061
High school or above	231 (23.9)	229 (26.9)		1.82 (1.32–2.49)	**<0.0001**	175 (25.0)	139 (28.9)		1.72 (1.15–2.58)	**0.0080**
Relationship status			**<0.0001**					**<0.0001**		
Not in a steady relationship	183 (18.9)	40 (4.7)		1.00		219 (31.2)	28 (5.8)		1.00	
In a steady relationship	785 (81.1)	811 (95.3)		4.15 (2.84–6.07)	**<0.0001**	482 (68.8)	453 (94.2)		7.46 (4.79–11.63)	**<0.001**
Satisfied with life			0.46					0.22		
No	267 (27.6)	249 (29.3)		–	–	194 (27.7)	150 (31.2)		–	–
Yes	701 (72.4)	602 (70.7)		–	–	507 (72.3)	331 (68.8)		–	–
Health characteristics										
General health										
Self-reported general health status			0.33					**0.011**		
Very good	105 (10.8)	94 (11.0)		1.00		66 (9.4)	73 (15.2)		1.00	
Good	413 (42.7)	394 (46.3)		1.05 (0.74–1.49)	0.77	269 (38.4)	190 (39.5)		0.53 (0.34–0.82)	**0.0040**
Fair	262 (27.1)	221 (26.0)		0.99 (0.68–1.45)	0.97	182 (26.0)	113 (23.5)		0.47 (0.29–0.76)	**0.0020**
Bad or very bad	188 (19.4)	142 (16.7)		0.98 (0.64–1.50)	0.91	184 (26.2)	105 (21.8)		0.58 (0.35–0.96)	**0.034**
Difficulty walking upstairs because of a health problem			**<0.0001**					**<0.0001**		
No	814 (84.1)	769 (90.4)		1.00		553 (78.9)	437 (90.9)		1.00	
Yes	154 (15.9)	82 (9.6)		0.89 (0.63–1.26)	0.52	148 (21.1)	44 (9.1)		0.63 (0.41–0.97)	**0.034**
Specific health										
Hypertension			**0.038**					**<0.0001**		
No	574 (59.3)	546 (64.2)		1.00		434 (61.9)	348 (72.3)		1.00	
Yes	394 (40.7)	305 (35.8)		0.88 (0.70–1.11)	0.29	267 (38.1)	133 (27.7)		0.83 (0.61–1.12)	0.22
Diabetes			0.58					**<0.0001**		
No	811 (83.8)	722 (84.8)		1.00		582 (83.0)	437 (90.9)		1.00	
Yes	157 (16.2)	129 (15.2)		0.86 (0.64–1.16)	0.32	119 (17.0)	44 (9.1)		0.64 (0.42–0.98)	**0.041**
Backache, or bone or muscle disease for >3 months			0.95					**0.023**		
No	913 (94.3)	803 (94.4)		1.00		635 (90.6)	454 (94.4)		1.00	
Yes	55 (5.7)	48 (5.6)		1.15 (0.65–2.04)	0.63	66 (9.4)	27 (5.6)		0.83 (0.47–1.44)	0.50
Depressive symptoms[a]			0.17					0.91		
No	924 (95.5)	824 (96.8)		1.00		684 (97.6)	468 (97.3)		1.00	
Yes	44 (4.5)	27 (3.2)		1.12 (0.69–1.83)	0.64	17 (2.4)	13 (2.7)		1.51 (0.64–3.56)	0.34
Menopause[b]								**<0.0001**		
No	–	–	–	–	–	36 (5.1)	71 (14.8)		1.00	
Yes	–	–	–	–	–	665 (94.9)	410 (85.2)		0.57 (0.36–0.92)	**0.021**
Sexual health characteristics										
Talking about sexual preferences with your partner always easy			0.81					0.42		
No	615 (63.5)	535 (62.9)		1.00		489 (69.8)	324 (67.4)		1.00	
Yes	353 (36.5)	316 (37.1)		0.97 (0.78–1.21)	0.81	212 (30.2)	157 (32.6)		0.94 (0.71–1.26)	0.70

Notes: Sexual activity was defined as one or more occasion of vaginal, oral, or anal sex in the past year. OR = odds ratio. [a]Respondents were asked with two-item Patient Health Questionnaire (PHQ-2). [b]Women deemed to be postmenopausal when they had not menstruated in the past year.

Table 2: **Sexual activity in the past year in relation to demographic, health, and sexual health characteristics, by sex.**

Characteristics	Men (N = 851)		P	Adjusted OR	P	Women (N = 968)		P	Adjusted OR	P
	Satisfied with sex life					Satisfied with sex life				
	No	Yes				No	Yes			
Overall	225 (26.4)	626 (73.6)				128 (26.6)	353 (73.4)			
Demographic characteristics										
Age			0.95					0.14		
50–59	115 (51.1)	325 (51.9)		1.00		83 (64.8)	193 (54.7)		1.00	
60–69	82 (36.4)	221 (35.3)		1.01 (0.70–1.44)	0.97	35 (27.3)	123 (34.8)		1.10 (0.65–1.87)	0.72
70+	28 (12.4)	80 (12.8)		1.41 (0.83–2.39)	0.21	10 (7.8)	37 (10.5)		1.71 (0.72–4.02)	0.22
Living area			0.13					0.30		
Rural	108 (48.0)	339 (54.2)		1.00		71 (55.5)	175 (49.6)		1.00	
Urban	117 (52.0)	287 (45.8)		0.58 (0.40–0.84)	**0.0040**	57 (44.5)	178 (50.4)		0.84 (0.50–1.42)	0.52
Highest education attained			**<0.0001**					**<0.0001**		
Primary school or below	65 (28.9)	96 (15.3)		1.00		43 (33.6)	80 (22.7)		1.00	
Middle school	107 (47.6)	354 (56.5)		2.46 (1.62–3.73)	**<0.0001**	64 (50.0)	155 (43.9)		1.21 (0.70–2.09)	0.496
High school or above	53 (23.6)	176 (28.1)		2.82 (1.68–4.71)	**<0.0001**	21 (16.4)	118 (33.4)		2.52 (1.22–5.21)	**0.013**
Relationship status			0.15					0.68		
Not in a steady relationship	15 (6.7)	25 (4.0)		1.00		6 (4.7)	22 (6.2)		1.00	
In a steady relationship	210 (93.3)	601 (96.0)		1.31 (0.64–2.65)	0.46	122 (95.3)	331 (93.8)		0.78 (0.27–2.25)	0.64
Satisfied with life			**<0.0001**					**<0.0001**		
No	95 (42.2)	154 (24.6)		1.00		58 (45.3)	92 (26.1)		1.00	
Yes	130 (57.8)	472 (75.4)		1.73 (1.22–2.46)	**0.0020**	70 (54.7)	261 (73.9)		2.23 (1.34–3.71)	**0.0020**
Health characteristics										
General health										
Self-reported general health status			**<0.0001**					**<0.0001**		
Very good	9 (4.0)	85 (13.6)		1.00		6 (4.7)	67 (19.0)		1.00	
Good	91 (40.4)	303 (48.4)		0.25 (0.12–0.53)	**<0.0001**	36 (28.1)	154 (43.6)		0.27 (0.10–0.70)	**0.0080**
Fair	70 (31.1)	151 (24.1)		0.17 (0.08–0.37)	**<0.0001**	44 (34.4)	69 (19.5)		0.11 (0.04–0.30)	**<0.0001**
Bad or very bad	55 (24.4)	87 (13.9)		0.15 (0.06–0.34)	**<0.0001**	42 (32.8)	63 (17.8)		0.11 (0.04–0.32)	**<0.0001**
Difficulty walking upstairs because of a health problem			**<0.0001**					**0.038**		
No	190 (84.4)	579 (92.5)		1.00		110 (85.9)	327 (92.6)		1.00	
Yes	35 (15.6)	47 (7.5)		0.58 (0.34–0.99)	**0.046**	18 (14.1)	26 (7.4)		0.48 (0.23–1.03)	0.059
Specific health										
Hypertension			0.53					0.34		
No	140 (62.2)	406 (64.9)		1.00		88 (68.8)	260 (73.7)		1.00	
Yes	85 (37.8)	220 (35.1)		1.05 (0.73–1.51)	0.81	40 (31.2)	93 (26.3)		1.05 (0.62–1.76)	0.86
Diabetes			0.93					0.32		
No	190 (84.4)	532 (85.0)		1.00		113 (88.3)	324 (91.8)		1.00	
Yes	35 (15.6)	94 (15.0)		1.20 (0.74–1.92)	0.46	15 (11.7)	29 (8.2)		0.88 (0.41–1.88)	0.74
Backache, or bone or muscle disease for >3 months			**0.050**					0.053		
No	206 (91.6)	597 (95.4)		1.00		116 (90.6)	338 (95.8)		1.00	
Yes	19 (8.4)	29 (4.6)		0.61 (0.31–1.19)	0.151	12 (9.4)	15 (4.2)		0.80 (0.32–1.99)	0.63
Depressive symptoms[a]			**0.0050**					**0.0010**		
No	211 (93.8)	613 (97.9)		1.00		119 (93.0)	349 (98.9)	–	–	–
Yes	14 (6.2)	13 (2.1)		0.39 (0.17–0.92)	**0.032**	9 (7.0)	4 (1.1)	–	–	–
Menopause[b]								0.91		
No	–	–	–	–	–	18 (14.1)	53 (15.0)		1.00	
Yes	–	–	–	–	–	110 (85.9)	300 (85.0)		0.77 (0.40–1.47)	0.42
Sexual health characteristics										
Talking about sexual preferences with your partner always easy			**<0.0001**					**<0.0001**		
No	165 (73.3)	370 (59.1)		1.00		105 (82.0)	219 (62.0)		1.00	
Yes	60 (26.7)	256 (40.9)		1.77 (1.23–2.56)	**0.0020**	23 (18.0)	134 (38.0)		2.93 (1.69–5.09)	**<0.0001**

Notes: Only sexually active participants were asked whether they were satisfied with their sex life. [a]Respondents were asked with a validated two-item Patient Health Questionnaire (PHQ-2). Depressive symptoms among women could not be included due to small numbers in some cells. [b]Women deemed to be postmenopausal when they had not menstruated in the past year.

Table 3: **Satisfaction with sex life in relation to demographic, health, and sexual health characteristics, by sex.**

difference may be explained by differential relationship status, including the age structure of marital relationships (e.g. men are, on average, married to younger women).[7]

After adjusting for sociodemographic variables, we found a sex difference in the associations between health factors and sexual activity. For female older adults, better self-reported general health status and physical capability were associated with sexual activity, similar to previous research.[11] In contrast, we did not observe such associations in men. The sex difference demonstrated that poor health status did not mean sexual activity must stop, it merely requires adaptation to physical capability. Older adults with poor health status should be given additional attention in public health services and they may benefit from therapeutic interventions. Menopause appears to be an important factor associated with sexual activity in females. Low sexual desire due to less sex hormone production after menopause could be a potential reason.[33,34] Future research needs to focus on the sexual function/sexual difficulties of postmenopausal female older adults further to explore sexual health service strategies for this population.

In terms of sexual satisfaction, we found that older adults with better health status (including general and mental health) were more likely to report sexual satisfaction after adjusting for sociodemographic variables. Limited evidence from high-income countries (such as the ELSA in England, Natsal in Britain, and NSHAP in America) shows that poor physical condition may lead to worse sexual response and poorer sexual satisfaction.[7–9] Poorer health status among older adults has attracted more attention from clinicians, invariably leaving sexual health a potentially neglected area. However, prospective findings from ELSA suggest a decline in sexual activity, desire, or function in older age may be an important indicator of future adverse health outcomes. Our findings suggest highlighting sexual health aspects in healthcare services for older adults. Specifically, clinicians need to focus on the sexuality of older adults during routine health monitoring, especially managing their sexual health within their existing sexual relationships. And further research is needed to explore the association between health status and some commonly impaired sexual responses or sexual function through long-term cohorts/longitudinal surveys.

We also found other significant correlates of sexual satisfaction, including life satisfaction and communication between partners about sexual preferences. Life satisfaction was associated with sexual satisfaction, which suggested the importance of sexual satisfaction among older adults should be understood. Similar to a previous review of older adults' views on sexual health,[35] our finding also suggested that sexuality could be a key component of the well-being of older adults at later ages. It was worth noting that sexual satisfaction in older adults is not age-related, unlike sexual activity. In the future, health education programs that advocate healthy sex could be considered integrated into public health services for older adults to help them achieve sexual satisfaction. Besides, we found that participants who talked easily with their partners about their sex life were more likely to report sexual satisfaction. It proved that encouraging individuals to share their sexual preferences with their partners could be crucial, even be the potential touch point to help older adults achieve sexual satisfaction. Therefore, partner-based rather than individual-based sexual health education was a potential measure to encourage and guide discussion about sexual issues for better sexual satisfaction. In addition, incorporating consultation and advice about sexual health in public health nursing for older adults would be a considered measure to promote sexual expression between partners for reinforcing the effectiveness of sexual health education among older adults.

Our study has several limitations, and caution should be taken in interpreting data. First, causal interpretations were excluded from the findings because of the cross-sectional study design. Second, the data from our study relies on self-reported information, which led to inevitable recall bias among participants. Third, we failed to access sexual orientation and gender identity in the SWELL Study. The results maybe additionally skewed given that there may have been a reporting bias when it comes to sexual orientation and/or gender identity. Fourth, the assessment of sexual behaviour in the SWELL study only includes penetrative sex. It may result in a biased outcome and overlook the beneficial influence on health and well-being that can be derived from non-penetrative activities. Fifth, the survey was conducted during the SARS-CoV-2 pandemic. It may have introduced a potential bias. Sixth, it is important to note that the results of this study are exploratory and should be interpreted with caution. We did not have any a priori hypotheses about specific endpoints, and our findings should be considered as generating hypotheses rather than providing definitive conclusions. Finally, although the multi-centre study design and multi-stage sampling method have broadened representativeness, participation bias cannot be avoided. The results may not be generalizable to all older adults in China. However, as a large-scale study about sexual health among older adults in China, it provides valuable information about sexual behaviour characteristics and their associations among older adults.

In conclusion, many older adults remained sexually active, and most were satisfied with their sex life. Health status (including general and mental health) were associated with sexual activity and sexual satisfaction among older adults, but there are sex differences in the effect on sexual activity. Older adults who

had better health status and talked easily with their partners about their sex life were more likely to report sexual satisfaction. Sexual health promotion should be a component of holistic healthcare for older adults with poor health status. These findings, based on representative data from the SWELL study, increase insights into sexual activity and sexual satisfaction among older adults and may contribute to achieving overall health and well-being among older adults in China. Further research should address measures that improve sexual satisfaction, especially among sexually active older adults.

Contributors

HZ, BW, XP, WT, DW, JT, and BL contributed to the conception and design of the study. BW, XP, BL, and LF carried out data collection and data cleaning. BW, XP, LF, and ZL performed the statistical analyses and were involved in data organization and presentation. BW drafted the manuscript. BW, XP, BL, LF, XL, ZL, TT, XX, JL, TS, WT, DW, and JT critically reviewed the manuscript with suggestions for improvement and revision. The study was supervised by HZ, WT, DW, JT, YC, LO, YW, MY, and GW. HZ, DW, and JT contributed to the funding acquisition and resources. All authors read and approved the final version.

Data sharing statement

The data collected in this study will not be publicly available. However, the de-identified data are available on reasonable request to the corresponding author.

Declaration of interests

The authors declare that they have no competing interests.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.lanwpc.2023.100825.

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