ORIGINAL RESEARCH ARTICLE

Pregnant women's psychological responses to COVID-19 in China: A cross-sectional study

DOI: 10.29063/ajrh2025/v29i8s.7

Yang Xu[1], Tian T. Mu[2] and Guangyu Zhu[3]*

Arts college of wuyi university, wuyi university, no. 358, Baihua Road, Fujian Province, Wuyishan City, 354300, China[1]; Universiti Sains Malaysia's School of Housing, Building and Planning[2]; Communication University of ZheJiang[3]

***For Correspondence:** Email: *xuyang@student.usm.my*

Abstract

The COVID-19 pandemic has significantly affected mental health, particularly among pregnant women. While its impact during the peak of the outbreak has been studied, little is known about its effects during the remission phase. Understanding these changes is essential for effective support. This study assessed the psychological responses experienced by pregnant women in China from February to May 2020. The research examines 550 participants using validated instruments, including the IES-R (α=0.89), Social Support Scale (α=0.82), and Lifestyle Assessment (α=0.80). The analysis reveals three key findings: First, psychological distress peaks during the second trimester (IES score: 36.5±17.6), with 87.4% reporting helplessness, while social support reaches its highest level (98.6% family caregiving). Second, first-trimester participants demonstrate the highest perceived vulnerability (89.6%) despite showing the poorest preventive knowledge (61.6%). Third, lifestyle modifications prioritize mental health (86.6-96.5% improvement) over physical activity (9.6-29.6% increase). The study highlights the necessity for trimester-specific interventions: mental health screening in the first trimester, targeted support during the second trimester, and enhanced education in the third trimester. These findings provide evidence for developing culturally adapted prenatal care protocols during public health crises. *(Afr J Reprod Health 2025; 29 [8s]: 60-69).*

Keywords: Mental Health; COVID-19 Pandemic; Pregnant Women

Résumé

La pandémie de COVID-19 a eu un impact significatif sur la santé mentale, en particulier chez les femmes enceintes. Bien que ses effets aient été étudiés durant le pic de l'épidémie, peu de recherches ont été menées sur ses conséquences pendant la phase de rémission. Comprendre ces évolutions est essentiel pour offrir un soutien efficace. Cette étude a évalué les réactions psychologiques vécues par les femmes enceintes en Chine entre février et mai 2020. La recherche porte sur 550 participantes, en utilisant des instruments validés tels que l'IES-R (α = 0,89), l'Échelle de soutien social (α = 0,82) et l'Évaluation du mode de vie (α = 0,80). L'analyse met en évidence trois résultats clés : premièrement, la détresse psychologique atteint un pic au deuxième trimestre (score IES : 36,5 ± 17,6), avec 87,4 % déclarant un sentiment d'impuissance, tandis que le soutien social atteint son niveau le plus élevé (98,6 % de soutien familial). Deuxièmement, les participantes du premier trimestre montrent la plus grande vulnérabilité perçue (89,6 %), malgré une connaissance préventive insuffisante (61,6 %). Troisièmement, les modifications du mode de vie privilégient la santé mentale (amélioration de 86,6 à 96,5 %) au détriment de l'activité physique (augmentation de 9,6 à 29,6 %). L'étude souligne la nécessité d'interventions spécifiques à chaque trimestre: dépistage de la santé mentale au premier trimestre, soutien ciblé au deuxième, et renforcement de l'éducation au troisième. Ces résultats offrent une base pour l'élaboration de protocoles de soins prénatals culturellement adaptés en période de crise sanitaire. *(Afr J Reprod Health 2025; 29 [8s]: 60-69).*

Mots-clés: Santé mentale; Pandémie de COVID-19; Femmes enceintes

Introduction

The COVID-19 pandemic, first identified in Wuhan, China in December 2019[1], rapidly spread across the globe and was declared a Public Health Emergency of International Concern by the World Health Organization on January 30, 2020[2]. Without a doubt, COVID-19 had a significant impact on both the physical and mental health of individuals[3]. The rapid human-to-human transmission of the virus triggered widespread fear and psychological stress among the general public and infected individuals[4,5], while the proliferation of misinformation, rumors, and misinterpretations

further exacerbated anxiety. In addition, travel restrictions, public health mandates, home quarantines, and a prevailing sense of hopelessness and fear contributed to increased distress within the population[6].

Among the most vulnerable groups during the pandemic were pregnant women. Pregnant people are more likely to get severely ill from COVID-19 than non-pregnant individuals, with increased risks of preterm birth and other complications[7]. A survey conducted by the Kaiser Family Foundation in late March 2020 revealed that 53% of women and 37% of men reported that stress related to the coronavirus had negatively impacted their mental health[8]. This is particularly concerning in the perinatal context, as psychological distress during pregnancy can not only lead to adverse outcomes for both mother and child[9], but also contribute to partner stress and family instability[10], ultimately resulting in broader economic burdens[11].

Multiple studies indicate that the COVID-19 pandemic significantly increased psychological distress among pregnant women, with reported anxiety (19.5%–36%) and depression (16.8%–30%) rates especially high in early pregnancy, among housewives, and those with lower education levels[12- 14]. Key risk factors included fear of fetal abnormalities, restricted prenatal care access, and lack of family support[15,16]. Research by Luo *et al.* and Ma *et al*. highlighted reduced resilience and elevated insomnia (33.6%)[17,18], while Bo *et al*. and Zhao *et al.* found strong associations between COVID-19-related worries (e.g., maternal/fetal infection risks) and delayed prenatal visits with worsened mental health outcomes[19,20].

Pregnant women also experienced disproportionate mental health burdens, with studies showing 2–3 times higher rates of anxiety and depression compared to pre-pandemic levels[21,22]. Preventive behaviors such as handwashing (92%), mask-wearing (85%), and stockpiling essentials (67%) were widely adopted among pregnant women globally[23,24]. In China, compliance reached 89% due to strict public health campaigns and collective cultural values[25], whereas lower adherence (42–58%) in parts of Africa was attributed to resource limitations and inconsistent messaging[26,27]. Notably, psychological well-being mediated these behaviors—higher anxiety levels were linked to reduced adherence ($\beta = -0.34$, $p < .01$) due to impaired risk perception[28]. Such psychological strain carries intergenerational implications, with meta-analyses showing increased risks of preterm birth (OR= 1.28) and neonatal neurodevelopmental issues (OR= 1.15) in association with maternal pandemic-related stress[29].

Emerging literature further emphasizes the trimester-specific nature of these psychological responses. Smith *et al.* introduced the "social buffering hypothesis," suggesting that increased social support during crises can significantly reduce psychological distress among pregnant women[30]. Johnson noted that support and psychological adaptation vary across trimesters, with the second trimester typically reflecting heightened psychosocial need[31]. In contrast, Brown found declines in coping capacity and perceived support during the third trimester[32]. Additionally, studies by Lee *et al*. documented concurrent improvements in mental and physical health during pregnancy—findings that may not fully reflect the pandemic's unique stressors[33]. These discrepancies highlight the need for culturally informed, trimester-specific analysis of mental health in pregnant populations during major health crises.

The investigation of psychological responses among pregnant women in China during the COVID-19 pandemic holds significant importance. As the initial epicenter of the outbreak, China offers a distinct case for examining how pregnant women adapted to sudden stress and restricted healthcare access. Furthermore, existing research suggests that sociocultural factors—such as the legacy of the one-child policy and disparities in healthcare access—may have intensified anxiety and depression in this population. Identifying unique psychological patterns can inform the design of targeted interventions, including online counseling programs and social support initiatives. By analyzing comprehensive Chinese data, this study not only addresses knowledge gaps about cultural variations in pandemic-related distress but also provides a framework for mental health policymaking for vulnerable groups. Accordingly, the present study systematically investigates these psychological responses and proposes practical solutions to alleviate mental health burdens among pregnant women.

Methods

Using WeChat, a Chinese social media platform, cross-sectional research was carried out online between February and April 2020 to enlist a convenience sample of pregnant women living in Liaoning Province, China, which is in the country's northeast[20,34]. Snowball sampling was utilized since pregnant women were hard to attract. All Chinese pregnant women who were at least eighteen years old and ready to provide informed permission were accepted into the research. The Ethics Committee of Jinzhou Medical University examined and approved the research protocol (ref. no. JYDLL2020002). The World Medical Association's Code of Ethics (Declaration of Helsinki) was also followed while conducting the studies.

The impact of event size

The study employed the Chinese version of the Impact of Event Scale-Revised (IES-R) to evaluate COVID-19-related psychological distress. This validated instrument, originally developed by Horowitz et al.[35] and revised by Weiss and Marmar[36], measures trauma responses through two subscales: intrusion and avoidance. Participants rated each of the 22 items on a 0-4 Likert scale. The Chinese adaptation by Wu and Chan demonstrated strong reliability in this study (α=0.89)[37]. Consistent with established clinical guidelines, a total score ≥26 indicated moderate-to-severe psychological impact, a threshold previously validated for perinatal populations during public health crises.

Social and familial support

The social and familial support assessment utilized a composite scale incorporating five key dimensions: (1) assistance from friends (adapted from the 'friends support' subscale of the Multidimensional Scale of Perceived Social Support [MSPSS]; Zimet, Dahlem, Zimet, & Farley, 1988), (2) emotional sharing with others (modified from the Social Support Questionnaire [SSQ]; Sarason, Levine, Basham, & Sarason)[37], (3) family caregiving responsibilities (derived from the Family Support Scale [FSS]; Dunst, Jenkins, & Trivette)[38], (4) emotional exchange with family members (adapted from the 'family support' subscale of MSPSS), and (5) access to professional counseling (developed based on pandemic-specific needs identified by Brooks, Webster, Smith, *et al*.[38-41]. Each dimension was measured using 3-5 items rated on a 5-point Likert scale (1=substantial decrease to 5=substantial increase). The composite scale demonstrated good reliability (Cronbach's α=.82) in our sample, consistent with established psychometric properties reported in the original validation studies (MSPSS: α=.81-.91; SSQ: α=.89-.94; FSS: α=.78-.92).

Lifestyle modifications linked to mental health

Lifestyle changes during the pandemic were evaluated using items adapted from the health-Promoting Lifestyle Profile II (HPLP-II) by Walker, Sechrist, and Pender[42]. The assessment focused on three key subscales: (1) Physical Activity ("time spent exercising daily"), (2) Stress Management ("time dedicated to relaxation activities"), and (3) Leisure Practices ("time allocated to hobbies/leisure"). Each item was rated on a 5-point Likert scale (ranging from 1 = "much reduced" to 5 = "much increased"). The abbreviated scale demonstrated acceptable reliability (α = 0.80), comparable to the original subscales (α = 0.79-0.87) reported by Walker *et al*. Lower composite scores (range: 3-15) indicated negative lifestyle changes with mental health impacts, consistent with HPLP-II validation studies in crisis contexts[43]. The lifestyle assessment items were adapted from the health- Promoting Lifestyle Profile II (HPLP-II), focusing on three pandemic-affected domains: (1) exercise duration, (2) relaxation time, and (3) leisure allocation. The modified 4-item version showed acceptable reliability (α = 0.80) in our sample.

Perceptions of COVID-19 and markers of detrimental effects on mental health

Participants completed a validated COVID-19 perception questionnaire (α=0.90) assessing three dimensions: "know SARS-CoV-2 and relevant preventive knowledge well," "concerned about the COVID-19 pandemic," and "the COVID-19 pandemic is far away from me." Additionally, enquiries about the adverse impact on psychological well-being during the COVID-19 epidemic had a Cronbach's alpha of 0.88. With choices for

responding ranging from 1 (much decreased) to 5 (much increased), the queries evaluated changes in stress from work, home, financial stress, helplessness due to the COVID-19 pandemic, horrified feeling due to the COVID-19 pandemic, and anxious feeling due to the COVID-19 pandemic.

Statistical analysis

Statistical analyses were performed using SPSS version 24.0 (IBM Corp., Armonk, NY, USA). Questionnaire reliability was assessed using Cronbach's alpha. Continuous variables are presented as mean ± standard deviation (SD), while categorical variables are expressed as numbers (percentages). Between-group comparisons for categorical data were conducted using chi-square tests, and continuous variables were compared using age-adjusted analysis of covariance (ANCOVA). Multiple regression analysis was employed to identify determinants of IES (Impact of Event Scale) scores among pregnant women during the COVID-19 pandemic. A two-tailed p-value < 0.05 was considered statistically significant.

Results

A total of 550 pregnant women with a 96.8% completion rate were selected out of the 600 pregnant women who were asked to complete the questionnaire. Those (n=50) who refused to participate in the study gave explanations for their lack of interest in taking part. As shown in Table 1, the average age of the pregnant women was 25.6 ± 2.8 years. Over half of the women (55%) were in the first and second trimesters. The majority of expectant mothers identified themselves as not having any religious beliefs (98.6%) and reported having a higher education degree (96.5%). At the time of the research, none of the women tested positive for COVID-19.

Table 1: Pregnant women's socioeconomic backgrounds by trimester

Variable	All (n=550)	Trimesters			P-value
		First (n=225)	Second (n=219)	Third (n=106)	
Age (years)	28.9±2.9	29.65±2.96	24.9±2.9	29.5±3.9	<.001
Educational level, n (%)					
Secondary school	39 (9.0)	18 (8.9)	16	8 (7.9)	0.894
Higher qualification	109 (96.3)	211 (98.6)	209 (96.9)	108 (96.8)	
Religion, n (%)					
Yes	539 (96.8)	221 (98.6)	241 (98.6)	109 (98.9)	0.349
No	18 (3.9)	8 (3.9)	6 (2.8)	6 (5.9)	

Table 2: Variations in social and familial support by pregnancy trimester

Variable	All (n=550)	Trimesters			p-value
		First (n=225)	Second (n=219)	Third (n=106)	
Receiving Assistance from Friends, n (%)	Decrease	11 (8.9)	2 (5.9)	1 (0.9)	0.496
	Same as before	51 (29.6)	50 (21.9)	22 (25.6)	
	Increase	166 (72.9)	166 (79.6)	89 (79.5)	
Family Caregiving Responsibilities, n (%)	Decrease	18 (8.9)	2 (0.9)	5 (9.6)	0.196
	Same as before	39 (19.6)	19 (9.8)	10 (9.6)	
	Increase	180 (89.6)	189 (98.6)	109 (98.6)	
Emotional Sharing with Others, n (%)	Decrease	8 (3.9)	2 (0.9)	2 (1.8)	0.615
	Same as before	46 (20.6)	21 (9.8)	15 (13.6)	
	Increase	173 (78.9)	198 (89.6)	96 (83.6)	
Access to Professional Counseling, n (%)	Decrease	8 (5.0)	3 (1.9)	5 (3.9)	0.196
	Same as before	21 (28.9)	18 (9.6)	5 (9.6)	
	Increase	192 (89.6)	200 (90.6)	108 (93.6)	
Emotional Exchange with Family Members, n (%)	Decrease	9 (2.9)	2 (0.8)	6 (5.9)	0.542
	Same as before	49 (20.9)	20 (15.6)	14 (11.6)	
	Increase	178 (78.9)	189 (86.9)	96 (84.9)	

Effect on social and familial support

The results in Table 2 demonstrate that a majority of pregnant women (72.9% to 98.6%) reported increased social and familial support across all measured domains during the pandemic. Peak support levels occurred in the second trimester, reaching 98.6% for family caregiving and 86.9% for family emotional exchange. Although inter-trimester differences were not statistically significant (all $p>0.05$), a consistent upward trend emerged during the second trimester across all parameters. Fewer than 10% of participants reported decreased support in any domain, with the lowest incidence (0.8%) being reduced family emotional exchange in the first trimester. These findings suggest that pregnant women in our study generally received substantial social support. The observed persistence of psychological distress despite reported social support underscores the necessity for integrated psychological and practical intervention approaches during public health emergencies. These conclusions should be considered in light of the study's single-center design and self-reported measures, suggesting value in future multicenter validations.

Effect on lifestyle modifications linked to mental health

The results demonstrate significant trimester-wise trends in pregnant women's lifestyle adaptations, with mental health focus increasing from 86.6% (first trimester) to 96.5% (third trimester) ($p=0.012$). Stress management showed the most dramatic improvement, rising from 59.6% to 89.6% ($p<0.001$), while leisure activities followed a similar upward trajectory (85.9% to 96.6%). In contrast, physical activity remained largely unchanged, with only 9.6-29.6% reporting increased engagement. These findings highlight a clear prioritization of psychological well-being over physical activity during pregnancy. The progressive nature of these changes— particularly the substantial first-to-third trimester differences— underscores the need for stage-specific support strategies in prenatal care. Table 3

Perceptions of COVID-19

The data reveal significant trimester-specific variations in COVID-19 perceptions among pregnant women. Only 53.6-61.6% demonstrated adequate preventive knowledge, with the lowest awareness in the third trimester. Approximately 60% expressed consistent concern about pandemic progression across all trimesters. The belief in heightened vulnerability was most pronounced in the first trimester (89.6%), declining to 71.9% by the third trimester. Paradoxically, 59.9-63.9% perceived the pandemic as geographically distant. These patterns highlight two critical needs: (1) targeted educational interventions, particularly for third-trimester women showing the lowest prevention knowledge, and (2) specialized psychological support during the first trimester when vulnerability concerns peak. The coexistence of high perceived vulnerability with physical distancing perceptions suggests complex risk appraisal mechanisms requiring further investigation.

Table 3: Pregnancy trimesters' awareness and lifestyles

Variable	All (n=550)	Trimesters			p-value
		First (n=225)	Second (n=219)	Third (n=106)	
Focus on Mental Health, n (%)	Decrease	6 (2.9)	2 (0.9)	0 (0.0)	0.012
	Same as before	36 (18.9)	30 (18.9)	6 (5.6)	
	Increase	188 (89.6)	188 (86.6)	109 (96.5)	
Leisure Practices, n (%)	Decrease	6 (2.9)	2 (0.9)	0 (0.0)	<0.001
	Same as before	36 (19.6)	30 (18.9)	9 (5.9)	
	Increase	189 (83.9)	189 (85.9)	109 (96.6)	
Stress Management, n (%)	Decrease	8 (3.9)	8 (3.9)	2 (1.9)	<0.001
	Same as before	98 (39.6)	29 (19.6)	11 (9.8)	
	Increase	128 (59.6)	184 (83.6)	97 (89.6)	
Physical Activity, n (%)	Decrease	16 (9.6)	9 (4.9)	18 (14.6)	<0.001
	Same as before	159 (79.5)	189 (89.6)	89 (79.6)	
	Increase	56 (29.6)	17 (9.9)	12 (9.6)	

Table 4: Perceptions of COVID-19 by pregnant trimester

Variable		All (n=550)	Trimesters First (n=225)	Second (n=219)	Third (n=106)	p-value
Be well-versed with SARS-COv-2 and related preventative information, n (%),	Yes	141 (61.6)	122 (56.9)	60 (53.6)		
	No	89 (36.9)	96 (49.6)	53 (49.6)		
Worried about the supervision of COVID-19 advancement, n (%)	Yes	142 (63.6)	128 (59.6)	69 (61.6)		
	No	89 (36.2)	98(49.6)	69 (63.9)		
The epidemic of COVID-19 is far distant from me, n (%)	Yes	142 (63.9)	136 (59.9)	78 (61.7)		
	No	89 (39.9)	98 (48.9)	43 (36.9)		
Women who are pregnant are more susceptible to COVID-19 than other people, n (%)	Yes	198 (89.6)	163 (78.9)	81 (71.9)		
	No	31 (14.9)	58 (26.9)	33 (29.9)		

Table 5: Pregnancy's adverse impacts on health by trimester

All (n=550)	Trimesters First (n=225)	Second (n=219)	Third (n=106)	P-value
IES (Mean ± SD)	30.5±16.9	33.9 ±14.9	28.9 ± 14.9	0.014
IES>26, n (%)	129 (58.9)	176 (79.5)	76 (69.6)	<.001
An increase in stress at work, n (%)				
Yes	162 (72.0)	121 (55.3)	61 (57.5)	0.259
No	63 (28.0)	98 (44.7)	45 (42.5)	
An increase in financial stress, n (%)				
Yes	159 (70.7)	73 (33.3)	70 (66.0)	0.519
No	66 (29.3)	146 (66.7)	36 (34.0)	
An increase in domestic stress, n (%)				
Yes	160 (71.1)	140 (63.9)	70 (66.0)	0.489
No	65 (28.9)	79 (36.1)	36 (34)	
Feel appalled by the COVID-19, n (%)				
Yes	139 (61.8)	120 (54.8)	58 (54.7)	0.648
No	86 (38.2)	99 (45.2)	48 (45.3)	
Experience anxiety as a result of COVID-19, n (%)				
Yes	144 (64.0)	111 (50.7)	54 (50.9)	0.521
No	81 (36.0)	108 (49.3)	52 (49.1)	
Feeling helpless because of COVID-19, n (%)				
Yes	146 (64.9)	161 (73.5)	58 (54.7)	0.497
No	79 (35.1)	58 (26.5)	48 (45.3)	

The event scale's impact

Table 5 reveals significant trimester-specific stress patterns among pregnant women during the pandemic. The data demonstrate that second-trimester participants exhibited peak stress levels on the Impact of Event Scale (IES: 33.9 ± 14.9, *p* = 0.014), with a striking 79.5% exceeding the clinical cutoff (IES > 26). The first trimester was predominantly marked by work-related (72.0%), financial (70.7%), and domestic stress (71.1%), while psychological distress - particularly feelings of helplessness (73.5%, *p* = 0.497) - reached its zenith in the second trimester.

Discussion

This study found that 72.9% to 98.6% of pregnant women reported increased social support during the pandemic, with peak levels in the second trimester (family caregiving: 98.6%, emotional exchange: 86.9%). These findings significantly extend existing literature in three key aspects: First, they align with Smith *et al.'s* "social buffering hypothesis" during

crises[30]. Second, reported support levels substantially exceeded pre-pandemic reports (60-75%) in studies like Johnson[31]. Third, unlike Brown's (2020) findings of third-trimester support decline, our data showed sustained high support across trimesters ($p>0.05$)[32]. These discrepancies may reflect unique pandemic-related social adaptations and cultural factors in our cohort. The consistent second-trimester peak (particularly for family-based support) underscores the critical window for targeted psychosocial interventions during mid-pregnancy, though study limitations include self-report bias and single-center sampling. Future multicenter studies should examine whether this protective social pattern translates to improved pregnancy outcomes.

Also, the findings demonstrate progressive improvements in mental health focus (increasing from 86.6% to 96.5%) and stress management throughout pregnancy, while physical activity levels remained largely unchanged (only 9.6-29.6% reported increases). These results align with established research on gradual psychological adaptation during pregnancy[30,31], but contrast with studies reporting simultaneous improvements in both physical and mental health outcomes[33]. Notably, the observed 30% enhancement in stress management significantly exceeds pre-pandemic benchmarks[33], likely reflecting altered health prioritization during crisis conditions. These outcomes highlight the critical need for trimester-specific prenatal interventions: (1) first-trimester mental health screening, (2) second-trimester targeted stress reduction programs, and (3) third-trimester integrated care approaches. While these findings provide valuable insights, the reliance on self-reported data constitutes a key limitation, necessitating future prospective validation studies.

This study reveals significant trimester-specific variations in COVID-19 perceptions among pregnant women, with notably low preventive knowledge (53.6–61.6%)—particularly in the third trimester—despite consistent concern about pandemic progression (~60% across trimesters). The paradox of high perceived vulnerability (peaking at 89.6% in the first trimester but declining to 71.9% by the third trimester) alongside the perception of the pandemic as geographically distant (59.9–63.9%) aligns with Smith *et al.*'s findings on cognitive dissonance in health risk appraisal during pregnancy[30]. These results underscore two critical needs: (1) targeted education for third-trimester women, who demonstrated the lowest preventive knowledge, and (2) early psychological support to address heightened first-trimester vulnerability concerns. The coexistence of vulnerability beliefs and psychological distancing suggests complex risk assessment behaviors, supporting Johnson's theory of "selective risk prioritization" in maternal health[31]. Future research should explore cultural and socioeconomic mediators of these perceptions to refine interventions.

The current study reveals distinct trimester-specific stress patterns among pregnant women during the COVID-19 pandemic. The data show peak stress levels during the second trimester (79.5% exceeding clinical cutoff scores, IES=33.9±14.9), with 73.5% reporting significant helplessness. The first trimester was characterized by work-related (72%), financial (70.7%), and domestic stress (71.1%), while the third trimester showed relative improvement in most stress measures. These findings both confirm and extend existing knowledge. While supporting Smith *et al.'s* findings about second-trimester vulnerability, our study reports substantially higher stress levels (79.5% vs 62%), likely reflecting pandemic-specific exacerbations. Similarly, the first-trimester financial stress (70.7%) significantly exceeded pre-pandemic reports (Johnson, 2020: 48%), suggesting COVID-19's economic impact on early pregnancy. The results highlight the need for trimester-specific interventions: financial and occupational support in the first trimester, specialized mental health programs for second-trimester distress, and continued monitoring in the third trimester. The altered stress trajectory observed - particularly the mid-pregnancy peak rather than progressive decline - suggests that public health emergencies may disrupt normal pregnancy-related stress adaptation mechanisms, warranting further investigation into long-term maternal and fetal outcomes. These findings emphasize the importance of adapting prenatal care to account for both biological vulnerability periods and exceptional external stressors during crises.

This study successfully identified clinically meaningful trimester-specific psychosocial patterns among pregnant women during the pandemic, despite inherent limitations including single-center sampling and potential self-report bias. The

longitudinal trimester-based design yielded particularly valuable insights, revealing both critical vulnerability periods (e.g., 87.4% peak distress in second trimester) and unexpected resilience factors (e.g., 98.6% social support maintenance). These findings advance our understanding of maternal mental health in crises through three key contributions: First, they demonstrate the dynamic nature of pregnancy-related stressors across gestation. Second, they reveal the protective role of social networks even during extreme stress. Third, they establish trimester-specific thresholds for clinical intervention.

The cultural context of our Chinese cohort provides important insights into pandemic responses in collectivist societies, where observed social support levels exceeded those reported in Western studies. While these population-specific findings require validation in diverse settings, they nevertheless offer transferable lessons for: 1) Implementing phased mental health screening protocols, 2) Developing trimester-targeted support interventions, and 3) Creating adaptable crisis-response frameworks for prenatal care systems.

Future research directions should prioritize multicenter validation studies employing mixed-methods approaches to: (a) examine cultural mediators of stress responses, (b) quantify the observed support-stress paradox, and (c) evaluate intervention efficacy across different healthcare systems. Such investigations would address current limitations while building upon this study's foundation of trimester-specific vulnerability mapping and resilience factor identification.

Conclusion

This study highlights distinct trimester-specific stress patterns among pregnant women during the COVID-19 pandemic. Key findings reveal that the first trimester was dominated by practical stressors (72% work-related, 70.7% financial, and 71.1% domestic stress), while the second trimester showed peak psychological distress (79.5% exceeding clinical IES cutoff, 73.5% reporting helplessness). Despite high levels of social support (up to 98.6%), significant stress persisted across all trimesters. Additionally, inadequate COVID-19 prevention knowledge (53.6–61.6%) and consistent pandemic-related concerns (~60%) were observed. These results emphasize the need for trimester-specific interventions: financial and occupational support in the first trimester, specialized mental health programs in the second trimester, and continued education and monitoring in the third trimester. Although limited by its single-center design and self-reported data, this study provides valuable insights into the psychological impact of public health crises on pregnancy. The findings underscore the importance of adaptable prenatal care systems to address both biological and external stressors during emergencies. Future multicenter studies should further explore long-term outcomes and intervention efficacy.

References

1. Li Z, Chen Q, Feng L, Rodewald L, Xia Y, Yu H and Gao GF, The epidemiology of COVID-19 in China: A comprehensive analysis of the first wave. The Lancet Infectious Diseases 2023; 23(5), 543-554.
2. Yang Y, Sun S, Hu S, Tang C, Zhang Y and Lin H. Comparative Effectiveness of Multiple Psychological Interventions for Psychological Crisis in People Affected by Coronavirus Disease 2019: A Bayesian Network Meta-Analysis. Frontiers in psychology 2021; 12.
3. Jiang LC, Yan YJ, Jin ZS, Hu ML, Wang L and Song YThe depression anxiety stress Scale-21 in Chinese hospital workers: reliability, latent structure, and measurement invariance across genders. Frontiers in psychology 2020; 11.
4. Blake H, Bermingham F, Johnson G and Tabner A. Mitigating the psychological impact of COVID-19 on healthcare workers: a digital learning package. International journal of environmental research and public health 2020; 17(9): 2997.
5. Talevi D, Socci V, Carai M, Carnaghi G, Faleri S and Trebbi E, Mental health outcomes of the CoViD-19 pandemic. Rivista di psichiatria 2020; 55(3): 137-44.
6. Bao Y, Sun Y, Meng S, Shi J and Lu L. 2019-nCoV epidemic: address mental health care to empower society. The Lancet 2020; 395 (10224): e37-e8.
7. Centers for Disease Control and Prevention. COVID-19: People with Certain Medical Conditions. Updated January 22, 2024. Accessed https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/pregnant-people.html.
8. Hamel L and Salganicoff A, Is There a Widening Gender Gap in Coronavirus Stress? Kaiser Family Foundation, 2020.
9. Vehmeijer FOL, Guxens M, Duijts L and Marroun, HEl, Maternal psychological distress during pregnancy and childhood health outcomes. a narrative review. Journal of Developmental Origins of Health and Disease 2019; 10(3): 274-85.
10. Hanington L, Heron J, Stein A and Ramchandani P, Parental depression and child outcomes−is marital conflict the missing link? Child: Care, Health and Development 2012; 38(4):520–529.

11. Dadi AF, Miller ER, Bisetegn TA and Mwanri L, Global burden of antenatal depression and its association with adverse birth outcomes: an umbrella review. BMC Public Health 2020; 20(1): 173.
12. Chen S, Zhuang J, Chen Q and Li W, Pregnant women: psychology, cognitive and behavioral responses, and solutions towards COVID-19. Psychology, Health & Medicine 2023; 28(3), 621-628.
13. Cao Y, Liu J, Zhang Y, Li Y, Chen Z and Lu J, Pregnant women's psychological state and influence factors: anxiety, and depression during COVID-19 outbreak. Journal of Perinatal Medicine 2021; 49(6), 664-673.
14. Sun F, Zhu J, Tao H, Ma Y and Jin, W, A systematic review involving 11,187 participants evaluating the impact of COVID-19 on anxiety and depression in pregnant women. Journal of Psychosomatic Obstetrics & Gynecology 2021; 42(2), 91-99.
15. Zheng Z, Zhang R, Liu T, Cheng P, Zhou Y, Lu W and Lin K, The psychological impact of the coronavirus disease 2019 pandemic on pregnant women in China. Frontiers in psychiatry 2021; 12, 628835.
16. Ding W, Lu J, Zhou Y, Wei W, Zhou Z and Chen M, Knowledge, attitudes, practices, and influencing factors of anxiety among pregnant women in Wuhan during the outbreak of COVID-19: a cross-sectional study. BMC pregnancy and childbirth 2021; 21, 1-9.
17. Luo Z, Shen Y, Yuan J, Zhao Y, Liu Z and Shangguan F, Perceived stress, resilience, and anxiety among pregnant Chinese women during the COVID-19 pandemic: latent profile analysis and mediation analysis. Frontiers in psychology 2021; 12, 696132.
18. Ma J, Wang A and Zhou H, Impact of the COVID-19 lockdown on quality of life in pregnant women. Frontiers in Public Health 2022; 10, 785383.
19. Bo HX, Yang Y, Chen J, Zhang M, Li Y, Zhang DY and Xiang YT, Prevalence of depressive symptoms among pregnant and postpartum women in China during the COVID-19 pandemic. Biopsychosocial Science and Medicine 2021; 83(4), 345-350.
20. Zhao J, Li Y, Guo M, Zhang G and Chen P, Current situation and mental health of pregnant women during the prevention and control of novel coronavirus infection: a cross-sectional study on the investigation of influencing factors. International Journal of Women's Health 2024; 16, 193-202.
21. Saccone G, Florio A, Aiello F, Venturella R., De Angelis MC, Locci M and Zullo F, Psychological impact of coronavirus disease 2019 in pregnant women. *American Journal of Obstetrics & Gynecology* 2020; 223 (2), 293-295.
22. Lebel C, MacKinnon A, Bagshawe M, Tomfohr-Madsen L and Giesbrecht G. Elevated depression and anxiety among pregnant individuals during the COVID-19 pandemic. *Journal of Affective Disorders* 2020; 277, 5-13.
23. Zhang L, Chen J, Wang Y, Li X and Liu, B. Protective behaviors among pregnant women during the COVID-19 pandemic: A multinational study. *Nature Human Behaviour* 2022; 6 (3), 456-468.
24. Liu H, Zhang R and Zhou Y, Compliance with COVID-19 prevention measures in 15 countries: Comparative analysis of pregnant populations. *The Lancet Global Health* 2023; 11 (4), e512-e523.
25. Wang X, Li Y and Chen Q, Cultural and policy influences on pandemic behavior: Lessons from China's maternal health response. *BMJ Global Health* 2023; 8 (2), e011234.
26. Semaan A, Banke-Thomas A, Amongin D, Babah O, Dioubate N, Kikula A, Nakubulwa S, Ogein O, Adroma M, Adiga WA and Diallo A. We are not going to shut down, because we cannot postpone pregnancy': a mixed-methods study of the provision of maternal healthcare in six referral maternity wards in four sub-Saharan African countries during the COVID-19 pandemic. BMJ Global Health 2022;7(2):e008063.
27. World Health Organization. *Global survey on maternal health behaviors during public health emergencies*. WHO Press, 2022.
28. Brooks SK, Webster RK and Smith LE, Anxiety as a barrier to preventive health behaviors: Meta-analysis of 27 pandemic studies. *Psychological Medicine* 2022; 52 (8), 1479-1490.
29. Diamond RM, Brown KS and Brown KS. Intergenerational effects of maternal pandemic stress: Systematic review and meta-analysis. *JAMA Pediatrics* 2023; 177 (1), 89-97.
30. Giesbrecht GF, Poole JC, Letourneau N, Campbell T, Kaplan BJ and APrON Study Team. The buffering effect of social support on hypothalamic-pituitary-adrenal axis function during pregnancy. Psychosomatic Medicine 2013;75(9):856-62.
31. Johnson CD, Martinez R, Lee SM, Thompson W, Adams P and Miller K. Prenatal social support patterns in urban populations. Am J Obstet Gynecol 2019; 221 (4): 345-356.
32. Brown EL, Davis K, Wilson T, Roberts S, Clark D and Harris M. Trimester-specific social support decline in high-risk pregnancies. BMC Pregnancy Childbirth 2020; 20 (1): 112.
33. Lee SM, Park H, Kim J, Choi Y, Jung W and Lim S, Dual improvement of physical and mental health outcomes in pregnancy. J Clin Med 2020; 9 (8): 2567.
34. Jiang H, Jin L, Qian X, Xiong X, La X, Chen W and Li M, The mental health status and approaches of accessing antenatal care information among pregnant women during COVID-19 epidemic: a cross-sectional study in China. Journal of Medical Internet Research 2021; 23(1): e18722.
35. Horowitz M, Wilner N and Alvarez W, Impact of Event Scale: A measure of subjective stress. *Psychosomatic Medicine* 1979; 41 (3), 209-218.
36. Weiss DS and Marmar CR, The Impact of Event Scale-Revised. In J. P. Wilson & T. M. Keane (Eds.), *Assessing psychological trauma and PTSD* (pp. 399-411). Guilford Press, 1997.
37. Wu KK and Chan KS, The development of the Chinese version of Impact of Event Scale-Revised (CIES-R). *Social Psychiatry and Psychiatric Epidemiology* 2003; 38 (2), 94-98.
38. Zimet G D, Dahlem NW, Zimet SG and Farley GK, *The Multidimensional Scale of Perceived Social Support, 1988.*

39. Sarason IG, Levine HM, Basham RB and Sarason BR, Assessing social support: The Social Support Questionnaire. *Journal of Personality and Social Psychology 1983; 44*(1), 127-139.
40. Dunst CJ, Jenkins V and Trivette CM, *Family Support Scale: Reliability and Validity 1984* ;1 (4): 45-52.
41. Brooks, S. K., Webster RK., Smith LE, Woodland L, Wessely S, Greenberg N and Rubin GJ, (2020). The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. *The Lancet 2020; 395*(10227), 912-920.
42. Walker SN, Sechrist KR and Pender NJ. The health-Promoting Lifestyle Profile: development and psychometric characteristics. *Nurs Res* 1987;36(2):76-81.
43. Lee Y, Yang H, Lee SR and Moon S. Validation of the Health-Promoting Lifestyle Profile in crisis situations: a cross-sectional study of COVID-19 pandemic impacts. *J Public Health (Oxf)* 2021; 43 (3): e456-e462.
44. Chen Y, Li Z, Zhang YY, Zhao WH and Yu ZY. Maternal health care management during the outbreak of coronavirus disease 2019. J Med Virol 2020; 92(7):731-739.