Gender-specific secular trends and related factors of high perceived stress level among Korean older adults: a nation-wide serial cross-sectional study

Eunjeong Choi[1], Hyun-Ju Seo[2*], Kye Ha Kim[3*] and Sun-Young Jung[4]

Abstract

Background Aging is associated with various physical, functional, and social losses, leading to stress, which affects mental health and overall quality of life. Despite its significance, limited research exists on perceived stress and its related factors among community-dwelling older adults. This study aimed to identify temporal trends in the prevalence of high perceived stress according to sex and examine associated factors among older adults.

Methods This descriptive study analyzed secondary data from the nationally representative Korean Community Health Survey (KCHS) data from 2009 to 2019, including 274,883 older adults aged ≥ 65 years. High-perceived stress was coded as binary data, categorized as 'yes' or 'no' based on daily stress levels. Gender-stratified analyses examined temporal trends and associated factors affecting high perceived stress.

Results Women consistently reported higher levels of perceived stress compared with men across all years, with prevalence ranging from 22 to 30% in women and 14–20% in men. Among men, factors such as insufficient physical activity (OR: 1.32, 95% CI: 1.27–1.37), poor subjective health status (OR: 2.80, 95% CI: 2.69–2.92), and living alone were associated with high perceived stress. Among women, low household income (OR: 1.68, 95% CI: 1.56–1.81), smoking (OR: 1.63, 95% CI: 1.49–1.79), and living with a spouse (OR: 1.51, 95% CI: 1.34–1.70) were significant predictors.

Conclusions This study highlights significant gender disparities in perceived stress among older adults, with women demonstrating greater vulnerability. Public health policies should prioritize stress reduction strategies tailored to address gender-specific needs and socio-economic disparities in older adults.

Keywords Stress, Psychological, Older adults, Community health survey, Gender differences

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Background

The population of older adults has been increasing rapidly worldwide (OECD 2024). In Korea, by 2024, individuals aged 65 and older are expected to comprise 19.2% of the total population, and this proportion is anticipated to surpass 20% in 2025, reach 30% by 2036, and exceed 40% by 2050 (Statistics Korea 2024). In 2023, 31.9% of individuals aged 65 and older reported being satisfied with their lives, reflecting a decrease of 2.4% points compared to 2022 (Statistics Korea 2024). People experience various personal and social losses during aging. The loss of physical, psychological, and social functioning in senescence can contribute to mental health and older adults' overall quality of life (Offermann et al. 2024; Munawar et al., 2024; Huang et al. 2024).

Approximately 15% of the older population worldwide experience mental disorders, with stress being the main factor influencing the mental health of a significant proportion of older adults (10–55%) (Nelson et al. 2021; Kang and Kim 2022; Musich et al. 2022; Laustsen et al. 2024; O'Connor and Rogerson 2024; Kang et al. 2024). Older adults face higher stress-related factors than others due to the substantial and continuous loss of capacity and reduced functional capability and disease (Schwarz et al. 2019; van de Ree et al. 2020; Cristóbal-Narváez et al. 2022). The cognitive appraisal model (Lazarus and Folkman 1984) posits that stress is a subjective experience resulting from an individual's evaluation of a situation as threatening or exceeding their resources; they highlighted the influence of high perceived stress. Ultimately, high perceived stress is the stress subjectively perceived by the individual that could result from an imbalance between the demands of the environment and personal resources to cope with those demands.

Despite the suggestion that stress may influence health and quality of life among older people, there is still insufficient research on the association between perceived stress and related factors among community-dwelling older adults. Previous studies investigating risk factors of stress among older people used data from a partial period to investigate factors related to perceived stress levels among older adults (Srivastava et al. 2021; Steinert et al., 2019), and no study has analyzed temporal trends. Additionally, studies comparing high perceived stress in older adults according to gender using nationwide health survey data were still not conducted, despite gender-specific approaches to healthcare being essential for older adults due to the differing biological, psychological, and social factors that affect men and women as they age (Rudnicka et al. 2020; Mauvais-Jarvis et al. 2020). Previous studies also mainly focused on patients with specific diseases (van de Ree et al. 2020; Osmani et al. 2023; Knowles et al. 2023; McInerney et al. 2022) which means the studies that investigated the evidence in the general population among the older people still remain unknown.

Therefore, this study aimed to identify the temporal trends of the prevalence rate of high perceived stress according to gender and to examine associated factors affecting high perceived stress levels among older adults.

Methods

Data and sample

This serial cross-sectional study is based on secondary data analysis using the Korea Community Health Survey (KCHS) data from 2009 to 2019. The KCHS is a nationally standardized survey designed to collect comprehensive health-related data from regional communities, which is conducted annually by the Korea Disease Control and Prevention Agency (KDCA) to produce comparable health statistics of the regions by standardization of the survey system (KDCPA, 2024). The survey employs a multi-stage stratified cluster sampling method to ensure the representativeness of the sample. This study aimed to examine gender-specific high perceived stress levels among community-dwelling older adults aged ≥ 65 years, focusing on temporal trends according to age and gender and associated factors. The 2009–2019 KCHS data included 471,859 older adults aged ≥ 65 years. After excluding participants with missing values for the covariates and perceived stress variable, data from 274,883 participants (161,852 men and 113,031 women) were analyzed (Fig. 1).

Measurements

Assessment of high perceived stress level

The perceived stress level was assessed by the following question: "How much stress do you feel in your daily life?" with four response options: "Experiencing a great deal of stress' and 'experiencing considerable stress' were coded as high-stress level, while responses indicating 'experiencing moderate stress' and 'experiencing minimal to no stress' were coded as low-stress level.

Assessment of socio-demographic and lifestyle characteristics

The general characteristics of older adults aged ≥ 65, such as age, gender, education, household income, living arrangement, and residential area, were analyzed. For age, participants were divided into three groups in units of 10 years: 65–74, 75–84, and ≥ 85 years. Education was categorized as "≤ middle school," "high school," and "≥ college." Household income was assessed by asking participants about their annual income, categorized into quartiles for analysis, and further grouped into two categories: high (upper two quartiles) and low (lower two quartiles). The living arrangement was categorized
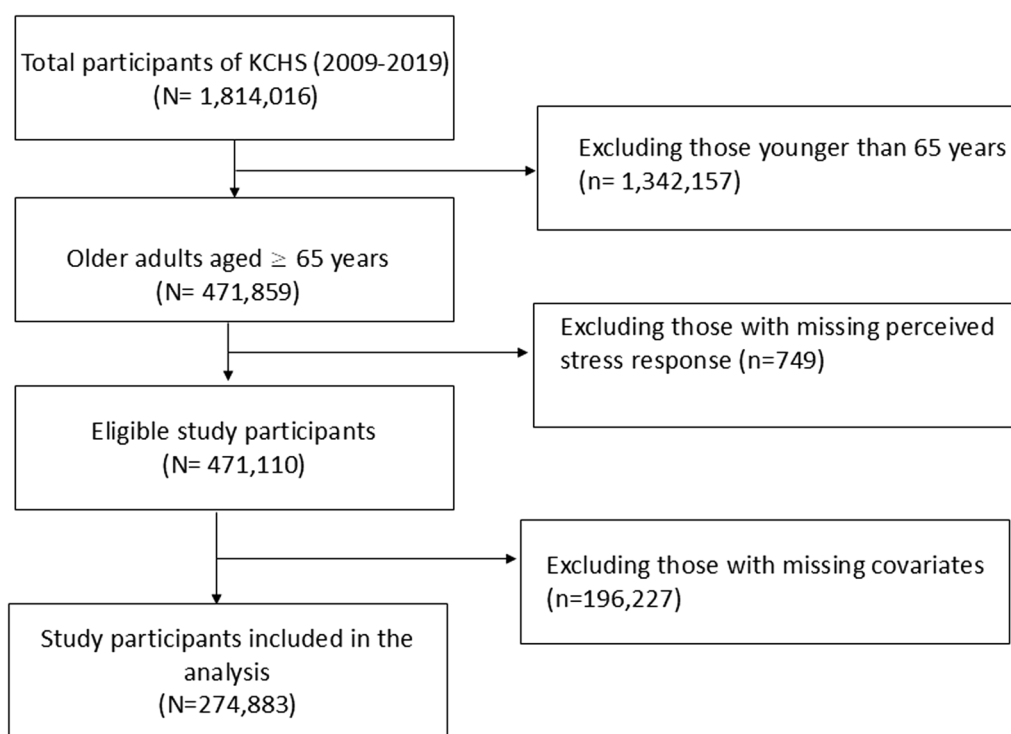
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Fig. 1 Flowchart of the study population

as living alone, with a spouse, and with children or other relatives. The residential area was classified into urban and rural areas based on the Dong and Eup/Myeon classifications. Average daily sleep duration was assessed (in units of minutes) from responses to the question, "How many hours do you usually sleep each day?" The categorization for the analysis was "7–9 hours" and "others," based on the National Sleep Foundation's recommended daily sleep duration (Seo et al. 2022). Participants were coded as "yes" to physical activity if they reported walking for at least 10 minutes at a time on three or more days in the past week and "no" otherwise. Physical activity levels were assessed using questions about walking, a form of exercise that is widely accessible and feasible, considering the varying degrees of physical function among the elderly population included in the study. Smoking status was self-reported and categorized as 'current smoker' (smoking daily or occasionally), 'former smoker' (smoked in the past but not currently), and 'never smoker' (never smoked in their lifetime) (KDCA, 2024). Problem drinking was determined by asking participants how often they consumed a large quantity of alcohol in a single drinking occasion. Problem drink is defined for men, consuming seven or more standard drinks in a single drinking occasion at least twice per week, for women, consuming five or more standard drinks in a single drinking occasion at least twice per week (KDCA, 2024). In response to the question, "How do you usually perceive your health status?" subjective health status was categorized as a dichotomous variable: "good" for responses of "very good," "good," or "moderate," and "poor" for responses of "very poor" or "poor." (Jung et al. 2020).

Statistical analysis

The weighted prevalence rates of high perceived stress were calculated as the proportion of individuals with the condition within each sex group, expressed as percentages, accounting for the complex survey design and sampling weights to ensure population-representative estimates. Multivariable-adjusted logistic regression was performed to investigate the relationship between sociodemographic variables and high prevalence stress after adjusting for covariates. The results were expressed as odds ratios (OR) with 95% confidence intervals (CIs). For independent variables with three or more ordered categories, we conducted a trend analysis (p for trend) by assigning the median value of each category and including it as a continuous variable in the regression models. The analyses were conducted using the stratified sampling variables (strata) and weighted variables recommended by the KCHS. The PROC SURVEY procedure in SAS (version 9.4 M6; SAS Institute Inc., Cary, NC, USA) was used for all statistical analyses.

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Ethics statement

The Institutional Review Board of KDCA approved the KCHS. The KCHS raw data were downloaded from the KCHS website after permission was granted following an online application from the administrator of the KCHS website. This study was approved by the Chungnam National University Institutional Review Board (No. 202411-SB-155-01).

Results

Socio-demographic characteristics

Table 1 illustrates the distribution of participants across socio-demographic and lifestyle variables from the Korea Community Health Survey (KCHS) 2009–2019. A total of 161,852 men and 113,031 women were included in the analysis. There was a higher percentage of aged 65–74 years for men 66.9% and women 65.6%. Across all age groups, a higher percentage of women had lower levels of education than men. In addition, 1.3% of men and 4.4% of women lived alone, and 8.6% of men and 5.5% of women lived with a spouse. Women experienced poor subjective health status than men (Table 1).

Temporal trends in stress prevalence

Figure 2 illustrates the annual prevalence rates of high perceived stress among older people in Korea, and the result indicates fluctuations over the study period, with notable peaks in specific years. Overall, the prevalence demonstrates both periods of stability and sharp increases, reflecting external influences on stress levels. Figure 3 depicts the prevalence rate trends stratified by sex. In men, the prevalence ranged from about 14–20%, and in women, the prevalence ranged from about 22–30%. Across the years, women consistently reported higher levels of perceived stress than men (Fig. 3 and Suppl. 1).

Associated factors of high perceived stress

Table 2 presents logistic regression results for high perceived stress levels. Among the men, the odds ratio (OR) for perceiving high levels of stress was 0.79 in the 75–84 age group and 0.65 in individuals aged 85 and older, compared to the reference group. These findings indicate the likelihood of perceiving high stress decreases as age increases. Additionally, men living alone (reference) compared to living with spouse(OR: 0.65, 95% CI: 0.56–0.77) or living with other relatives (OR: 0.77, 95% CI: 0.66–0.89), insufficient physical activity (<3 days of walking per week) (OR: 1.32, 95% CI: 1.27–1.37), and poor subjective health status (OR: 2.80, 95% CI: 2.69–2.92) were associated with increased stress levels.

Among women, similar trends were observed. The odds ratio (OR) for perceiving high levels of stress was 0.77 in the 75–84 age group and 0.44 in individuals aged 85 and older, compared to the reference group. Smoking (OR 1.63, 95% CI 1.49–1.79), suboptimal sleep duration (<7 or >9 h), and poor subjective health were associated with higher perceived stress levels. Regarding living arrangements, women living with a spouse (OR 1.51, 95% CI 1.34–1.70) or with other relatives (OR 1.44, 95% CI 1.31–1.58) had higher perceived stress levels compared to those living alone (reference group).

Discussion

This study aimed to examine the temporal trends of prevalence in high perceived stress and to identify factors associated with high perceived stress among Korean older adults using nationally representative data. The estimated prevalence rate of high perceived stress among older adults significantly decreased over the study period. However, sex-specific trends revealed that the prevalence rate of high perceived stress was consistently higher in women than in men throughout the study period. Notably, the prevalence rate for women increased from 2018 to 2019, in contrast to men. Our results tend to align with previous studies that older women may be more vulnerable to mental health issues, and these gender differences are reported to interact in complex ways with age and social factors (Aviv et al. 2024; Kiely et al. 2019).

The study examining factors influencing high-stress perception in male older adults and women revealed that while some factors showed similar tendencies, others produced contrasting results. In this study, compared to the youngest elderly group, both older men and women demonstrated a tendency for lower stress perception as age increased. The association between increasing age and stress in older adults varies across studies, with evidence supporting both an increase and a decrease in stress levels. Perceived stress does not necessarily increase linearly with age in older adults and instead, stress levels were influenced by other factors such as health conditions, social support, and psychological resources (whitehead et al., 2021; Feeney et al. 2018; Cristóbal-Narváez et al. 2022).

In this study, men living with a spouse were significantly less likely to perceive high stress than those living alone. Conversely, among women, those living with a spouse were more likely to perceive high stress compared to their counterparts living alone. This result could be explained by the fact that older women have more household responsibilities than men (Tabler et al., 2021; Ervin et al. 2022; Cha et al. 2024) and face a heavier burden as partner caregivers compared to men, primarily due to their exposure to more secondary stressors (Swinkels et al. 2019). Since women have unpaid obligations and spend considerable time performing household chores

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Table 1 The sociodemographic characteristics of this study

Variables	Men (N = 161,852)	Women (N = 113,031)	Weighted Men[a] (N = 20,592,457)	Weighted Women[a] (N = 14,018,017)
	N(%)	N(%)	N(%)	N(%)
Year				
2009	16,754(10.4)	10,878(9.6)	1,734,719(8.4)	1,158,179(8.3)
2010	7,268(4.5)	5,040(4.5)	1,204,149(5.8)	848,781(6.1)
2011	2,639(1.6)	2,082(1.8)	602,854(2.9)	457,071(3.3)
2012	12,258(7.6)	9,031(8)	1,677,407(8.1)	1,230,754(8.8)
2013	739(0.5)	578(0.5)	234,990(1.1)	168,286(1.2)
2014	21,346(13.2)	17,542(15.5)	2,441,227(11.9)	1,919,219(13.7)
2015	22,723(14)	19,539(17.3)	2,598,121(12.6)	2,125,153(15.2)
2016	22,732(14)	18,895(16.7)	2,675,313(13.0)	2,122,699(15.1)
2017	24,055(14.9)	19,678(17.4)	2,858,690(13.9)	2,211,136(15.8)
2018	9,484(5.9)	8,528(7.5)	1,932,656(9.4)	1,638,508(11.7)
2019	21,854(13.5)	1,240(1.1)	2,632,331(12.8)	138,232(1.0)
Age				
65 ~ 74	102,981(63.6)	69,092(61.1)	13,782,529(66.9)	9,189,062(65.6)
75 ~ 84	52,221(32.3)	37,342(33.0)	6,074,353(29.5)	4,131,500(29.5)
≧85	6,650(4.1)	6,597(5.8)	735,575(3.6)	697,455(5.0)
Education				
≤ Middle school	102,268(63.2)	100,982(89.3)	10,846,380(52.7)	11,638,505(83.0)
High school	37,937(23.4)	8,914(7.9)	5,691,233(27.6)	1,704,932(12.2)
≥ College	21,647(13.4)	3,135(2.8)	4,054,844(19.7)	674,580(4.8)
Household income				
Q1	114,627(70.8)	92,753(82.1)	13,358,641(64.9)	10,547,688(75.2)
Q2	29,782(18.4)	11,825(10.5)	4,174,589(20.3)	1,873,643(13.4)
Q3	11,494(7.1)	5,278(4.7)	1,916,626(9.3)	951,260(6.8)
Q4	5,949(3.7)	3,175(2.8)	1,142,601(5.5)	645,427(4.6)
Living arrangement				
Living alone	2,648(1.6)	7,087(6.3)	272,179(1.3)	615,548(4.4)
Living with spouse	16,474(10.2)	7,189(6.4)	1,764,603(8.6)	766,064(5.5)
Other	142,730(88.2)	98,755(87.4)	18,555,675(90.1)	12,636,405(90.1)
Residential area				
Urban	75,986(46.9)	53,860(47.7)	15,791,065(76.7)	10,779,435(76.9)
Rural	85,866(53.1)	59,171(52.3)	4,801,392(23.3)	3,238,582(23.1)
Average daily sleep time				
7 ~ 9 h	86,239(53.3)	50,014(44.2)	10,624,461(51.6)	5,819,297(41.5)
The other	75,613(46.7)	63,017(55.8)	9,967,996(48.4)	8,198,720(58.5)
Walking activity (days/week)				
≧3 days	90,763(56.1)	54,959(48.6)	12,966,076(63.0)	7,807,970(55.7)
<3 days	71,089(43.9)	58,072(51.4)	7,626,382(37.0)	6,210,047(44.3)
Smoking				
Current smoker	35,927(22.2)	4,248(3.8)	4,407,602(21.4)	505,001(3.6)
Former smoker	98,131(60.6)	5,141(4.5)	12,488,902(60.6)	608,445(4.3)
Never smoker	27,794(17.2)	103,642(91.7)	3,695,953(17.9)	12,904,570(92.1)
Alcohol drinking				
Yes	111,000(68.6)	68,776(60.8)	14,624,606(71.0)	8,509,266(60.7)
No	50,852(31.4)	44,255(39.2)	5,967,851(29.0)	5,508,750(39.3)
Subjective health status:				
Good	104,469(64.5)	56,217(49.7)	13,996,235(68.0)	7,593,399(54.2)
Poor	57,383(35.5)	56,814(50.3)	6,596,222(32.0)	6,424,618(45.8)

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Table 1 (continued)

Values are presented as number (%)
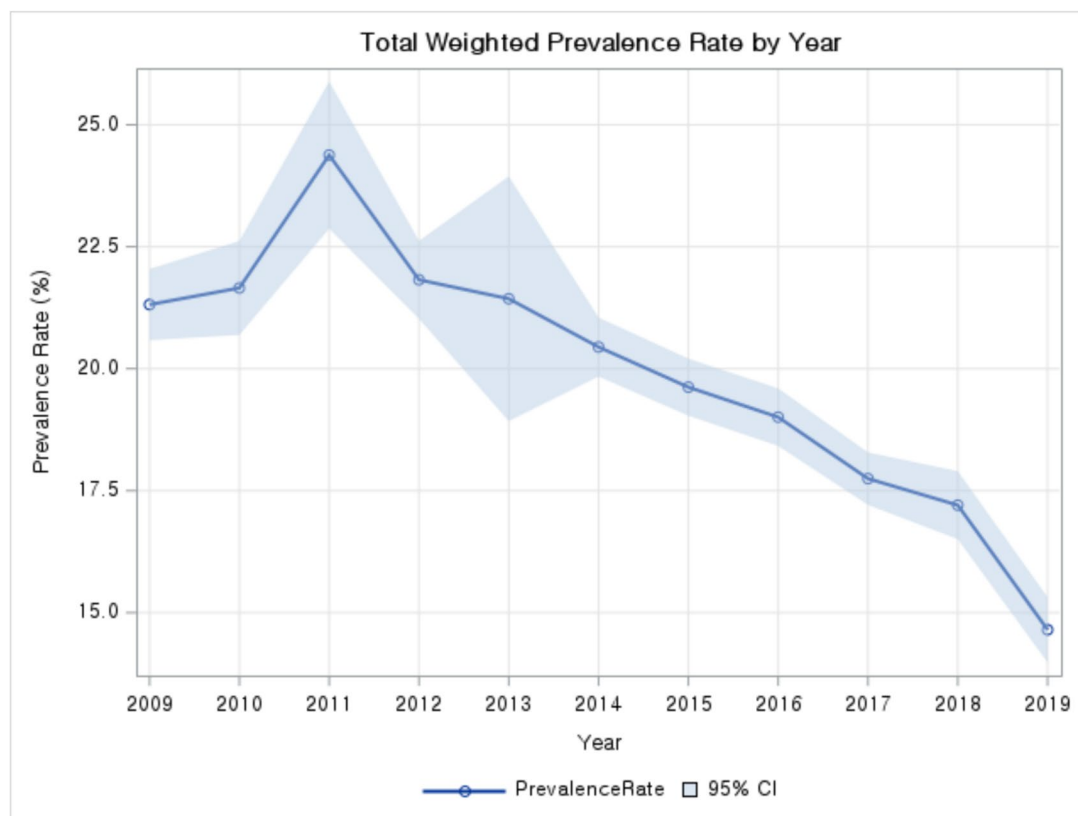
Fig. 2 Prevalence rate of high perceived stress of all older adults *The analyses were conducted using the stratified sampling variables (strata) and weighted variables recommended by the KCHS

for their families (Seedat & Randon, 2021; Ervin et al. 2022; Aviv et al. 2024), they are likelier to perceive stress while living with a spouse. These unequal divisions could cause women to experience poor psychological well-being. The unmet needs of older women who live with a spouse related to high perceived stress need to be investigated in future research.

In women, the lower-income older adults reported a higher prevalence of high perceived stress levels. This finding is consistent with studies reporting that high psychological distress among the lower income older adults was more prevalent (Eyjólfsdóttir et al. 2019; Lai et al. 2019). Older adults who were socially isolated and had lower socio-economic status faced challenges such as poor accessibility to health services, high cost of care, and self-management (Lee et al. 2020), and they were more likely to experience poor health outcomes (Mathews and Brewer 2021; Murray et al. 2021).

These results underpinned that public policies related to health and social care services need to support low-income older adults with a high perceived stress level.

This study confirmed that both men and women with lower levels of physical activity, who were smokers, and who had shorter sleep durations were more likely to perceive high levels of stress. This finding is similar to the previous studies reporting that walking behavior significantly reduced the probability of perceived stress (Ren and Kwon 2021). Perceived stress is strongly associated with smoking and related behaviors (Kastelic et al. 2021; Buhelt et al. 2021), and sleep deprivation is linked to mood impairment and psychosocial distress in older adults (Yamamoto et al. 2019; Schwarz et al. 2019). Approaches to health behavior interventions (Jokela et al. 2020; Zhang et al. 2022; Mardani et al. 2024), such as effective exercise programs to reduce
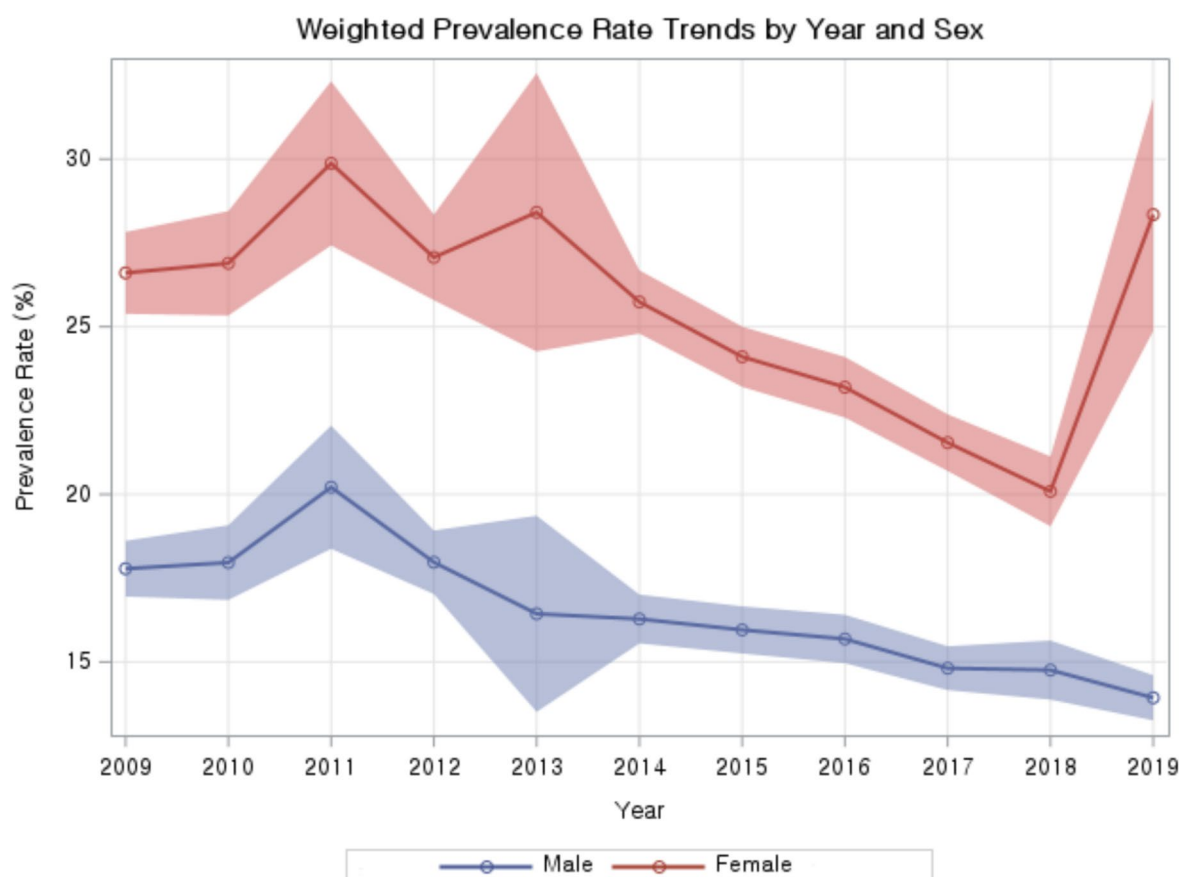
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Weighted Prevalence Rate Trends by Year and Sex

Fig. 3 Prevalence rate of high perceived stress according to sex *The analyses were conducted using the stratified sampling variables (strata) and weighted variables recommended by the KCHS

perceived stress (Gujral et al. 2024), should be designed to address the stress levels of older adults.

Subjective health status was strongly associated with the high perceived stress of older adults, both men and women. Our result was consistent with the previous finding that subjective health status and perceptions of aging were associated with high perceived stress levels in the older adult population (Whitehead et al., 2021). Older adults often experience frailty and undergo bodily changes, which can serve as significant sources of stress. In particular, subjective health status plays a critical role in shaping their overall quality of life and psychological well-being, complementing objective measures of health such as clinical diagnoses and physical capabilities (Hei-estad et al. 2020; Velaithan et al. 2024). Appropriate social support for older adults should be implemented to alleviate poor subjective health status and cope with stressful life events (Liu et al. 2021; Olawa et al. 2024).

This study has several limitations. First, this study was cross-sectional; therefore, it could not determine the causal relationship between perceived stress and its related factors. Second, this study used secondary data;

consequently, we could not control the influence of variables other than those included in the questionnaires. Third, the perceived stress of older adults was investigated using a self-reported one question rather than clinical and objective measurements of stress level. However, the measure of self-rated stress level has been widely used in epidemiology studies (Kim et al. 2021; Jindo et al. 2020). Fourth, this study could not consider confounding variables, such as clinical data and psychiatric examination history, because the CHS questionnaire did not include related items. Finally, because the KDCA has not maintained the consistency of the data items since 2020 by adding the COVID-19-related questionnaires in CHS, we could not include recent data collected after the COVID-19 pandemic outbreak to exclude the impact of emerging infectious diseases.

Despite these limitations, this is the first study to examine gender-specific trends and associated factors of high perceived stress prevalence among nationwide community-dwelling older adults. In addition, the results of our study provide a comprehensive under-standing of the temporal trends in high stress levels by

Table 2 Results of factors associated between high perceived stress and sociodemographic status by sex

Variables		Male				Female			
		OR[a]	95% CI		P or P for trend	OR[a]	95% CI		P or P for trend
Year		0.98	0.98	0.99	< 0.0001	0.97	0.96	0.98	< 0.0001
Age	65–74	Reference				Reference			
	75–84	0.79	0.76	0.83	< 0.0001	0.77	0.74	0.81	< 0.0001
	≥ 85	0.65	0.59	0.72		0.44	0.40	0.49	
Education	≤Middle school	Reference				Reference			
	High school	1.01	0.96	1.06	< 0.0001	0.89	0.83	0.96	0.01
	≥University	0.85	0.80	0.91		0.94	0.84	1.06	
Household income	high								
	low	1.09	1.03	1.17	0.01	1.27	1.18	1.36	< 0.0001
Living arrangement	Living alone	Reference				Reference			
	Living with spouse	0.65	0.56	0.77	0.39	1.51	1.34	1.70	< 0.0001
	Living with others	0.77	0.66	0.89		1.44	1.31	1.58	
Residential area	Urban								
	Rural	0.85	0.82	0.88	< 0.0001	0.99	0.95	1.03	0.61
Average daily sleep time (7 ~ 9 h)	Yes	Reference				Reference			
	No	1.45	1.40	1.51	< 0.0001	1.55	1.49	1.62	< 0.0001
Physical activities	Yes	Reference				Reference			
	No	1.32	1.27	1.37	< 0.0001	1.19	1.14	1.24	< 0.0001
Smoking	No	Reference				Reference			
	Yes	1.50	1.44	1.57	< 0.0001	1.63	1.49	1.79	< 0.0001
Drinking	No								
	Yes	0.87	0.84	0.91	< 0.0001	0.89	0.85	0.93	< 0.0001
Subjective health status	Good	Reference				Reference			
	Poor	2.80	2.69	2.92	< 0.0001	2.68	2.56	2.79	< 0.0001

Abbreviation: *OR* Odds ratio, *CI* Confidence interval;

[a] The analyses were conducted using the stratified sampling variables (strata) and weighted variables recommended by the KCHS

gender, which is valuable for prioritizing mental health promotion efforts to help manage stress levels at a national level.

Conclusion

This study identified temporal trends in high perceived stress levels depending on gender. This study's findings confirmed that stress prevalence was consistently higher among older women. This gender disparity underscores the persistent vulnerability of women to stress factors, which may be linked to differences in socio-economic status, caregiving responsibilities, or health-related issues. Notably, certain factors influencing perceived stress showed significant differences between men and women. Both temporal and gender-based analyses highlight the importance of targeted interventions, particularly for women, to mitigate the impact of high stress. Further research is needed to examine the underlying drivers of these trends and to develop effective policy measures.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12889-025-21644-4.

Supplementary Material 1

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Data availability
Publicly available datasets were analyzed in this study. This data can be found here: (https://chs.kdca.go.kr/chs/rdr/rdrInfoPledgeMain.do).

Declarations

Ethics approval and consent to participate
The KCHS was approved by the Institutional Review Board of the KDCA. The raw KCHS data were downloaded from the KCHS website after applying for and receiving permission from the administrator of the KCHS website. This study was approved by the Chungnam National University Institutional Review Board (No. 202411-SB-155-01). This study was conducted in accordance with the Declaration of Helsinki.

Consent for publication
None.

Competing interests
The authors declare no competing interests.

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