narra j

Biopsychosocial determinants of anxiety and depression among working mothers in China: A public mental health perspective

Jia Jiao[1], Rewadee Jenraumjit[1,2], Shirley Worland[3], Saifon Bunyachatakul[4], Bijing He[5] and Tinakon Wongpakaran[1,6]*

[1]Mental Health Program, Multidisciplinary and Interdisciplinary School, Chiang Mai University, Chiang Mai, Thailand; [2]Department of Pharmaceutical Care, Faculty of Pharmacy, Chiang Mai University, Chiang Mai, Thailand; [3]Faculty of Health Sciences, University of New England, Armidalea, Australia; [4]Department of Occupational Therapy, Faculty of Associated Medical Sciences, Chiang Mai University, Chiang Mai, Thailand; [5]Longquan Secondary Vocational School, Longquan, China; [6]Department of Psychiatry, Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand

*Corresponding author: tinakon.w@cmu.ac.th

Abstract

Working mothers often face dual demands from work and parenting, increasing their risk for anxiety and depression. However, the prevalence and contributing factors among Chinese working mothers remain underexplored. The aim of this study was to examine the prevalence and biopsychosocial determinants of anxiety and depression in this population. A cross-sectional survey was conducted between October 17 and November 21, 2024 through WeChat online among 330 working mothers aged 30–45 years old using validated instruments, including the Outcome Inventory-21 (OI-21), Parental Stress Scale (PSS), Experiences in Close Relationships-revised (ECR-R-10), Inner Strength-based Inventory (I-SBI), and the Multidimensional Scale of Perceived Social Support (MSPSS). Sociodemographic, socioeconomic and biological factors, including age, marital status, annual income, and physical disease, were also collected through a self-administered general information questionnaire. Data were analyzed using t-test, analysis of variance, Pearson's correlation, and hierarchical linear regression. This study found the prevalence was 26.1% for anxiety symptoms and 38.2% for depression symptoms in this group based on the screening tools. Anxiety was significantly associated with both biological (e.g., hormonal changes, family psychiatric history) and psychological factors (e.g., attachment anxiety, parental stress). At the same time, depressive symptoms were primarily predicted by psychological and lifestyle-related factors (e.g., smoking, alcohol use). Notably, inner strength was a protective factor across both conditions. The findings highlight the importance of early detection and integrative care strategies for addressing mental health concerns in working mothers. Incorporating psychological screening, lifestyle assessment, and resilience-building interventions into workplace and community-based healthcare services may improve work-family balance outcomes in this population.

Keywords: Mental health, anxiety symptoms, depressive symptoms, working mothers, factors

Introduction

Working mothers—women who balance paid employment with caregiving and household responsibilities—are particularly susceptible to anxiety and depression [1,2]. The dual demands

of managing professional and family roles can amplify emotional strain, especially in midlife, a period often marked by increased stress and limited recovery resources [3]. While previous research has noted higher depressive symptoms among employed mothers compared to non-employed counterparts [4], the prevalence and determinants of mental health conditions among working mothers in China remain largely unexplored.

Mental health disorders, especially anxiety and depression, are escalating global public health concerns [5]. In China alone, over 40 million individuals are affected by anxiety, and more than 50 million suffer from depression [6]. Understanding the contributing factors among vulnerable populations requires a multidimensional framework—one that encompasses biological, psychological, and social influences. The biopsychosocial model, proposed by George Engel in 1977 [7], provides a framework that emphasizes the interplay among physical health, psychological well-being, and social context [8]. Biologically, working mothers may face hormonal fluctuations, genetic predispositions, and chronic health conditions that heighten their risk for anxiety and depression [9-13]. Behavioral factors, such as smoking and alcohol use, may further exacerbate these risks [14]. Psychologically, maternal stress—often intensified by competing responsibilities—can fuel anxiety and depressive symptoms [15]. Conversely, inner strength and supportive relationships appear to buffer against mental health deterioration [16,17]. Attachment theory further illustrates how relational security influences emotional resilience [18,19].

Social determinants are equally influential. Perceived social support is consistently associated with better mental health outcomes [20]. Additionally, demographic and economic variables—including marital status, educational level, number of children, working hours, and income—shape the mental health landscape of working mothers [21-25]. The aim of this study was to examine the prevalence and biopsychosocial determinants of anxiety and depression among working mothers in China. By adopting an integrative public mental health perspective, the research seeks to inform more targeted interventions for this at-risk population.

Methods

Study design and setting
A cross-sectional study was conducted via an online survey targeting working mothers residing in mainland China from October 17 until November 21, 2024. Ms. Bijing He, as the Chinese mentor affiliated with a local institution, was responsible for regulations about the data collection in China. Before data collection, the researcher obtained permission to use the validated Chinese versions of all measurement instruments. Subsequently, a comprehensive questionnaire was developed, comprising self-administered items and all relevant tools. A pilot study of 30 participants was conducted to assess the psychometric properties of measures among the Chinese population and determine the average completion time. Afterwards, the WeChat group leaders granted the researcher permission to send the questionnaires via their platform. All participants provided informed consent before participation.

Sampling strategy
Calculation based on previous literature data. In a study of Japanese working mothers, 31% of respondents reported moderate to severe anxiety symptoms [26]. In another study from the USA, 23.5% of the respondents met the criteria for positive depression screening [27]. The required sample size was estimated using a single-proportion formula $n=z^2 \times p \times (1-p) / e^2$, with a 95% confidence level, an anticipated prevalence of 30%, and a 5% margin of error, yielding a minimum of 323 respondents. A total of 369 questionnaires were collected, among which 39 were excluded as invalid. The invalid cases were identified based on criteria, including respondents who met the exclusion criteria, duplicate IP addresses, and short completion times. Finally, 330 completed questionnaires were ultimately collected and included in the analysis. Data collection employed a convenience sampling strategy (**Figure 1**).
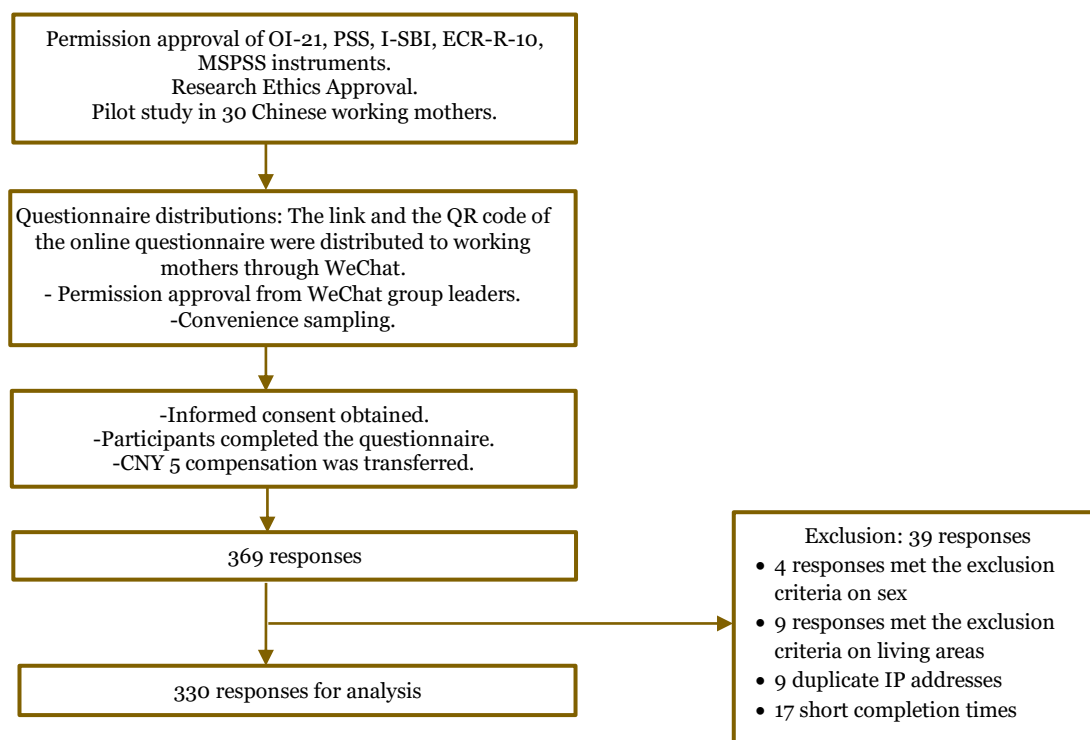
Figure 1. Flow chart of the study.

Participants

This study included working mothers residing in various urban and regional areas across China. Eligible participants were women aged 30 to 45 years who had at least one child aged 6 to 11 years enrolled in primary school, held either full-time or part-time employment, were in pregnancy, premenopausal, or perimenopausal periods, and had access to a computer or smartphone with a stable internet connection. Patients with long-term work leave or those residing in rural areas, as documented in the Chinese household registration book (hukou), were excluded from the study.

Data collection

A self-designed questionnaire was developed using the Chinese online platform Questionnaire Star. Subsequently, relevant WeChat (Tencent Holdings Ltd., Shenzhen, China) groups were identified, specifically targeting parenting groups consisting of parents with children in primary school. The group leaders were contacted to elaborate on the research objectives and related details. Upon obtaining their approval, they issued a notice to authorize the distribution of the questionnaire. Following this, the questionnaire poster was distributed in the groups and explicitly restated the enrolment criteria to all members. Each participant was provided with a detailed explanation of the study, including a participant information sheet (PIS) and an informed consent form (ICF). Eligibility was self-assessed through screening items embedded in an online questionnaire based on inclusion and exclusion criteria. To ensure that all participants were aware that only those who met the requirements could participate, clear instructions were included at the beginning of the questionnaire.

Personal privacy-related information such as real names or phone numbers was not required, and only participants' network IDs were visible. All data were anonymized to protect participant confidentiality. As compensation for participation, each respondent received CNY 5 (USD 0.7) via an Alipay red envelope, with payment processed confidentially by the researcher. Additionally, some participants voluntarily shared the poster with acquaintances who expressed interest, thereby facilitating convenience sampling.

Regarding data security on the survey platform, access to the dataset was password-protected and restricted to authorized members of the research team only. Data were stored in a de-identified or pseudonymized format. Regular audits were conducted to monitor access, and all team members adhered to confidentiality agreements and secure data handling protocols. Data were stored on secure servers, and backups were encrypted to prevent unauthorized retrieval.

The distribution of the online questionnaire ceased once the target sample size was achieved. Study data were retained for approximately one year after data cleaning, with personally identifiable information promptly redacted and secured.

Self-administered measure
The self-administered measure was a general information questionnaire comprising 14 items, covering sociodemographic and socioeconomic queries. This section also assessed biological factors, including hormonal changes, family psychiatric history, smoking, alcohol use, and physical disease.

Psychological measures
Mental health status was assessed using the Outcome Inventory-21 (OI-21), a 21-item self-report instrument designed to measure symptoms across four domains: depression, anxiety, somatization, and interpersonal difficulties [28]. Items were rated on a 5-point Likert scale ranging from 0 ("never") to 4 ("almost always"), yielding total scores between 0 and 84, with higher scores indicating greater symptom severity. Symptom prevalence was determined using established cut-off scores of 14 for depression [29] and 7 for anxiety [28]. Cronbach's alpha coefficients in the present study were 0.934 (anxiety), 0.934 (depression), 0.899 (interpersonal difficulty), and 0.922 (somatization).

Parental stress was measured using the Parental Stress Scale (PSS), initially developed by Berry and Jones (1995) [30], and translated into Chinese by Cheung (2000) [31]. The PSS consists of 18 items covering both positive and negative aspects of parenting. Higher total scores indicate greater parental stress [31]. The scale demonstrated good internal consistency in this study (α= 0.89).

Inner strength was assessed with the Inner Strength-Based Inventory (I-SBI), which evaluates ten Buddhist-derived behavioral traits including truthfulness, perseverance, wisdom, morality, and equanimity [32]. Each trait was assessed through a single item rated on a 5-point Likert scale, with total scores ranging from 10 to 50. The Chinese version of the I-SBI demonstrated high internal consistency (α=0.878) [33].

Adult attachment was measured using the abbreviated Experiences in Close Relationships–Revised (ECR-R-10), derived from the original 36-item version [34,35]. The ECR-R-10 comprises two subscales (anxiety and avoidance), each rated on a 7-point Likert scale. Scores above the median (score>4) were interpreted as high levels of attachment-related anxiety or avoidance. The Chinese adaptation of the tool has demonstrated acceptable psychometric properties [36], with Cronbach's alpha values in this study of 0.925 (anxiety) and 0.896 (avoidance).

Perceived social support was evaluated using the Multidimensional Scale of Perceived Social Support (MSPSS) [37], a 12-item self-report scale assessing support from family, friends, and significant others. Items were rated on a 7-point Likert scale from 1 ("very strongly disagree") to 7 ("very strongly agree"), with total scores ranging from 12 to 84. Higher scores reflect stronger perceived social support. The Chinese version of the MSPSS has demonstrated high internal consistency and reliability [38]; in the present study, the Cronbach's alpha was 0.958.

Data analysis
Descriptive statistics were used to summarize demographic characteristics, mental health outcomes, and levels of anxiety and depression, expressed as mean values with standard deviations. Sociodemographic and socioeconomic variables, categorized as nominal or ordinal, were presented using frequencies and percentages. A t-test was used to compare whether there was a significant difference between the means of the two groups. One-way analysis of variance (ANOVA) was applied to examine group differences across categorical variables. Pearson's correlation coefficients were calculated to assess associations between continuous variables. Hierarchical linear regression analyses were conducted to evaluate the contribution of biological, psychological, and social factors to anxiety and depression symptoms, with variables entered in sequential blocks according to the biopsychosocial framework. Assumptions of linearity, normality, and homoscedasticity were assessed. Multicollinearity was evaluated using the variance inflation factor (VIF), with values below 10 considered acceptable. Model fit was determined using the coefficient of determination (R^2) to reflect total explained variance and the

change in R^2 (ΔR^2) to indicate the additional variance explained by each successive block. All statistical analyses were conducted using IBM SPSS Statistics version 27 (IBM Corp., Armonk, NY, USA), with a significance threshold set at $p<0.05$.

Results

Sociodemographic, socioeconomic and biological factors associated with anxiety and depression

A total of 330 valid responses were analyzed using ANOVA and t-test, depending on the number of categories. The sociodemographic, socioeconomic, and biological characteristics of the working mothers, along with their corresponding anxiety and depression symptom scores, are presented in **Table 1**. The vast majority of working mothers were married or cohabiting (83.6%), and more than half (54.5%) held a bachelor's degree or higher. A substantial proportion (62.1%) worked 40 hours or more per week, and approximately 75% reported an annual household income of less than CNY 150,000. The proportion of women experiencing hormonal changes—such as during pregnancy, postpartum, or perimenopause—was 15.2%, while 22.7% of them reported having physical disease (**Table 1**).

Significant differences were observed in anxiety and depression levels across several variables (**Table 1**). Younger mothers aged 30–35 exhibited higher anxiety (10.50±6.76) and depression (6.67±5.73) compared to older age groups ($p<0.05$). Marital status was also significantly associated with psychological symptoms: mothers who were divorced, widowed, or separated reported the highest levels of depression (8.56±5.43) and anxiety (11.84±6.76) ($p<0.001$). Participants with three or more children experienced the highest psychological burden, with mean anxiety and depression scores of 16.77±4.00 and 11.17±3.83, respectively ($p<0.001$). Educational level showed an apparent gradient effect; those with high school education or below reported significantly higher anxiety (13.88±6.12) and depression (9.74±4.99) compared to those with a bachelor's degree or above ($p<0.001$). Working hours were positively associated with symptom severity. Participants working ≥55 hours per week reported significantly elevated anxiety (13.12±5.95) and depression (8.98±5.01) scores compared to those working fewer hours ($p<0.001$). Household income was inversely related to psychological distress. Those earning >CNY 151,001 annually had the lowest anxiety (5.23±4.77) and depression (2.80±3.86) scores, while the highest scores were observed in the lowest income group ($p<0.001$) (**Table 1**).

Regarding biological characteristics, participants who reported hormonal fluctuations, a family history of psychiatric disorders, smoking, alcohol use, and physical illness all showed significantly higher levels of anxiety and depression symptoms compared to those who did not report these factors (all $p<0.001$). These findings highlight the significant impact of both structural and biological factors on maternal mental health and provide empirical support for targeted interventions aimed at high-risk subgroups (**Table 1**).

Table 1. Sociodemographic, socioeconomic and biological characteristics and their associations with anxiety and depression symptoms among working mothers in China (n=330)

Sociodemographic socioeconomic biological characteristics	n (%)	Anxiety score (mean±SD)	Test difference	Depression score (mean±SD)	Test difference
Age [a]					
30−35	94 (28.5)	10.50±6.76	F (2,327) = 3.581[*]	6.67±5.73	F (2.327) = 4.572[*]
36−40	141 (42.7)	8.37±6.20		4.73±4.32	
41−45	95 (28.8)	8.54±6.12		5.31±4.64	
Marital status [a]					
Single	9 (2.7)	10.44±8.05		7.78±7.29	
Married/cohabiting	276 (83.6)	8.52±6.17	F (2,327) = 5.626[**]	4.87±4.51	F (2,327) = 12.878[***]
Divorced/widowed/ separated	45 (13.6)	11.84±6.76		8.56±5.43	
Children number [a]					
1	189 (57.3)	7.02±5.44	F (2,327) = 42.091[*]	4.03±4.16	F (2,327) = 36.693[***]
2	111 (33.6)	10.34±6.50		6.32±5.03	

Sociodemographic socioeconomic biological characteristics	n (%)	Anxiety score (mean±SD)	Test difference	Depression score (mean±SD)	Test difference
≥3	30 (9.1)	16.77±4.00		11.17±3.83	
Educational level [a]					
High school and below	81 (24.6)	13.88±6.12		9.74±4.99	
High vocational school	69 (20.9)	8.17±6.07	$F_{(2,327)} = 38.844^{***}$	4.52±3.79	$F_{(2,327)} = 55.364^{***}$
Bachelor's degree and above	180 (54.5)	7.17±5.47		3.87±4.05	
Weekly working hours [a]					
1−20	48 (14.6)	8.23±6.09		5.15±4.94	
21−40	77 (23.3)	6.96±6.34	$F_{(3,326)} = 12.070^{*}$	3.53±4.19	$F_{(3,326)} = 16.181^{***}$
41−54	147 (44.5)	8.75±6.01		5.16±4.51	
≥55	58 (17.6)	13.12±5.95		8.98±5.01	
Annual income (CNY) [a]					
0−60,000	78 (23.6)	10.19±6.62		6.96±5.65	
61,000−10,000	88 (26.7)	11.00±6.20	$F_{(4,325)} = 12.443^{***}$	6.74±4.71	$F_{(4,325)} = 10.995^{***}$
101,000−150,000	81 (24.5)	9.74±6.23		5.36±4.15	
>151,001	83 (25.2)	5.23±4.77		2.80±3.86	
Hormonal fluctuations [b]					
No	280 (84.8)	8.30±6.26	$t_{(328)} = 5.078^{***}$	5.03±4.86	$t_{(328)} = 3.723^{***}$
Yes	50 (15.2)	13.10±5.57		7.78±4.49	
Family psychiatric history [b]					
No	320 (97)	8.73±6.24	$t_{(328)} = 4.873^{***}$	5.52±4.78	$t_{(328)} = 4.270^{***}$
Yes	10 (3)	18.40±3.53		11.80±4.76	
Smoking [b]					
No	310 (93.9)	8.63±6.29	$t_{(328)} = 4.59^{***}$	5.11±4.74	$t_{(328)} = 5.131^{***}$
Yes	20 (6.1)	15.20±4.46		10.70±4.35	
Alcohol use [b]					
No	297 (90)	8.56±6.25	$t_{(328)} = 4.062^{***}$	4.96±4.65	$t_{(328)} = 5.647^{***}$
Yes	33 (10)	13.21±6.23		9.82±4.99	
Physical disease [b]					
No	255 (77.3)	7.85±6.17	$t_{(328)} = 6.529^{***}$	4.65±4.64	$t_{(328)} = 5.737^{***}$
Yes	75 (22.7)	13.01±5.48		8.17±4.80	

[a] Analyzed using ANOVA
[b] Analyzed using t-test
CNY: Chinese yuan (7.30 CNY=1 U.S. Dollar); OI: Outcome Inventory
Statistically significant $^{*}p<0.05$, $^{**}p<0.01$, $^{***}p<0.001$

Correlations between key factors and anxiety/depression symptoms

The Pearson correlation coefficients between key variables and mental health outcomes among the Chinese working mothers are presented in **Table 2.** Sociodemographic and behavioral variables (marital status, number of children, educational level, working hours, smoking, and alcohol use) were included alongside psychosocial predictors. Significant positive correlations were observed between anxiety and interpersonal difficulty ($r=0.801$, $p<0.01$), attachment anxiety ($r=0.593$, $p<0.01$), and parental stress ($r=0.829$, $p<0.01$). Similarly, these variables were positively associated with depression: interpersonal difficulty ($r=0.790$, $p<0.01$), attachment anxiety ($r=0.625$, $p<0.01$), and parental stress ($r=0.837$, $p<0.01$). Conversely, protective factors such as inner strength ($r=−0.692$ with anxiety; $r=−0.708$ with depression, $p<0.01$) and perceived social support ($r=−0.692$ with anxiety; $r=−0.703$ with depression, $p<0.01$) were strongly negatively correlated with both outcomes (**Table 2**).

Hierarchical regression predicting anxiety symptoms

A hierarchical linear regression was conducted to assess the relative contributions of biological, psychological, and social factors to anxiety symptoms, as presented in **Table 3.** Predictors were entered in four sequential blocks: (1) covariates (age, number of children, educational level, and weekly working hours); (2) biological and behavioral factors (hormonal changes, family psychiatric history, physical disease, smoking, and alcohol use); (3) psychological factors (parental stress, interpersonal difficulty, attachment anxiety, attachment avoidance, and inner strength); and (4) social factors (marital status, annual income, and perceived social support).

The assumptions of linearity, normality, and homoscedasticity were met. Multicollinearity was not a concern, with all VIFs below 5 (**Table 3**).

Block 1 accounted for 32.7% of the variance in anxiety symptoms (R^2=0.327; F change (4,325)=39.528, $p<0.001$). The addition of biological and behavioral factors in Block 2 explained a further 14.8% of the variance (ΔR^2=0.148; F change (5,320)=18.084, $p<0.001$). Psychological factors introduced in Block 3 significantly improved the model, accounting for an additional 34.8% of the variance (ΔR^2=0.348; F change (5,315)=123.723, $p<0.001$). In contrast, social factors in Block 4 contributed only 0.1% of additional variance (ΔR^2=0.001; F change (3, 312) =0.822, $p=0.483$). The final model explained 81.5% of the total variance in anxiety symptoms (adjusted R^2= 0.815) (**Table 3**).

Hierarchical regression predicting depression symptoms

A hierarchical linear regression was conducted to identify biopsychosocial predictors of depression symptoms, presented in **Table 4.** Predictors were entered in four blocks, as previously mentioned. Block 1 accounted for 35.5% of the variance in depression symptoms (R^2 = 0.355; F change (4,325)=44.683, $p<0.001$), with number of children (β=0.30, $p<0.001$), lower education (β=−0.41, $p<0.001$), and longer working hours (β=0.11, $p<0.05$) as significant predictors. Biological and behavioral factors in Block 2 explained an additional 10.9% of the variance (ΔR^2=0.109; F change (5,320)=13.021, $p<0.001$). Psychiatric history (β=0.21, $p<0.001$), physical disease (β=0.11, $p<0.05$), smoking (β=0.11, $p<0.05$), and alcohol use (β=0.10, $p<0.05$) were significant predictors. Psychological factors introduced in Block 3 added 36.6% to the explained variance (ΔR^2=0.366; F change (5,315)=136.046, $p<0.001$). Significant predictors included parental stress (β=0.36, $p<0.001$), interpersonal difficulty (β=0.38, $p<0.001$), attachment anxiety (β=0.13, $p<0.001$), and lower inner strength (β=-0.11, $p<0.01$). Social factors in Block 4 did not contribute significantly to the model (ΔR^2=0.003; F change (3,312)=2.165, $p>0.05$). The final model accounted for 82.5% of the total variance in depression symptoms (adjusted R^2=0.825) (**Table 4**).

Discussion

Findings revealed that 26.1% reported anxiety symptoms and 38.2% reported depression symptoms, based on the Outcome Inventory-21. These rates are considerably higher than those reported in earlier studies among Chinese women aged 40−60, where 14.2% experienced anxiety and 19.5% reported depressive symptoms [39,40]. The discrepancy may be due to the unique stressors faced by working mothers, who juggle dual roles, in contrast to the broader female population. Additionally, methodological differences in measurement tools may account for variation in prevalence. While clinical diagnosis remains the gold standard, the elevated rates observed underscore a pressing concern regarding the mental health of Chinese working mothers.

In terms of associated factors, the findings generally supported our hypotheses based on the biopsychosocial framework. Biological and psychological variables were significantly associated with anxiety symptoms, while social factors, particularly perceived social support, did not show a direct effect. It is possible that time constraints hinder working mothers from accessing available support or diminish their perception of its utility, especially under high self-reliance expectations [41]. In collectivist contexts such as China, social support may be seen as normative, potentially reducing its perceived impact on psychological outcomes. Moreover, a previous study indicated that perceived social support may exert interaction effects with other variables [42], a dimension not examined in this study.

Biological determinants such as work-life imbalance, sleep disturbances, and postpartum hormonal dysregulation, particularly involving cortisol and thyroid hormones, are consistent with findings from related studies and contribute significantly to anxiety vulnerability [43-45]. Furthermore, genetic predisposition may underlie individual susceptibility to anxiety, independent of external support mechanisms [12].

Table 2. Pearson's Correlation coefficients among sociodemographic, behavioral, psychosocial variables, and mental health outcomes (n=330)

Items	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Marital status	1														
2. No. of Children	-0.046	1													
3. Educational level	0.193**	-0.276**	1												
4. Working hours	-0.163**	0.220**	-0.141*	1											
5. Smoking	-0.162**	0.062	-0.187**	-0.008	1										
6. Alcohol use	-0.115*	0.062	-0.310**	-0.008	0.381**	1									
7. Physical disease	-0.139*	0.116*	-0.161**	0.051	0.284**	0.157**	1								
8. Interpersonal difficulties	-0.165**	0.300**	-0.323**	0.186**	0.1	0.052	0.235**	1							
9. Attachment anxiety	-0.436**	0.205**	-0.310**	0.204**	0.146**	0.148**	0.230**	0.481**	1						
10. Attachment avoidance	-0.503**	0.213**	-0.223**	0.207**	0.125*	0.134*	0.180**	0.351**	0.617**	1					
11. Parental stress	-0.225**	0.450**	-0.521**	0.201**	0.212**	0.226**	0.275**	0.689**	0.601**	0.471**	1				
12. Inner strength	0.140*	-0.316**	0.384**	-0.160**	-0.266**	-0.221**	-0.219**	-0.613**	-0.418**	-0.393**	-0.705**	1			
13. Social support	0.212**	-0.309**	0.444**	-0.177**	-0.236**	-0.197**	-0.285**	-0.626**	-0.475**	-0.491**	-0.708**	0.663**	1		
14. Anxiety	-0.193**	0.364**	-0.434**	0.193**	0.249**	0.204**	0.339**	0.801**	0.593**	0.409**	0.829**	-0.692**	-0.692**	1	
15. Depression	-0.282**	0.336**	-0.500**	0.207**	0.269**	0.244**	0.302**	0.790**	0.625**	0.445**	0.837**	-0.708**	-0.703**	0.896**	1

Analyzed using Pearson's Correlation
Statistically significant *$p<0.05$, **$p<0.01$

Table 3. Hierarchical linear regression of biopsychosocial predictors on anxiety symptoms among working mothers in China (n=330)

Variables	Block 1			Block 2			Block 3			Block 4		
	β	t	95%CI (LB, UB)	β	t	95%CI (LB, UB)	β	t	95%CI (LB, UB)	β	t	95%CI (LB, UB)
Age	-0.03	-0.71	-1.06, 0.50	-0.09	-1.94	-1.43, 0.01	-0.05	-1.77	-0.81, 0.04	-0.05	-1.79	-0.81, 0.04
Children number	0.34	6.99***	2.28, 4.06	0.33	7.48***	2.23, 3.83	0.01	0.36	-0.44, 0.65	0.01	0.35	-0.45, 0.66
Educational level	-0.35	-7.19***	-2.32, -1.32	-0.23	-5.04***	-1.70, -0.75	-0.00	-0.11	-0.33, 0.29	-0.01	-0.19	-0.37, 0.31
Working hours	0.09	1.98*	0.00, 1.15	0.10	2.23*	0.07, 1.09	0.02	0.88	-0.17, 0.44	0.02	0.71	-0.20, 0.42
Hormonal changes				0.17	3.95***	1.54, 4.60	0.07	2.72**	0.35, 2.18	0.07	2.68*	0.33, 2.16
Psychiatric history				0.24	5.85***	5.86, 11.8	0.08	2.96**	0.95, 4.71	0.08	2.96**	0.950, 4.72
Physical disease				0.17	3.59***	1.14, 3.91	0.07	2.41*	0.19, 1.83	0.07	2.37	0.17, 1.82
Smoking				0.10	2.03*	0.05, 3.15	0.06	2.05*	0.04, 1.88	0.05	1.88	-0.04, 1.82
Alcohol use				0.04	0.89	-0.74, 1.97	0.00	0.05	-0.79, 0.83	-0.00	-0.06	-0.84, 0.79
Parental stress							0.38	7.89***	0.11, 0.19	0.36	7.31***	0.10, 0.18
Interpersonal difficulties							0.38	10.79***	0.54, 0.78	0.37	10.14***	0.51, 0.76
Attachment anxiety							0.10	2.75**	0.02, 0.13	0.10	2.81**	0.02, 0.13
Attachment avoidance							-0.04	-1.18	-0.09, 0.02	-0.05	-1.50	-0.10, 0.01
Inner strength							-0.09	-2.60*	-0.13, -0.02	-0.09	-2.25*	-0.13, 0.01

Variables	Block 1			Block 2			Block 3			Block 4		
	β	t	95%CI (LB, UB)	β	t	95%CI (LB, UB)	β	t	95%CI (LB, UB)	β	t	95%CI (LB, UB)
Marital status										0.01	0.31	-0.71, 0.97
Annual income										0.01	0.46	-0.21, 0.34
Social support										-0.06	-1.45	-0.06, 0.01
All VIFs <5												
Variance Explained	$R^2 = 0.327$ R^2 adjusted = 0.319 F change $(4,325) = 39.528^{***}$			R^2 change = 0.148 R^2 adjusted = 0.461 F change $(5,320) = 18.084^{***}$			R^2 change = 0.348 R^2 adjusted = 0.823 F change $(5,315) = 123.723^{***}$			R^2 change = 0.001 R^2 adjusted = 0.815 F change $(3,312) = 0.822$		

Analyzed using Hierarchical Linear Regression
β=standardized coefficients; t=t-value; 95%CI (LB/UB): 95% confidence interval for lower bound and upper bound; VIF=variance inflation factor; Statistically significant at $^*p<0.05$, $^{**}p<0.01$, $^{***}p<0.001$

Table 4. Hierarchical linear regression of biopsychosocial predictors on depression symptoms among working mothers in China (n=330)

Variables	Block 1			Block 2			Block 3			Block 4		
	β	t	95%CI (LB, UB)	β	t	95%CI (LB, UB)	β	t	95%CI (LB, UB)	β	t	95%CI (LB, UB)
Age	-0.01	-0.13	-0.62 ,0.55	-0.03	-0.68	-0.75, 0.37	0.01	0.33	-0.27, 0.37	0.00	0.17	-0.29, 0.35
Children number	0.30	6.21^{***}	1.45, 2.79	0.29	6.60^{***}	1.45, 2.69	-0.03	-0.95	-0.61, 0.21	-0.03	-1.14	-0.65, 0.17
Educational level	-0.41	-8.77^{***}	-2.05, -1.30	-0.30	-6.50^{***}	-1.59, -0.85	-0.07	-2.26^*	-0.50, -0.04	-0.08	-2.42^*	-0.57, -0.06
Working hours	0.11	2.45^*	0.11, 0.97	0.11	2.62^{**}	0.13, 0.92	0.03	1.39	-0.07, 0.39	0.03	1.00	-0.11, 0.35
Hormonal changes				0.10	2.21^*	0.15, 2.52	-0.01	-0.19	-0.75, 0.62	-0.01	-0.22	-0.76, 0.61
Psychiatric history				0.21	4.99^{***}	3.54, 8.15	0.04	1.44	-0.38, 2.45	0.04	1.44	-0.38, 2.44
Physical disease				0.11	2.42^*	0.25, 2.39	0.01	0.34	-0.51, 0.72	0.01	0.42	-0.49, 0.75
Smoking				0.11	2.34	0.26, 2.66	0.07	2.68^{**}	0.25, 1.64	0.07	2.63^{**}	0.23, 1.62
Alcohol use				0.10	2.26^*	0.16, 2.26	0.06	2.29^*	0.10, 1.31	0.05	2.00^*	0.01, 1.23
Parental stress							0.36	7.66^{***}	0.08, 0.14	0.35	7.22^{***}	0.08, 0.13
Interpersonal difficulties							0.38	11.01^{***}	0.41, 0.59	0.37	10.38^{***}	0.39, 0.58
Attachment anxiety							0.13	3.80^{***}	0.04, 0.12	0.13	3.76^{***}	0.04, 0.12
Attachment avoidance							-0.02	-0.67	-0.05, 0.03	-0.04	-1.33	-0.07, 0.01
Inner strength							-0.11	-2.96^{**}	-0.10, -0.02	-0.11	-2.92^{**}	-0.11, -0.02
Marital status										0.05	1.82	-0.05, 1.20
Annual income										0.04	1.20	-0.08, 0.33
Social support										-0.05	-1.38	-0.04, 0.01
All VIFs < 5												
Variance Explained	$R^2 = 0.355$ R^2 adjusted = 0.347 F change $(4,325) = 44.683^{***}$			R^2 change = 0.109 R^2 adjusted = 0.449 F change $(5,320) = 13.021^{***}$			R^2 change = 0.366 R^2 adjusted = 0.823 F change $(5,315) = 136.046^{***}$			R^2 change = 0.003 R^2 adjusted = 0.825 F change $(3,312) = 2.165$		

Analyzed using Hierarchical Linear Regression
β=standardized coefficients; t =t-value; 95%CI (LB/UB): 95% confidence interval for lower bound and upper bound; VIF=variance inflation factor; Statistically significant at $^*p<0.05$, $^{**}p<0.01$, $^{***}p<0.001$

In contrast, depressive symptoms among Chinese working mothers were primarily associated with educational attainment, lifestyle factors (smoking and alcohol use), and psychological variables, while biological and social factors showed no significant associations. Education level has consistently been identified as a predictor of depression [23], likely due to its role in enhancing cognitive coping strategies and mitigating learned helplessness [46]. Unlike anxiety, which centers on heightened arousal and fear, depression often reflects persistent low mood and helplessness, conditions that can be moderated through higher educational engagement [47].

Lifestyle behaviors such as smoking and alcohol consumption were also linked to depressive symptoms in the present study. These behaviors are commonly adopted as maladaptive coping mechanisms in response to chronic stress [48]. While they may offer temporary relief from anxiety, prolonged use tends to worsen depressive states due to their neurobiological impacts, including nicotine withdrawal-induced dysphoria and alcohol's depressive effects on GABAergic and dopaminergic systems [14].

Psychological variables, including interpersonal difficulties, attachment anxiety, and parental stress, emerged as shared transdiagnostic factors for both anxiety and depression. Parental stress, driven by societal expectations of ideal motherhood and occupational obligations, fosters internal conflict, guilt, and emotional exhaustion [49]. Additionally, interpersonal dysfunction and insecure attachment can disrupt relational harmony, promote rumination, and intensify emotional vulnerability, thereby contributing to both depressive and anxious symptomatology [50].

This study is also the first to utilize the Chinese version [33] of the I-SBI [32] to assess inner strength among Chinese working mothers. Results indicated a significant negative association between inner strength and both anxiety and depression. These findings align with prior studies, including recent research among Chinese salespersons, where inner strength was inversely related to anxiety [33,51]. Given that depression is often marked by diminished self-worth and perceived helplessness, the buffering role of inner strength is particularly critical in this context [17].

The strengths of this study lie in its contribution to a more comprehensive understanding of the mental health challenges faced by Chinese working mothers, with implications for both individual-level interventions and broader public mental health strategies. The findings support the integration of routine mental health screening into primary care settings to facilitate early identification and prevention. Furthermore, they underscore the need for community-based mental health programs, including regular training in stress management and the promotion of open, stigma-free discussions around mental well-being. Strengthening inner psychological resources, such as inner strength, may also serve as a viable intervention strategy. On a policy level, the results advocate for structural support systems, including extended maternity leave, flexible work schedules, and improved access to affordable, high-quality childcare services.

Several limitations must be acknowledged. First, the sample was limited to urban and regional populations in mainland China, potentially restricting generalizability. Future studies should include rural populations to capture a more representative national profile. Second, expanding the sample size and incorporating additional biopsychosocial variables would enhance the study's statistical power and comprehensiveness. Third, the cross-sectional design prevents causal inference; longitudinal research and the use of randomized sampling methods are necessary to clarify temporal relationships and strengthen validity. Lastly, the inclusion of a mixed-methods approach could address limitations of quantitative data alone by offering richer contextual insights and increasing the interpretive depth and reliability of findings [52].

Conclusion

This study identified a notable prevalence of anxiety and depression symptoms among Chinese working mothers, highlighting the relevance of the biopsychosocial model in understanding these mental health outcomes. Anxiety was primarily associated with biological and psychological factors, while depression was more influenced by lifestyle behaviors (smoking, alcohol use) and psychological stressors. Inner strength emerged as a significant protective factor against both conditions. By offering region-specific insights into an underrepresented population, the present

study contributes to the global mental health discourse. Prioritizing the mental health of working mothers is essential not only for individual well-being but also for fostering stable family dynamics and supporting optimal child development.

Ethics approval

This study received endorsement from the research ethics committee of the Faculty of Medicine, Chiang Mai University (protocol code: PSY-2567-0513), with certification number 380/2024, effective October 1, 2024.

Acknowledgments

The authors express their gratitude to all working mothers who participated in this research.

Competing interests

The authors assert that they have no conflicts of interest.

Funding

This study received no external funding.

Underlying data

Derived data supporting the findings of this study are available from the corresponding author on request.

Declaration of artificial intelligence use

We hereby confirm that no artificial intelligence (AI) tools or methodologies were utilized at any stage of this study, including data collection, analysis, visualization, or manuscript preparation. The authors conducted all work presented in this study manually without the assistance of AI-based tools or systems.

How to cite

Jiao J, Jenraumjit R, Worland S, *et al.* Biopsychosocial determinants of anxiety and depression among working mothers in China: A public mental health perspective. Narra J 2025; 5 (3): e2754 - http://doi.org/10.52225/narra.v5i3.2754.

References

1. Lin W, Wang H, Gong L, *et al*. Work stress, family stress, and suicide ideation: A cross-sectional survey among working women in Shenzhen, China. J Affect Disord 2020;277:747-754.
2. Kirwin MA, Ettinger AK. Working mothers during COVID-19: A cross-sectional study on mental health status and associations with the receipt of employment benefits. BMC Public Health 2022;22:435.
3. Chai H, Fu R, Coyte PC. How do middle-aged chinese men and women balance caregiving and employment income? Healthcare 2021;9(4):415.
4. Adhikari H. Anxiety and depression: comparative study between working and non-working mothers. Int Mul tidiscip Res J 2022;12:273-282.
5. COVID-19 Mental Disorders Collaborators. Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. Lancet 2021;398:1700-1712.
6. World Health Organization. Mental health in China. Available online: https://www.who.int/china/health-topics/mental-health. Accessed: 10 March 2025.
7. Engel GL. The need for a new medical model: A challenge for biomedicine. Science 1977;196(4286):129-136.
8. Wade DT, Halligan PW. The Biopsychosocial model of illness: a model whose time has come. Clin Rehabil 2017;31(8):995-1004.
9. Chan CY, Lee AM, Koh YW, *et al*. Associations of body dissatisfaction with anxiety and depression in the pregnancy and postpartum periods: A longitudinal study. J Affect Disord 2020;263:582-592.

10. Jalali A, Ziapour A, Karimi Z, *et al.* Global prevalence of depression, anxiety, and stress in the elderly population: A systematic review and meta-analysis. BMC geriatrics 2024;24:809.

11. Zhang Y, Hu TT, Cheng YR, *et al.* Global, regional, and national burden of anxiety disorders during the perimenopause (1990-2021) and projections to 2035. BMC women's health 2025;25:11.

12. Ochoa-Fuentes DA, Gutiérrez-Chablé LE, Méndez-Martínez S, *et al.* Confinement and social distancing: Stress, anxiety, depression in children and adolescents. Rev Med Inst Mex Seguro Soc 2022;60:338-344.

13. Meda RT, Nuguru SP, Rachakonda S, *et al.* Chronic pain-induced depression: A review of prevalence and management. Cureus 2022;14(8):e28416.

14. Boson K, Anderberg M, Wenneberg P, *et al.* Long-term outcomes of adolescent outpatient treatment for substance use problems: Exploring the co-occurrence of mental health and substance use problems. Scand J Child Adolesc Psychiatr Psychol 2024;12:20240013.

15. Sandnes R, Le Floch M, Riquin E, *et al.* Parental stress and mental health outcomes following very preterm birth: A systematic review of recent findings. J Affect Disord 2024;355:513-525.

16. Nan Y, Xie Y, Hu, Y. Internet use and depression among Chinese older adults: The mediating effect of interpersonal relationship. Front Public Health 2023;11:1102773.

17. Thongprem T, Deechaiya R, Chanachai S, *et al.* Moderating effect of variables associated with positive mental health in a mediation model on depression among college students: Protocol for a longitudinal study. Healthcare 2023;11(13):1709.

18. Bowlby J. Attachment and loss. Vol. I. New York: Basic Books; 1969.

19. Simpson JA, Rholes WS. Adult attachment, stress, and romantic relationships. Curr Opin Psychol 2017;13:19-24.

20. Shao R, He P, Ling B, *et al.* Prevalence of depression and anxiety and correlations between depression, anxiety, family functioning, social support and coping styles among Chinese medical students. BMC psychology 2020;8:38.

21. Demir UF, Bozkurt O. Evaluation of anxiety, depression and marital relationships in patients with migraine. Ideggyogyaszati szemle 2020;73):129-134.

22. Qian G, Mei J, Tian L, *et al.* Assessing mothers' parenting stress: differences between one- and two-child families in China. Front Psychol 2021;11:609715.

23. Kist Bakof K, Morais Machado L, Rocha Iensen G, *et al.* Stress and its contribution to the development of depression symptoms are reduced in caregivers of elderly with higher educational level. Stress 2021;24(6):676-685.

24. Ma X. Impact of long working hours on mental health: Evidence from China. Int J Environ Res Public Health 2023;20:1641.

25. Qian Z, Pines A, Stone BV, *et al.* Changes in anxiety and depression in patients with different income levels through the COVID-19 pandemic. J Affect Disord 2023;338:17-20.

26. Sato M, Yamada T. Anxiety symptoms among Japanese working mothers during the COVID-19 pandemic. Jpn J Public Health 2022;12(3): 273-282.

27. Goodman JM, *et al.* Maternal employment and mental health: A longitudinal study. J Fam Psychol. 2020;34(4):543-554.

28. Wongpakaran N, Wongpakaran T, Kövi Z. Development and validation of 21-item outcome inventory (OI-21). Heliyon 2022;8(12):e09682.

29. Wang X, Wongpakaran T, Pojanapotha P, *et al.* Anxiety and associated factors among chinese preschool teachers. Educ Sci 2024;14(10):1242.

30. Berry JO, Jones WH. The parental stress scale: Initial psychometric evidence. J Soc Pers Relat 1995;12(3):463-472.

31. Cheung SK. Psychometric properties of the Chinese version of the parental stress scale. Psychologia 2000;43(4):253-261.

32. Wongpakaran T, Yang T, Varnado P, *et al.* The development and validation of a new resilience inventory based on inner strength. Sci Rep 2023;13:2506.

33. Mao B, Kanjanarat P, Wongpakaran T, *et al.* Factors associated with depression, anxiety and somatic symptoms among international salespeople in the medical device industry: A cross-sectional study in china. Healthcare 2023;11(9):2174.

34. Fraley RC, Waller NG, Brennan KA. An item response theory analysis of self-report measures of adult attachment. J Pers Soc Psychol 2000;78(2):350-365.

35. Wongpakaran N, Wongpakaran T, Lerttrakarnnon P, *et al.* Psychometric assessment of the 10-item, revised experience of close relationship (ECR-R-10) in nonclinical and clinical populations of adults and older adults in Thailand. Sci Rep 2023;13:14969.

36. Li T, Kato K. Measuring adult attachment: Chinese adaptation of the ECR scale. Acta Psychol. Sin 2006;38(3):399-406.

37. Zimet GD, Dahlem NW, Zimet SG, *et al*. The multidimensional scale of perceived social support. J. Pers. Assess 1988;52(1):30-41.

38. Wang Y, Wan Q, Huang Z, *et al*. Psychometric properties of multi-dimensional scale of perceived social support in Chinese parents of children with cerebral palsy. Front Psychol 2017;8:2020.

39. Wang X, Zhao G, Di J, *et al*. Prevalence and risk factors for depressive and anxiety symptoms in middle-aged Chinese women: A community-based cross-sectional study. BMC women's health 2022;22:319.

40. Li Y, Wang X, Zhang L, Liu X, Chen M, Yang Y. Prevalence and risk factors for depressive and anxiety symptoms in middle-aged Chinese women: A community-based cross-sectional study. J Affect Disord 2022;315:113597.

41. Khan MF, Shahzadi S. Understanding parenting and pregnant women's perceptions of accessing, utilizing, and barriers to seeking social support for mental well-being. Behav Sci 2023;15(3):348.

42. Jin L, Pan C, Zhao C, *et al*. Perceived social support and symptoms of depression and anxiety among Chinese adolescents: A moderated chain mediation model. Int J Ment Health Promot 2025;27(1):29-40.

43. Kim H Y, Hong Y C, Lee N, *et al*. Working from home, work-life balance, and depression/anxiety among korean workers in the covid-19 pandemic period: A mediation analysis. J Occup Environ Med 2023;65:98-103.

44. Zhang N, Gao X, Li D, *et al*. Sleep deprivation-induced anxiety-like behaviors are associated with alterations in the gut microbiota and metabolites. Microbiol Spectr 2024;12:e0143723.

45. Modak A, Ronghe V, Gomase KP, *et al*. A comprehensive review of motherhood and mental health: postpartum mood disorders in focus. Cureus 2023;15:e46209.

46. Li B, Allebeck P, Burstöm B, *et al*. Educational level and the risk of mental disorders, substance use disorders and self-harm in different age-groups: A cohort study covering 1,6 million subjects in the Stockholm region. Int J Methods Psychiatr Res 2023;32:e1964.

47. Li J, Ma W. Does higher education increase depression risk? A U-shaped relationship analysis in China. Popul Dev 2020;26(3):12-25.

48. Chow MSC, Poon SHL, Lui KL, *et al*. Alcohol consumption and depression among university students and their perception of alcohol use. East Asian Arch Psychiatry 2021;31:87-96.

49. Aarntzen L, Derks B, van Steenbergen E, *et al*. When work–family guilt becomes a women's issue: Internalized gender stereotypes predict high guilt in working mothers but low guilt in working fathers. Br J Soc Psychol 2023;62(1):12-29.

50. Clark DA, Rock AJ, Coventry WL. Adult attachment, worry and reassurance seeking: Investigating the role of intolerance of uncertainty. Clin Psychol 2020;24(3):239-249.

51. DeMaranville J, Wongpakaran T, Wongpakaran N, Wedding D. The mediating role of precepts and meditation on attachment and depressive symptoms in adolescents. Healthcare 2023;11(13):1923.

52. Wasti SP, Simkhada P, van Teijlingen ER, *et al*. The growing importance of mixed-methods research in health. Nepal J Epidemiol 2022;12:1175-1178.