Postprint of a Meta-Analysis on the Incidence of Perimenopausal Syndrome Among Chinese Women Aged 40–65 Years

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Abstract

Background With the rapid development of China's economy and society, residents' living standards and self-healthcare awareness have significantly improved, the average life expectancy of the population has gradually extended, the perimenopausal female population has grown substantially, and health management of perimenopausal women has become increasingly important. Perimenopausal syndrome occurs in women aged 40-65 and can severely affect patients' physical and mental health and quality of life. Objective To systematically evaluate the incidence rate of perimenopausal syndrome among Chinese women aged 40-65. Methods Computerized searches of PubMed, Embase, Web of Science, CNKI, Wanfang Data Knowledge Service Platform, Chinese Biomedical Literature Database, and VIP Database were conducted to collect cross-sectional studies on the occurrence of perimenopausal syndrome in Chinese women aged 40-65, with the search period set from database inception to February 1, 2023. Two researchers independently screened the literature, extracted data, and assessed the quality of included studies, and meta-analysis was performed using Stata 17.0 software. Results A total of 62 cross-sectional studies were finally included, with a total sample size of 82,455. The meta-analysis results showed that the incidence rate of perimenopausal syndrome among Chinese women aged 40-65 was 61.0%. Subgroup analysis results showed that the incidence rates of perimenopausal syndrome in women aged 40-45, >45-50, >50-55, >55-60, and >60 years were 42.6%, 53.8%, 64.6%, 59.7%, and 56.1%, respectively; the incidence rates in women aged 40-65 with normal, irregular, and menopausal menstrual status were 43.6%, 56.9%, and 61.3%, respectively; the incidence rates in women aged 40-65 with and without chronic diseases were 85.9% and 68.3%, respectively; the incidence rate of perimenopausal syndrome was highest in Southwest China at 71.3%, with rates of 57.4%, 57.9%, 48.5%, 59.2%, 69.5%, and 68.6% in North China, East China, South China, Northwest

China, Northeast China, and Central China, respectively; the incidence rates in women aged 40-65 with education levels of junior high school and below, high school or technical secondary school, and college and above were 54.1%, 55.7%, and 49.6%, respectively. The incidence rates of perimenopausal syndrome in Han and ethnic minority women aged 40-65 were 62.1% and 64.7%, respectively. Conclusion The incidence rate of perimenopausal syndrome is high among Chinese women aged 40-65, with higher incidence observed in women aged >50-55, those who are menopausal, those with chronic diseases, those in Southwest China, those with education levels of high school and below, and ethnic minorities. Attention should be paid to the prevention, screening, and intervention of perimenopausal syndrome in these populations to lay a foundation for women's health in old age.

Full Text

Incidence of Perimenopausal Syndrome in Chinese Women Aged 40 to 65 Years: A Meta-analysis

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Abstract

Background: With China's rapid economic and social development, living standards and health awareness have improved significantly, leading to gradual increases in average life expectancy and a growing population of perimenopausal women. Consequently, health management for this demographic has become increasingly important. Perimenopausal syndrome (PMS) affects women aged 40–65 years and can seriously impact physical and mental health and quality of life. **Objective:** To systematically evaluate the incidence of PMS among Chinese women aged 40–65 years. **Methods:** We systematically searched PubMed, Embase, Web of Science, CNKI, Wanfang Data, CBM, and VIP databases for cross-sectional studies on PMS in Chinese women aged 40–65 years, from inception to February 1, 2023. Two investigators independently screened literature, extracted data, and assessed quality. Meta-analysis was performed using Stata 17.0 software. **Results:** Sixty-two cross-sectional studies with a total sample size of 82,455 were included. The pooled incidence of PMS in Chinese women aged 40–65 years was 61.0%. Subgroup analyses revealed incidence rates of 42.6%, 53.8%, 64.6%, 59.7%, and 56.1% for age groups 40–45, >45–50, >50–55, >55–60, and >60 years, respectively. By menstrual status, incidence was 43.6%

for normal menstruation, 56.9% for irregular menstruation, and 61.3% for postmenopausal women. Women with chronic diseases had an incidence of 85.9% versus 68.3% in those without. Geographically, Southwest China showed the highest incidence at 71.3%, while North, East, South, Northwest, Northeast, and Central China reported rates of 57.4%, 57.9%, 48.5%, 59.2%, 69.5%, and 68.6%, respectively. By education level, incidence was 54.1% for junior high school and below, 55.7% for high school/technical secondary school, and 49.6% for university and above. Han Chinese women had an incidence of 62.1% compared with 64.7% among ethnic minorities. **Conclusion:** The incidence of PMS is high among Chinese women aged 40–65 years, with particularly elevated rates in women aged >50–55 years, postmenopausal women, those with chronic diseases, residents of Southwest China, those with high school education or below, and ethnic minorities. Targeted prevention, screening, and intervention efforts for PMS in these high-risk populations are essential to establish a foundation for healthy aging in women.

Key words: Perimenopause; Climacteric syndrome; Perimenopausal syndrome; Female; Incidence; Cross-sectional studies; Meta-analysis

Introduction

Perimenopause represents a critical transitional phase from reproductive maturity to old age in women. Chinese women typically enter perimenopause around age 46, a period that continues for approximately 10–15 years until one year after the final menstrual period. Statistics indicate that China currently has approximately 130 million perimenopausal women, with projections reaching 280 million by 2030. Perimenopausal syndrome (PMS), also known as climacteric syndrome or menopausal syndrome, refers to a cluster of somatic and psycho-emotional symptoms resulting from declining estrogen levels during the menopausal transition. Manifestations include menstrual irregularities, vasomotor symptoms, depression, metabolic abnormalities, and urogenital symptoms. Over 120 million women worldwide suffer from PMS annually, significantly affecting their physical and mental well-being and quality of life. Improving quality of life for perimenopausal women has been designated as one of the three major health priorities of the 21st century. Understanding the epidemiology of PMS can enhance both quality of life and healthcare delivery for perimenopausal women while providing direction for healthy aging strategies.

Although numerous domestic studies have investigated PMS prevalence among Chinese women aged 40–65 years, reported incidence rates vary substantially due to differences in study design, measurement tools, sample sizes, and geographic regions. These inconsistencies prevent systematic characterization of PMS epidemiology in this population. Therefore, this meta-analysis aims to comprehensively identify cross-sectional studies on PMS prevalence among Chinese women aged 40–65 years, systematically analyze the pooled incidence rate,

and examine distribution patterns across different populations, regions, and age groups to provide evidence-based guidance for PMS prevention and treatment.

1.1 Literature Search Strategy

We systematically searched PubMed, Embase, Web of Science, CNKI, Wanfang Data, VIP, and CBM databases for cross-sectional studies on PMS among Chinese women aged 40–65 years, with search dates from inception to February 1, 2023. Chinese search terms included: 绝经期综合征, 绝经综合征, 围绝经期综合征, 更年期综合征, 患病率, 发生率, 流行病学, 调查, and 现状. English search terms included: perimenopaus*,* *menopaus*, climacteric, syndrome, symptoms, prevalence, epidemiology, China, and Chinese. The search strategy for PubMed is shown in .

1.2 Inclusion and Exclusion Criteria

Inclusion criteria: (1) Cross-sectional study design; (2) Chinese women aged 40–65 years as study population; (3) Use of the modified Kupperman Index as measurement tool, which quantifies perimenopausal symptoms to assess severity and contains 13 items evaluating hot flashes/sweating, paresthesia, insomnia, irritability, depression/suspiciousness, palpitations, dizziness, fatigue, musculoskeletal pain, headache, formication, urinary tract infections, and sexual function (total score 0–63, with higher scores indicating more severe PMS); (4) PMS incidence as outcome measure.

Exclusion criteria: (1) Duplicate publications; (2) Studies using hospital/medical center samples or specific occupational populations; (3) Non-Chinese/English publications; (4) Conference abstracts or reviews; (5) Studies with unavailable data.

1.3 Literature Screening and Data Extraction

Two investigators independently conducted literature searches, screening, and data extraction according to inclusion/exclusion criteria, with cross-checking. Disagreements were resolved by consultation with a third investigator. Literature screening involved initial title/abstract review to exclude obviously irrelevant studies, followed by full-text review for final inclusion. Extracted data included: first author, publication year, study region, sample size, number of PMS cases, incidence rate, and age range. This study was registered with PROSPERO (registration number: CRD42023391475).

1.5 Statistical Methods

Meta-analysis was performed using Stata 17.0 software, with pooled incidence rates and 95% confidence intervals (CI) as effect measures. Heterogeneity was assessed using ^{2} test ($\alpha = 0.10$) and I^2 statistic. If $I^2 < 50\%$ and $P > 0.10$, indicating low heterogeneity, a fixed-effects model was used; otherwise, a random-

effects model was applied. Subgroup analyses were conducted to explore heterogeneity sources and compare differences in PMS incidence across subgroups. Sensitivity analysis was performed to assess the stability of pooled incidence rates. Publication bias was evaluated using funnel plots combined with Egger's test ($\alpha = 0.05$).

Results

2.1 Literature Screening Process and Results

The initial database search yielded 3,780 relevant articles: PubMed (n = 442), Embase (n = 176), Web of Science (n = 426), CNKI (n = 382), Wanfang Data (n = 1,203), CBM (n = 928), and VIP (n = 223). After removing duplicates and applying inclusion criteria, 62 studies were ultimately included [8–69]. The literature screening flowchart is shown in [Figure 1: see original paper].

2.2 Characteristics of Included Studies and Risk of Bias Assessment

The 62 included studies comprised a total sample of 82,455 women, including 46,656 PMS cases. The basic characteristics and risk of bias assessment results are presented in . Quality assessment was performed using the Agency for Healthcare Research and Quality (AHRQ) criteria for cross-sectional studies, which includes 11 items scored as "yes" (1 point), "no" (0 points), or "unclear" (0 points). Total scores range from 0–11, with 0–3 indicating low quality, 4–7 moderate quality, and 8–11 high quality.

2.3 Meta-Analysis Results

2.3.1 Overall PMS Incidence Sixty-two articles were included in the meta-analysis. Heterogeneity testing revealed $I^2 = 99.8\%$ and $P < 0.001$, warranting use of a random-effects model. The pooled incidence of PMS among Chinese women aged 40–65 years was 0.61 [95% CI (0.54, 0.68)], as shown in [Figure 2: see original paper].

2.3.2 Subgroup Analysis Given substantial heterogeneity, subgroup analyses were performed by age, menstrual status, chronic disease status, geographic region, education level, ethnicity, publication year, and diagnostic threshold. Heterogeneity remained high within subgroups, so random-effects models were used for all analyses. Results showed: (1) By age group: 40–45 years, 42.6%; >45–50 years, 53.8%; >50–55 years, 64.6%; >55–60 years, 59.7%; and >60 years, 56.1%. (2) By menstrual status: normal menstruation, 43.6%; irregular menstruation, 56.9%; and postmenopausal, 61.3%. (3) By chronic disease status: women with chronic diseases, 85.9%; without chronic diseases, 68.3%. (4) By geographic region: Southwest China had the highest incidence at 71.3%, followed by Northeast (69.5%), Central (68.6%), Northwest (59.2%), North (57.4%), East

(57.9%), and South China (48.5%). (5) By education level: junior high school and below, 54.1%; high school/technical secondary school, 55.7%; university and above, 49.6%. (6) By ethnicity: Han Chinese, 62.1%; ethnic minorities, 64.7%. (7) By publication period: 2006–2010, 70.7%; 2011–2015, 65.3%; 2016–2020, 54.9%; 2021–2023, 58.2%. (8) By modified Kupperman Index threshold: $ $1 point, 85.6%; $ $5 points, 80.3%; $ $6 points, 70.6%; $ $7 points, 63.6%; $ $15 points, 42.6%; $ $16 points, 37.4%; $ $17 points, 53.6% .

2.4 Sensitivity Analysis

Sensitivity analysis yielded PMS incidence rates of 60.4%–61.8% for Chinese women aged 40–65 years, consistent with the overall pooled estimate and indicating robust results.

2.5 Publication Bias Analysis

The funnel plot for PMS incidence showed relatively symmetrical distribution of studies. Egger's test yielded t = 0.87 and P = 0.39, suggesting no significant publication bias [Figure 3: see original paper].

Discussion

Subgroup analyses revealed that PMS incidence increases with age among Chinese women aged 40–65 years, peaking at 50–55 years, consistent with previous findings. Incidence also varied by menopausal status, with postmenopausal women showing the highest rates (61.3%), followed by those with menstrual irregularities (56.9%), and those with normal menstruation (43.6%). These patterns likely reflect age-related ovarian function decline and associated estrogen reduction.

Women with chronic diseases exhibited a substantially higher PMS incidence (85.9%) compared with those without (68.3%). Multiple studies have demonstrated positive associations between chronic diseases and various perimenopausal symptom clusters, with physically ill women more likely to experience sexual dysfunction, depression, anxiety, and vasomotor symptoms. Therefore, perimenopausal women should prioritize chronic disease prevention and screening, and those with chronic conditions require integrated management addressing both their underlying diseases and PMS-related quality of life impacts.

Geographic variations in PMS epidemiology have been reported internationally. Our study found the highest incidence in Southwest China (71.3%), followed by Northeast (69.5%) and Central China (68.6%), with the lowest in South China (48.5%). These regional disparities may reflect differences in economic status, geographic characteristics, and research concentration (most studies have focused

on eastern regions). Current domestic research predominantly comprises single-province surveys, warranting further investigation into regional epidemiological patterns.

Women with university education or above showed lower PMS incidence (49.6%) compared with less-educated groups, possibly due to better health awareness and psychological coping skills that facilitate timely medical consultation and proactive symptom management. Ethnic minority women had slightly higher incidence (64.7%) than Han Chinese (62.1%). A survey of 7,290 Han, Hui, and Tibetan women in Gansu Province found the highest incidence among Hui women, with regression analysis identifying Tibetan ethnicity as a risk factor, potentially related to geographic conditions, dietary habits, and lifestyle factors.

Temporal trends showed declining PMS incidence over time (70.7% in 2006–2010 vs. 58.2% in 2021–2023), likely reflecting improved socioeconomic conditions, healthcare delivery, and health awareness. However, the persistently high incidence underscores the need for continued attention to perimenopausal health. Notably, substantial variation existed across different diagnostic thresholds. While the modified Kupperman Index is widely used with good reliability and validity, the lack of standardized cutoff points limits comparability. We recommend establishing uniform diagnostic criteria aligned with clinical standards to enable more accurate epidemiological assessment.

Limitations

This study has several limitations. First, all included studies were cross-sectional, making them susceptible to inherent biases. Second, the use of multiple diagnostic criteria for PMS created substantial heterogeneity and limited comparability. Third, despite subgroup analyses, high heterogeneity persisted, and its sources could not be fully identified, potentially affecting result accuracy.

Conclusion

Current evidence indicates a high incidence of PMS among Chinese women aged 40–65 years, with particularly elevated risk in women aged >50–55 years, postmenopausal women, those with chronic diseases, residents of Southwest China, those with high school education or below, and ethnic minorities. Targeted prevention, screening, and intervention programs for these high-risk populations are essential to promote healthy aging in women. However, given the heterogeneity in diagnostic criteria and sample sizes, these findings require confirmation through additional high-quality studies.

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