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Association between intimate partner violence and prenatal anxiety and depression in pregnant women: A cross-sectional survey during the COVID-19 epidemic in Shenzhen, China

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Abstract

Objectives: Intimate partner violence (IPV) against women remains a major global public health problem with harmful consequences for individuals and society. People's lifestyles have been greatly affected by the coronavirus disease 2019 (COVID-19) pandemic. This study investigated the prevalence of and relationship between IPV and anxiety and depression in pregnant Chinese women during the pandemic.

Design: This cross-sectional study was conducted in Shenzhen City, Guangdong Province, China from September 15 to December 15, 2020. A total of 3434 pregnant women were screened with the Abuse Assessment Screen Questionnaire to evaluate IPV and General Anxiety Disorder and Patient Health Questionnaire to evaluate symptoms of anxiety and depression, respectively. The primary outcomes were the incidence of IPV and association between IPV and prenatal anxiety and depression. Data were analysed with the chi-squared test and by logistic regression analysis.

Results: The prevalence of IPV among pregnant women was 2.2%. Mental violence was the most common type of violence (2.2%), followed by physical (0.6%) and sexual (0.7%) violence. The prevalence of anxiety and depression symptoms was 9.8% and 6.9%, respectively. After adjusting for covariates, there was a statistically significant association between IPV and prenatal anxiety (odds ratio OR=4.136, 95% confidence interval CI: 2.436, 7.022) and depression (OR=4.136, 95% CI: 2.436, 7.022).

Conclusions: IPV increased the risk of prenatal anxiety and depression in pregnant women in China during the COVID-19 pandemic. Efforts should be made by the government and civil society to promote long-lasting antenatal interventions to ensure the safety and protect the

mental health of pregnant women.

Strengths and limitations of this study

1. This is the first investigation of the relationship between IPV and prenatal anxiety and depression in pregnant women during the COVID-19 pandemic in China.
2. Causality between these two outcomes was not established.
3. Symptoms of depression and anxiety were assessed only once in the study.
4. IPV was likely under-reported by the study participants.

1. Introduction

Intimate partner violence (IPV) against women including physical, mental, and sexual abuse is an important clinical and public health issue[1,2]. In 2016, the World Health Organization highlighted various forms of interpersonal violence, particularly those occurring in the home and inflicted by intimate partners and other family members and remaining hidden, stigmatized, and largely unrecognized by health and other service providers[3]. A previous study showed that pregnant women were vulnerable to the initiation or exacerbation of IPV[4] and were 2.7 to 3.9 times more likely to be victims of physical violence and twice as likely to be subjected to sexual violence compared to non-pregnant women[5]. In China, IPV prevalence in pregnant women has been reported as 18.32% in Wuhan[6] and 11.3% in Changsha[7]. Prenatal depression and anxiety are common sequelae of IPV[8 9].

The coronavirus disease 2019 (COVID-19) outbreak began in December 2019 in Wuhan City, Hubei Province, China[10] and suddenly and radically altered the population's habits and lifestyles, with a drastic reduction in any form of socialization. Physical distancing and self-isolation strongly impacted people's lives[11], including those of pregnant women and their partners. Protecting the physical and mental wellbeing of pregnant women is important for a healthy society. However, only one study to date[12] has examined the prevalence of IPV among pregnant women since the start of the COVID-19 pandemic, and there have been no studies investigating the association between IPV and prenatal anxiety and depression in this group.

Shenzhen is one of the most economically developed and populous cities in mainland China whose activities have been severely impacted by the restrictions imposed in response

to the pandemic. The present study aimed to establish the prevalence of IPV among pregnant women in Shenzhen during the COVID-19 pandemic and the association between IPV and prenatal anxiety and depression.

2. Methods

2.1 Research design and study population

This cross-sectional survey was conducted from September 15 to December 15, 2020 and enrolled pregnant women in Shenzhen City, Guangdong Province, China. A multi-stage random sampling method was used to recruit participants. We sampled a certain number of pregnant women in maternity and child healthcare hospitals in each district of Shenzhen as described in our earlier study[13]. Pregnant women with perinatal health records at Shenzhen District Maternity and Child Healthcare Hospitals who consented to participate were enrolled. Women with psychotic disorders such as schizophrenia, mania, or substance dependence were excluded. The sample size calculation formula for cross-sectional studies was used to determine the minimum theoretical sample size for this study. The admissible error was 0.15, α=0.05, and based on previous studies, the expected prevalence was 5%[14]; 3416 people were therefore required to represent the population of Shenzhen. A total of 3437 women who met the inclusion criteria were enrolled; those who completed the questionnaire in less than 100 s were excluded, leaving 3434 women in the study. Thus, the response rate was 99.9% (3434/3437). The study was approved by the Institutional Review Board of Shenzhen Maternity and Child Healthcare Hospitals and was conducted in Shenzhen.

2.2 Measurements

2.2.1 General characteristics of the study population

General information obtained on each participant included age, education level, partner's education level, work status after pregnancy, partner's work status, marital status, living situation, psychological counselling before pregnancy, vaginal bleeding and pregnancy complications, pregnancy intention, intimacy between partners since COVID-19, and household income since COVID-19.

2.2.2 Family care

The Family Adaptation Partnership Growth and Resolved (APGAR) index was used for family care assessment[15]. The APGAR has five items, each answered on a 3-point Likert scale from "Often" (2 points) to "Rarely" (0 points). The total score was 0–10 points. A high APGAR score (7–10 points) indicated good family functioning; a mid-range score (4–6 points) indicated moderate family dysfunction; and a low score (0–3) indicated severe family dysfunction.

2.2.3 Lifestyle characteristics

Lifestyle characteristics including smoking and drinking by a pregnant woman and her partner, exercise, and sitting time per day were recorded. Smoking was defined as an average of one cigarette a day in recent years. Drinking was defined as consuming alcohol once a week on average. Exercise was defined as having engaged in walking, yoga, or other physical activities more than three times during the past week. The above definitions were in

accordance with previous research[16]. Sitting time per day was categorized as ≤1, 1 to <3, 3 to <5, 5 to <10, and ≥10 h.

2.2.4 Assessment of IPV

The Abuse Assessment Screen Questionnaire was used to assess IPV during pregnancy. This scale is widely used as a tool to screen IPV in pregnant women and has good validity and reliability[17]. The scale assesses three aspects of domestic violence—i.e., mental, physical, and sexual—and has eight items. The response to each item was "Yes" or "No." If the respondent answered "Yes" to one or more of questions 5 to 7, she was identified as a victim of domestic violence during pregnancy[18].

2.2.5 Assessment tool for prenatal anxiety

The 7-Item Generalized Anxiety Disorder scale (GAD-7)[19] is used as a screening tool for GAD in primary care patients and is easily understood and can be completed quickly. The scale has seven items, each scored on a 4-point scale ranging from 0 to 3 for a total score between 0 and 21, with a higher score indicating more severe anxiety symptoms. A GAD-7 score ≥7 was the cut-off for prenatal anxiety.

2.2.6 Assessment tool for prenatal depression

Prenatal depression was assessed with the 9-Item Patient Health Questionnaire (PHQ-9), which consists of nine questions pertaining to depression symptoms over the prior 2 weeks, each with four possible responses: "Not at all," "Several days," "More than half of the days,"

and "Nearly every day," corresponding to 0, 1, 2, and 3 points, respectively. The total score ranges from 0 to 27[20]. Participants with a score ≥10 were considered to have perinatal depression.

2.3 Statistical analysis

Data were kept anonymous and non-identifiable and were analysed using SPSS v25.0 (SPSS Inc, Chicago, IL, USA). Some continuous variables such as age and family care (APGAR), prenatal anxiety (GAD-7), and prenatal depression (PHQ-9) scores were treated as categorical variables. The chi-squared test, calibration chi-squared test, or Fisher's exact test was used to compare baseline characteristics between women who had experienced IPV (IPV group) and those who had not (No-IPV group). Multivariate logistic regression with the enter method was used to estimate odds ratio (OR) and 95% confidence interval (CI) of associations between IPV and prenatal anxiety and depression. A two-tailed test with $P<0.05$ was considered statistically significant.

2.4 Patients or public involvement statement

FW was involved in all stages of the study and wrote the paper. Other co-authors were consulted at the planning and design stages of the study and contributed to the interpretation and dissemination of the findings. Neither the patients nor the public were involved in the design, conduct, reporting, or dissemination of this work.

3. Results

Of 3437 pregnant women who completed the electronic questionnaire, three were excluded because their completion time was <100 s. Thus, 3434 participants were ultimately included in the analysis. The mean age of the participants was 28.97±4.57 years (Table 1). There were significant differences in age, professional psychological counselling, family care, pregnancy complications, partner intimacy since COVID-19, household income since COVID-19, smoking habits, the participant and her partner's drinking habits, exercise, and sitting time per day between the IPV and No-IPV groups, whereas no intergroup differences were observed in the participant and her partner's education level, work status, and other characteristics. A total of 77 participants (2.2%) experienced at least one form of IPV during pregnancy; mental violence was the most common (n=57, 1.7%), followed by physical (n=19, 0.6%) and sexual (n=7, 0.7%) violence.

Table 1. General characteristics of the study participants

Variable	No-IPV	IPV	χ^2	*P**
Age (years)			17.528	**0.002**
≤19	28 (0.8)	4 (5.2)		
20–24	507 (15.1)	13 (16.9)		
25–29	1341 (39.9)	30 (39.0)		
30–34	1096 (32.6)	19 (24.7)		
≥35	385 (11.5)	11 (14.3)		
Education level			4.895[a]	0.418
Master's degree or higher	140 (4.2)	7 (9.1)		
Undergraduate	919 (27.4)	18 (23.4)		
College degree	912 (27.2)	21 (27.3)		
High school degree	699 (20.8)	14 (18.2)		
Junior high school diploma	670 (20.0)	17 (22.1)		
Primary school or lower	17 (0.5)	0 (0.0)		
Partner's education level			6.761[a]	0.215
Master's degree or higher	202 (6.0)	6 (7.8)		
Undergraduate	998 (29.7)	22 (28.6)		
College degree	844 (25.1)	18 (23.4)		

High school degree	698 (20.8)	13 (16.9)		
Junior high school diploma	600 (17.9)	16 (20.8)		
Primary school or lower	15 (0.4)	2 (2.6)		
Work status after pregnancy			0.007	0.933
Employed	2065 (61.5)	47 (61.0)		
Unemployed	1292 (38.5)	30 (39.0)		
Partner's working status			0.024[b]	0.876
Employed	3217 (95.8)	73 (94.8)		
Unemployed	140 (4.2)	4 (5.2)		
Marital status			0.440	0.507
Married	3118 (92.9)	70 (90.9)		
Unmarried/divorced/widowed	239 (7.1)	7 (9.1)		
Living situation			3.337	0.189
Couple alone	2263 (67.4)	54 (70.1)		
Living with in-laws	844 (25.1)	14 (18.2)		
Living with parents	250 (7.4)	9 (11.7)		
Professional psychological counselling			17.816	**<0.001**
Not received	3125 (93.1)	62 (80.5)		
Received	232 (6.9)	15 (19.5)		
Family care			45.788	**<0.001**
Good functioning	1992 (59.3)	18 (23.4)		
Moderately dysfunction	872 (26.0)	31 (40.3)		
Severe dysfunction	493 (14.7)	28 (36.4)		
Gestational age			0.944	0.624
First trimester	1122 (33.4)	22 (28.6)		
Second trimester	1122 (33.4)	29 (37.7)		
Third trimester	1113 (33.2)	26 (33.8)		
Vaginal bleeding			2.623	0.105
No	2537 (75.6)	52 (67.5)		
Yes	820 (24.4)	25 (32.5)		
Pregnancy complications			6.730	**0.009**
No	2601 (77.5)	50 (64.9)		
Yes	756 (22.5)	27 (35.1)		
Pregnancy intention			3.641[a]	0.144
Planned conception	1796 (53.5)	33 (42.9)		
Unplanned pregnancy	1452 (43.3)	41 (53.2)		
Artificial insemination	109 (3.2)	3 (3.9)		
Intimacy with partner since COVID-19			64.846	**<0.001**
Essentially unchanged	2554 (76.1)	47 (61.0)		
Strained	65 (1.9)	12 (15.6)		
More intimate	738 (22.0)	18 (23.4)		
Household income since COVID-19			12.921[a]	**0.004**
Essentially unchanged	1805 (53.8)	30 (39.0)		
Increased	60 (1.8)	5 (6.5)		

Decreased by 20%–50%	1165 (34.7)	30 (39.0)		
Decrease by ≥50%	327 (9.7)	12 (15.6)		
Smoking			19.565[b]	**<0.001**
No	3302 (98.4)	70 (90.9)		
Yes	55 (1.6)	7 (9.1)		
Partner's smoking habits			1.217	0.270
No	2082 (62.0)	43 (55.8)		
Yes	1275 (38.0)	34 (44.2)		
Drinking			8.892[b]	**0.003**
No	3195 (95.2)	67 (87.0)		
Yes	162 (4.8)	10 (13.0)		
Partner's drinking habits			7.672	**0.006**
No	2441 (72.7)	45 (58.4)		
Yes	916 (27.3)	32 (41.6)		
Exercise			4.327	**0.038**
No	2412 (71.8)	47 (61.0)		
Yes	945 (28.2)	30 (39.0)		
Sitting time per day, h			14.533	**0.006**
≤1	454 (13.5)	19 (24.7)		
1–3	1069 (31.8)	21 (27.3)		
3–5	829 (24.7)	11 (14.3)		
5–10	831 (24.8)	18 (23.4)		
≥10	174 (5.2)	8 (10.4)		

Data are presented as n (%).
[a]Fisher's exact test.
[b]Calibration chi-squared test.
*Values in bold face are statistically significant at $P<0.05$.

There were differences in the prevalence of anxiety and depression between IPV and No-IPV groups. Among the participants, 337 (9.8%) were positive for prenatal anxiety and 238 (6.9%) experienced depression (Tables 2 and 3). Participants who experienced mental, physical, and sexual violence had higher rates of prenatal anxiety and depression than those who did not report IPV.

Table 2. Prevalence of anxiety among study participants

IPV or IPV subtype	No prenatal anxiety	Prenatal anxiety	χ^2	*P**

Overall IPV			97.172	**<0.001**
No	3053 (98.6)	304 (90.2)		
Yes	44 (1.4)	33 (9.8)		
Mental violence			83.936	**<0.001**
No	3066 (99.0)	311 (92.3)		
Yes	31 (1.0)	26 (7.7)		
Physical violence			44.591[a]	**<0.001**
No	3089 (99.7)	326 (96.7)		
Yes	8 (0.3)	11 (3.3)		
Sexual violence			13.594[a]	**<0.001**
No	3082 (99.5)	329 (97.6)		
Yes	15 (0.5)	8 (2.4)		
Total	3097 (90.2)	337 (9.8)		

Data are presented as n (%).
[a]Calibration chi-squared test.
*Values in bold face are statistically significant at $P<0.05$.
IPV, intimate partner violence.

Table 3. Prevalence of depression among study participants

IPV or IPV subtype	**No prenatal depression**	**Prenatal depression**	χ^2	***P****
Overall IPV			64.257	**<0.001**
No	3142 (98.3)	215 (90.3)		
Yes	54 (1.7)	23 (9.7)		
Mental violence			36.892[a]	**<0.001**
No	3155 (98.7)	222 (93.3)		
Yes	41 (1.3)	16 (6.7)		
Physical violence			31.369[a]	**<0.001**
No	3185 (99.7)	230 (96.6)		
Yes	11 (0.3)	8 (3.4)		
Sexual violence			23.669[a]	**<0.001**
No	3181 (99.5)	230 (96.6)		
Yes	15 (0.5)	8 (3.4)		
Total	3196 (93.1)	238 (6.9)		

Data are presented as n (%).
[a]Calibration chi-squared test.
*Values in bold face are statistically significant at $P<0.05$.
IPV, intimate partner violence.

After adjusting for potential confounding factors, IPV was significantly associated

with prenatal anxiety in the multivariate logistic regression analysis (Table 4). Participants who had experienced IPV were 4.207 times more likely to have experienced prenatal anxiety (OR=4.207, 95% CI: 2.469, 7.166). Mental violence (OR=4.394, 95% CI: 2.444, 8.179) and physical violence (OR=8.869, 95% CI: 3.224, 26.102) were significantly associated with prenatal anxiety; however, there was no association between sexual violence and anxiety.

Table 4. Association between intimate partner violence and prenatal anxiety

Variable	OR (95% CI)	*P*
IPV[a]	4.207 (2.469, 7.166)	**<0.001**
Mental violence[b]	4.471 (2.444, 8.179)	**<0.001**
Physical violence[b]	9.174 (3.224, 26.102)	**<0.001**
Sexual violence[b]	2.018 (0.733, 5.556)	0.174

[a]Adjusted for age, participant and her partner's education level, participant and her partner's work status, marital status, living situation, professional psychological counseling, family care, gestational age, vaginal bleeding, pregnancy complications, pregnancy intention, intimacy with partner since COVID-19, household income since COVID-19, participant and her partner's smoking habits, participant and her partner's drinking habits, exercise, sitting time per day, and IPV subtype.
[b]Adjusted for age, participant and her partner's education level, participant and her partner's work status, marital status, living situation, professional psychological counseling, family care, gestational age, vaginal bleeding, pregnancy complications, pregnancy intention, intimacy with partner since COVID-19, household income since COVID-19, participant and her partner's smoking habits, participant and her partner's drinking habits, exercise, sitting time per day, and IPV subtype.
*Values in bold face are statistically significant at $P<0.05$.
CI, confidence interval; IPV, intimate partner violence; OR, odds ratio.

In the logistic regression analysis, participants who reported IPV were more likely to develop prenatal depression after adjusting for confounding factors (OR=3.864, 95% CI: 2.095, 7.125). Mental violence (OR=3.259, 95% CI: 1.590, 6.678), physical violence (OR=10.176, 95% CI: 3.495, 29.627), and sexual violence (OR=4.121, 95% CI: 1.457, 11.659) were all associated with an increased risk of prenatal depression (Table 5).

Table 5. Association between intimate partner violence and prenatal depression

Variable	OR (95% CI)	P
IPV[a]	3.864 (2.095, 7.125)	**<0.001**
Mental violence[b]	3.259 (1.590, 6.678)	**0.001**
Physical violence[b]	10.176 (3.495, 29.627)	**<0.001**
Sexual violence[b]	4.121 (1.457, 11.659)	**0.008**

[a]Adjusted for age, participant and her partner's education level, participant and her partner's work status, marital status, living situation, professional psychological counseling, family care, gestational age, vaginal bleeding, pregnancy complications, pregnancy intention, intimacy with partner since COVID-19, household income since COVID-19, participant and her partner's smoking habits, participant and her partner's drinking habits, exercise, sitting time per day, and IPV subtype.
[b]Adjusted for age, participant and her partner's education level, participant and her partner's work status, marital status, living situation, professional psychological counseling, family care, gestational age, vaginal bleeding, pregnancy complications, pregnancy intention, intimacy with partner since COVID-19, household income since COVID-19, participant and her partner's smoking habits, participant and her partner's drinking habits, exercise, sitting time per day, and IPV subtype.
*Values in bold face are statistically significant at $P<0.05$.
CI, confidence interval; IPV, intimate partner violence; OR, odds ratio.

4. Discussion

The prevalence of IPV during the COVID-19 pandemic among pregnant women in Shenzhen, China, was 2.2%. This is comparable to the rate reported in a cross-sectional study conducted in London, UK (3%)[21] but much lower than that reported in Pakistan (35%)[22]. The disparities in prevalence are likely attributable to cultural, economic, and regional differences. During the pandemic, physical distancing and self-isolation strongly impacted the lives of pregnant women in that they spent more time with their partners, which likely influenced the prevalence of reported IPV.

Mental violence (1.7%) was the most common form of IPV among the study participants, which is consistent with findings from other studies conducted in China[7], Thailand[23], and Ethiopia[24]. We observed similar rates of physical (0.6%) and sexual (0.7%)

violence, although these were lower than that reported in Ethiopia during the COVID-19 pandemic[12]. The difference may be explained by the Chinese cultural norm of avoiding discussion of unpleasant personal circumstances in order to "save face"[16], with the result that violence during pregnancy is frequently underreported[25]. It is worth noting that our results may have been biased by the fact that outcomes were assessed by self-report[26].

We observed a significant and positive association between IPV and prenatal anxiety and depression during the COVID-19 pandemic. This is consistent with other reports[6 7 9 27] in which IPV was identified as a chronic stressful condition that increased the risk of depression and anxiety during pregnancy. We also found that IPV subtypes had different effects on prenatal anxiety and depression; for instance, mental violence was associated with an increased risk of both conditions. A higher rate of psychological (emotional and verbal) abuse was shown to be more closely associated with mental health outcomes than physical violence[28], possibly because psychological violence directly attacks a person's self-perception and can cause post-traumatic stress disorder and anxiety through mechanisms such as guilt, self-hatred, and regret[29]. The adverse consequences of physical violence such as fractures, lacerations, and head trauma are amplified during pregnancy and increased the risk of prenatal anxiety and depression in our cohort. Sexual violence did not appear to be associated with prenatal anxiety in our research, which contradicts earlier findings[30]; this may be due to participants' reluctance to report this form of IPV according to the norms of Chinese culture.

Strengths and limitations

This study is the first investigation of the relationship between IPV and prenatal anxiety and depression in pregnant women during the COVID-19 pandemic in China. The participants were representative of the entire population of Shenzhen. However, there were several limitations to our study. Firstly, we were unable to establish causality between the two outcomes because of the cross-sectional study design. Secondly, symptoms of depression and anxiety were evaluated only once and therefore, it was not possible to detect any trends over the course of pregnancy. Thirdly, non-pregnant women should have been included as controls to obtain a more comprehensive view of the effects of IPV on pregnant women. These issues can be addressed in future studies with a prospective, longitudinal, meditational, and mixed method designs that also examine the mental health consequences of IPV for pregnant women.

Conclusion

The prevalence of IPV in pregnant women in China cannot to be underestimated. Our results suggest that IPV among pregnant women during the COVID-19 pandemic was associated with prenatal anxiety and depression. Prenatal care can identify pregnant women who experience IPV so that they can be connected with services that offer protection. Eliminating violence against pregnant women requires practical and long-term interventions by the government and civil society starting from education within the family.

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Data Availability Statement

The datasets generated and analysed during the current study are not publicly available due to privacy restrictions but are available from the corresponding author on reasonable request.

Contributors

All authors made substantial contributions to this study. FW, WL, PL, and MZ were responsible for study conception and initiation, design, and supervised implementation. FW, CC, QL, WH, and CZ acquired the data. FW, WL, YW, and QC interpreted the data and performed statistical analyses. FW drafted the manuscript. All authors contributed to the critical revision of the manuscript and gave final approval for its publication.

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Competing interests

None declared.

Ethics approval

The Institutional Review Board of Shenzhen Maternity and Child Healthcare Hospital approved this study (authorization no. SFYLS [2020] 032) and granted an amended approval in 2020.

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5,6,7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6,7
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6,7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	8,9,10
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	
		(*b*) Report category boundaries when continuous variables were categorized	5,6,7
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	13,14
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	14,15
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	
Generalisability	21	Discuss the generalisability (external validity) of the study results	
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Association between intimate partner violence and prenatal anxiety and depression in pregnant women: A cross-sectional survey during the COVID-19 epidemic in Shenzhen, China

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Association between intimate partner violence and prenatal anxiety and depression in pregnant women: A cross-sectional survey during the COVID-19 epidemic in Shenzhen, China

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Abstract

Objectives: Intimate partner violence (IPV) against women remains a major global public health problem with harmful consequences for individuals and society. People's lifestyles have been greatly affected by the coronavirus disease 2019 (COVID-19) pandemic. This study investigated the prevalence of and relationship between IPV and anxiety and depression in pregnant Chinese women during the pandemic.

Design: Cross-sectional study.

Setting: This investigation was conducted in Shenzhen City, Guangdong Province, China from September 15 to December 15, 2020.

Participants: A total of 3434 pregnant women were screened with the Abuse Assessment Screen Questionnaire to evaluate IPV and General Anxiety Disorder and Patient Health Questionnaire to evaluate symptoms of anxiety and depression, respectively. Pregnant women with perinatal health records at Shenzhen District Maternity and Child Healthcare Hospitals who consented to participate were enrolled. Women with psychotic disorders such as schizophrenia, mania, or substance dependence and pregnant women who refused to participate were excluded. Data were analysed with the chi-squared test and by logistic regression analysis.

Results: The prevalence of IPV among pregnant women was 2.2%. Mental violence was the most common type of violence (2.2%), followed by physical (0.6%) and sexual (0.7%) violence. The prevalence of anxiety and depression symptoms was 9.8% and 6.9%, respectively. After adjusting for covariates, there was a statistically significant association between IPV and prenatal anxiety (odds ratio OR=4.136, 95% confidence interval CI: 2.436,

7.022) and depression (OR=4.136, 95% CI: 2.436, 7.022).

Conclusions: IPV increased the risk of prenatal anxiety and depression in pregnant women in China during the COVID-19 pandemic. Efforts should be made by the government and civil society to promote long-lasting antenatal interventions to ensure the safety and protect the mental health of pregnant women.

Strengths and limitations of this study

1. This is the first investigation of the relationship between IPV and prenatal anxiety and depression in pregnant women during the COVID-19 pandemic in China.
2. Causality between these two outcomes was not established.
3. IPV was likely under-reported by the study participants.

1. Introduction

Intimate partner violence (IPV) against women including physical, mental, and sexual abuse is an important clinical and public health issue[1,2]. In 2016, the World Health Organization highlighted various forms of interpersonal violence, particularly those occurring in the home and inflicted by intimate partners and other family members and remaining hidden, stigmatized, and largely unrecognized by health and other service providers[3]. A previous study showed that pregnant women were vulnerable to the initiation or exacerbation of IPV[4] and were 2.7 to 3.9 times more likely to be victims of physical violence and twice as likely to be subjected to sexual violence compared to non-pregnant women[5]. In China, IPV prevalence in pregnant women has been reported as 18.32% in Wuhan[6] and 11.3% in Changsha[7]. Prenatal depression and anxiety are common sequelae of IPV[8 9].

The coronavirus disease 2019 (COVID-19) outbreak began in December 2019 in Wuhan City, Hubei Province, China[10] and suddenly and radically altered the population's habits and lifestyles, with a drastic reduction in any form of socialization. Physical distancing and self-isolation strongly impacted people's lives[11], including those of pregnant women and their partners. Protecting the physical and mental wellbeing of pregnant women is important for a healthy society. However, only one study to date[12] has examined the prevalence of IPV among pregnant women since the start of the COVID-19 pandemic, and there have been no studies investigating the association between IPV and prenatal anxiety and depression in this group.

Shenzhen is one of the most economically developed and populous cities in mainland China whose activities have been severely impacted by the restrictions imposed in response

to the pandemic. The present study aimed to establish the prevalence of IPV among pregnant women in Shenzhen during the COVID-19 pandemic and the association between IPV and prenatal anxiety and depression.

2. Methods

2.1 Research design and study population

This cross-sectional survey was conducted from September 15 to December 15, 2020 and enrolled pregnant women in Shenzhen City, Guangdong Province, China. Shenzhen is an economic centre of China and has long been the fourth largest city in mainland China in terms of economic aggregate. Shenzhen has fewer migrant workers and most of its population is urban. Based on the characteristics of Shenzhen, the research objects of this study were recruited from 10 administrative areas of Shenzhen, which are representative to a certain extent and can provide reference value for similar areas in other countries. There are ten administrative regions in Shenzhen city, the present study recruited pregnancy women in Maternity and Child Healthcare Hospitals in each ten administrative area. A multi-stage random sampling method was used to recruit participants[13]. Briefly, pregnant women came to the hospital for regular check-ups were recruited during September 15 to December 15, 2020. A full description of the objectives, contents, procedures, associated benefits, and risks of the present study was provided at the beginning of the electronic questionnaire. They filled out an electronic questionnaire when registering for the check-up. Investigators composed of trained doctors, nurses or medical students guided the filling process. Pregnant women with perinatal health records at Shenzhen District Maternity and Child Healthcare Hospitals who

consented to participate were enrolled. Women with psychotic disorders such as schizophrenia, mania, or substance dependence and pregnant women who could not finish questionnaire within the allotted time were excluded. The sample size calculation formula for cross-sectional studies was used to determine the minimum theoretical sample size for this study. The admissible error was 0.15, α=0.05, and based on previous studies, the expected prevalence was 5%[14]; 3416 people were therefore required to represent the population of Shenzhen. A total of 3437 women who met the inclusion criteria were enrolled; those who completed the questionnaire in less than 100 s were excluded, leaving 3434 women in the study. Thus, the response rate was 99.9% (3434/3437). The study was approved by the Institutional Review Board of Shenzhen Maternity and Child Healthcare Hospitals and was conducted in Shenzhen.

2.2 Measurements

2.2.1 General characteristics of the study population

General information obtained on each participant included age, education level, partner's education level, work status after pregnancy, partner's work status, marital status, living situation, psychological counselling before pregnancy, vaginal bleeding and pregnancy complications, pregnancy intention, intimacy between partners since COVID-19, and household income since COVID-19.

2.2.2 Family care

The Family Adaptation Partnership Growth and Resolved (APGAR) index was used for

family care assessment[15]. The APGAR has five items, each answered on a 3-point Likert scale from "Often" (2 points) to "Rarely" (0 points). The total score was 0–10 points. A high APGAR score (7–10 points) indicated good family functioning; a mid-range score (4–6 points) indicated moderate family dysfunction; and a low score (0–3) indicated severe family dysfunction.

2.2.3 Lifestyle characteristics

Lifestyle characteristics including smoking and drinking by a pregnant woman and her partner, exercise, and sitting time per day were recorded. Smoking was defined as an average of one cigarette a day in recent years. Drinking was defined as consuming alcohol once a week on average. Exercise was defined as having engaged in walking, yoga, or other physical activities more than three times during the past week. The above definitions were in accordance with previous research[16]. Sitting time per day was categorized as ≤1, 1 to <3, 3 to <5, 5 to <10, and ≥10 h.

2.2.4 Assessment of IPV

The Abuse Assessment Screen Questionnaire was used to assess IPV during pregnancy. This scale is widely used as a tool to screen IPV in pregnant women and has good validity and reliability[17]. The scale assesses three aspects of domestic violence—i.e., mental, physical, and sexual—and has eight items. The response to each item was "Yes" or "No." If the respondent answered "Yes" to one or more of questions 5 to 7, she was identified as a victim of domestic violence during pregnancy[18].

2.2.5 Assessment tool for prenatal anxiety

The 7-Item Generalized Anxiety Disorder scale (GAD-7)[19] is used as a screening tool for GAD in primary care patients and is easily understood and can be completed quickly. The scale has seven items, each scored on a 4-point scale ranging from 0 to 3 for a total score between 0 and 21, with a higher score indicating more severe anxiety symptoms. A GAD-7 score ≥7 was the cut-off for prenatal anxiety.

2.2.6 Assessment tool for prenatal depression

Prenatal depression was assessed with the 9-Item Patient Health Questionnaire (PHQ-9), which consists of nine questions pertaining to depression symptoms over the prior 2 weeks, each with four possible responses: "Not at all," "Several days," "More than half of the days," and "Nearly every day," corresponding to 0, 1, 2, and 3 points, respectively. The total score ranges from 0 to 27[20]. Participants with a score ≥10 were considered to have prenatal depression.

2.3 Statistical analysis

Data were kept anonymous and non-identifiable and were analysed using SPSS v25.0 (SPSS Inc, Chicago, IL, USA). Some continuous variables such as age and family care (APGAR), prenatal anxiety (GAD-7), and prenatal depression (PHQ-9) scores were treated as categorical variables. The chi-squared test, calibration chi-squared test, or Fisher's exact test was used to compare baseline characteristics between women who had experienced IPV (IPV

group) and those who had not (No-IPV group). Multivariate logistic regression with the enter method was used to estimate odds ratio (OR) and 95% confidence interval (CI) of associations between IPV and prenatal anxiety and depression. A two-tailed test with $P<0.05$ was considered statistically significant.

2.4 Patients or public involvement statement

FW was involved in all stages of the study and wrote the paper. Other co-authors were consulted at the planning and design stages of the study and contributed to the interpretation and dissemination of the findings. Neither the patients nor the public were involved in the design, conduct, reporting, or dissemination of this work.

3. Results

Of 3437 pregnant women without psychotic disorders who completed the electronic questionnaire, three were excluded because their completion time was <100 s. Thus, 3434 participants were ultimately included in the analysis. The mean age of the participants was 28.97±4.57 years (Table 1). There were significant differences in age, professional psychological counselling, family care, pregnancy complications, partner intimacy since COVID-19, household income since COVID-19, smoking habits, the participant and her partner's drinking habits, exercise, and sitting time per day between the IPV and No-IPV groups, whereas no intergroup differences were observed in the participant and her partner's education level, work status, and other characteristics. A total of 77 participants (2.2%) experienced at least one form of IPV during pregnancy; mental violence was the most

common (n=57, 1.7%), followed by physical (n=19, 0.6%) and sexual (n=7, 0.7%) violence.

Table 1. General characteristics of the study participants

Variable	No-IPV	IPV	χ^2	*P**
Age (years)			17.528	**0.002**
≤19	28 (0.8)	4 (5.2)		
20–24	507 (15.1)	13 (16.9)		
25–29	1341 (39.9)	30 (39.0)		
30–34	1096 (32.6)	19 (24.7)		
≥35	385 (11.5)	11 (14.3)		
Education level			4.895[a]	0.418
Master's degree or higher	140 (4.2)	7 (9.1)		
Undergraduate	919 (27.4)	18 (23.4)		
College degree	912 (27.2)	21 (27.3)		
High school degree	699 (20.8)	14 (18.2)		
Junior high school diploma	670 (20.0)	17 (22.1)		
Primary school or lower	17 (0.5)	0 (0.0)		
Partner's education level			6.761[a]	0.215
Master's degree or higher	202 (6.0)	6 (7.8)		
Undergraduate	998 (29.7)	22 (28.6)		
College degree	844 (25.1)	18 (23.4)		
High school degree	698 (20.8)	13 (16.9)		
Junior high school diploma	600 (17.9)	16 (20.8)		
Primary school or lower	15 (0.4)	2 (2.6)		
Work status after pregnancy			0.007	0.933
Employed	2065 (61.5)	47 (61.0)		
Unemployed	1292 (38.5)	30 (39.0)		
Partner's working status			0.024[b]	0.876
Employed	3217 (95.8)	73 (94.8)		
Unemployed	140 (4.2)	4 (5.2)		
Marital status			0.440	0.507
Married	3118 (92.9)	70 (90.9)		
Unmarried/divorced/widowed	239 (7.1)	7 (9.1)		
Living situation			3.337	0.189
Couple alone	2263 (67.4)	54 (70.1)		
Living with in-laws	844 (25.1)	14 (18.2)		
Living with parents	250 (7.4)	9 (11.7)		
Professional psychological counselling			17.816	**<0.001**
Not received	3125 (93.1)	62 (80.5)		
Received	232 (6.9)	15 (19.5)		
Family care			45.788	**<0.001**

Good functioning	1992 (59.3)	18 (23.4)		
Moderately dysfunction	872 (26.0)	31 (40.3)		
Severe dysfunction	493 (14.7)	28 (36.4)		
Gestational age			0.944	0.624
First trimester	1122 (33.4)	22 (28.6)		
Second trimester	1122 (33.4)	29 (37.7)		
Third trimester	1113 (33.2)	26 (33.8)		
Vaginal bleeding			2.623	0.105
No	2537 (75.6)	52 (67.5)		
Yes	820 (24.4)	25 (32.5)		
Pregnancy complications			6.730	**0.009**
No	2601 (77.5)	50 (64.9)		
Yes	756 (22.5)	27 (35.1)		
Pregnancy intention			3.641[a]	0.144
Planned conception	1796 (53.5)	33 (42.9)		
Unplanned pregnancy	1452 (43.3)	41 (53.2)		
Artificial insemination	109 (3.2)	3 (3.9)		
Intimacy with partner since COVID-19			64.846	**<0.001**
Essentially unchanged	2554 (76.1)	47 (61.0)		
Strained	65 (1.9)	12 (15.6)		
More intimate	738 (22.0)	18 (23.4)		
Household income since COVID-19			12.921[a]	**0.004**
Essentially unchanged	1805 (53.8)	30 (39.0)		
Increased	60 (1.8)	5 (6.5)		
Decreased by 20%–50%	1165 (34.7)	30 (39.0)		
Decrease by ≥50%	327 (9.7)	12 (15.6)		
Smoking			19.565[b]	**<0.001**
No	3302 (98.4)	70 (90.9)		
Yes	55 (1.6)	7 (9.1)		
Partner's smoking habits			1.217	0.270
No	2082 (62.0)	43 (55.8)		
Yes	1275 (38.0)	34 (44.2)		
Drinking			8.892[b]	**0.003**
No	3195 (95.2)	67 (87.0)		
Yes	162 (4.8)	10 (13.0)		
Partner's drinking habits			7.672	**0.006**
No	2441 (72.7)	45 (58.4)		
Yes	916 (27.3)	32 (41.6)		
Exercise			4.327	**0.038**
No	2412 (71.8)	47 (61.0)		
Yes	945 (28.2)	30 (39.0)		
Sitting time per day, h			14.533	**0.006**
≤1	454 (13.5)	19 (24.7)		
1–3	1069 (31.8)	21 (27.3)		

3–5	829 (24.7)	11 (14.3)
5–10	831 (24.8)	18 (23.4)
≥10	174 (5.2)	8 (10.4)

Data are presented as n (%).
[a]Fisher's exact test.
[b]Calibration chi-squared test.
*Values in bold face are statistically significant at $P<0.05$.

There were differences in the prevalence of anxiety and depression between IPV and No-IPV groups (table 2 and table 3). Among the participants, according to the GAD-7 scale standard, the incidence of mild anxiety symptoms was 15.2% (523/3434), moderate anxiety symptom was 2.5% (85/3434), and severe anxiety symptoms was 1.0% (35/3434). When the cut-off value was 7, the incidence of anxiety symptoms was 9.8% (337/3434). According to the PHQ-9 scale standard, the incidence of mild depressive symptoms was 22.0% (757/3434), moderate depressive symptoms was 6.1% (210/3434), and severe depressive symptoms was 0.8% (28/3434). When the cut-off value was 10, The incidence of depressive symptoms was 6.9% (238/3434). Participants who experienced mental, physical, and sexual violence had higher rates of prenatal anxiety and depression than those who did not report IPV.

Table 2. Prevalence of anxiety among study participants

IPV or IPV subtype	No prenatal anxiety	Prenatal anxiety	χ^2	*P**
Overall IPV			97.172	**<0.001**
No	3053 (98.6)	304 (90.2)		
Yes	44 (1.4)	33 (9.8)		
Mental violence			83.936	**<0.001**
No	3066 (99.0)	311 (92.3)		
Yes	31 (1.0)	26 (7.7)		
Physical violence			44.591[a]	**<0.001**
No	3089 (99.7)	326 (96.7)		
Yes	8 (0.3)	11 (3.3)		
Sexual violence			13.594[a]	**<0.001**

No	3082 (99.5)	329 (97.6)
Yes	15 (0.5)	8 (2.4)
Total	3097 (90.2)	337 (9.8)

Data are presented as n (%).
[a]Calibration chi-squared test.
*Values in bold face are statistically significant at $P<0.05$.
IPV, intimate partner violence.

Table 3. Prevalence of depression among study participants

IPV or IPV subtype	No prenatal depression	Prenatal depression	χ^2	*P**
Overall IPV			64.257	**<0.001**
No	3142 (98.3)	215 (90.3)		
Yes	54 (1.7)	23 (9.7)		
Mental violence			36.892[a]	**<0.001**
No	3155 (98.7)	222 (93.3)		
Yes	41 (1.3)	16 (6.7)		
Physical violence			31.369[a]	**<0.001**
No	3185 (99.7)	230 (96.6)		
Yes	11 (0.3)	8 (3.4)		
Sexual violence			23.669[a]	**<0.001**
No	3181 (99.5)	230 (96.6)		
Yes	15 (0.5)	8 (3.4)		
Total	3196 (93.1)	238 (6.9)		

Data are presented as n (%).
[a]Calibration chi-squared test.
*Values in bold face are statistically significant at $P<0.05$.
IPV, intimate partner violence.

After adjusting for potential confounding factors, IPV was significantly associated with prenatal anxiety in the multivariate logistic regression analysis (Table 4). Participants who had experienced IPV were 4.207 times more likely to have experienced prenatal anxiety (OR=4.207, 95% CI: 2.469, 7.166). Mental violence (OR=4.394, 95% CI: 2.444, 8.179) and physical violence (OR=8.869, 95% CI: 3.224, 26.102) were significantly associated with prenatal anxiety; however, there was no association between sexual violence and anxiety.

Table 4. Association between intimate partner violence and prenatal anxiety

Variable	OR (95% CI)	*P*
IPV[a]	4.207 (2.469, 7.166)	**<0.001**
Mental violence[b]	4.471 (2.444, 8.179)	**<0.001**
Physical violence[b]	9.174 (3.224, 26.102)	**<0.001**
Sexual violence[b]	2.018 (0.733, 5.556)	0.174

[a]Adjusted for age, participant and her partner's education level, participant and her partner's work status, marital status, living situation, professional psychological counseling, family care, gestational age, vaginal bleeding, pregnancy complications, pregnancy intention, intimacy with partner since COVID-19, household income since COVID-19, participant and her partner's smoking habits, participant and her partner's drinking habits, exercise, sitting time per day, and IPV subtype.

[b]Adjusted for age, participant and her partner's education level, participant and her partner's work status, marital status, living situation, professional psychological counseling, family care, gestational age, vaginal bleeding, pregnancy complications, pregnancy intention, intimacy with partner since COVID-19, household income since COVID-19, participant and her partner's smoking habits, participant and her partner's drinking habits, exercise, sitting time per day, and IPV subtype.

*Values in bold face are statistically significant at $P<0.05$.

CI, confidence interval; IPV, intimate partner violence; OR, odds ratio.

In the logistic regression analysis, participants who reported IPV were more likely to develop prenatal depression after adjusting for confounding factors (OR=3.864, 95% CI: 2.095, 7.125). Mental violence (OR=3.259, 95% CI: 1.590, 6.678), physical violence (OR=10.176, 95% CI: 3.495, 29.627), and sexual violence (OR=4.121, 95% CI: 1.457, 11.659) were all associated with an increased risk of prenatal depression (Table 5).

Table 5. Association between intimate partner violence and prenatal depression

Variable	OR (95% CI)	P
IPV[a]	3.864 (2.095, 7.125)	**<0.001**
Mental violence[b]	3.259 (1.590, 6.678)	**0.001**
Physical violence[b]	10.176 (3.495, 29.627)	**<0.001**
Sexual violence[b]	4.121 (1.457, 11.659)	**0.008**

[a]Adjusted for age, participant and her partner's education level, participant and her partner's work status, marital status, living situation, professional psychological counseling, family

care, gestational age, vaginal bleeding, pregnancy complications, pregnancy intention, intimacy with partner since COVID-19, household income since COVID-19, participant and her partner's smoking habits, participant and her partner's drinking habits, exercise, sitting time per day, and IPV subtype.

[b]Adjusted for age, participant and her partner's education level, participant and her partner's work status, marital status, living situation, professional psychological counseling, family care, gestational age, vaginal bleeding, pregnancy complications, pregnancy intention, intimacy with partner since COVID-19, household income since COVID-19, participant and her partner's smoking habits, participant and her partner's drinking habits, exercise, sitting time per day, and IPV subtype.

*Values in bold face are statistically significant at $P<0.05$.

CI, confidence interval; IPV, intimate partner violence; OR, odds ratio.

4. Discussion

The prevalence of IPV during the COVID-19 pandemic among pregnant women in Shenzhen, China, was 2.2%. This is comparable to the rate reported in a cross-sectional study conducted in London, UK (3%)[21] but much lower than that reported in Pakistan (35%)[22]. The disparities in prevalence are likely attributable to cultural, economic, and regional differences. The COVID-19 has radically changed the lives of individuals. During quarantine due to the COVID-19, everyone is experimenting with new ways of relating to others, home risks to become a very dangerous place for victims of domestic violence, because they are required to stay the more time with partners and away from people who can validate their experiences and give help. For another, IPV can further deteriorate due to economic crisis linked to COVID emergence for some pregnancy women have difficulty to leave partners for economic reasons[23], which likely influenced the prevalence of reported IPV. However, do not consistently screen for IPV due to limited time and resources, reluctance to possibly offend the pregnancy women, insufficient training and reimbursement, and perceived lack of institutional support. Thus, it is increasingly essential that healthcare professionals address

safety and violence at home, telehealth provides a novel opportunity for longer conversations related to IPV screening and resource provision, contraceptive counselling, and mental health[24].

Mental violence (1.7%) was the most common form of IPV among the study participants, which is consistent with findings from other studies conducted in China[7], Thailand[25], and Ethiopia[26]. We observed similar rates of physical (0.6%) and sexual (0.7%) violence, although these were lower than that reported in Ethiopia during the COVID-19 pandemic[12]. The difference may be explained by the Chinese cultural norm of avoiding discussion of unpleasant personal circumstances in order to "save face"[16], with the result that violence during pregnancy is frequently underreported[27]. It is worth noting that our results may have been biased by the fact that outcomes were assessed by self-report[28]. Although we had told the subjects that the survey result was only for scientific research purposes and that they filled in the electronic questionnaire anonymously, it was still possible that the subjects concealed or avoided reporting their experiences of violence. On the other hand, the main research results of the present survey were based on the subjects' recall of past events. Pregnant women may forget the experience of IPV, especially psychological violence, and may ignore the abuse, belittling and ridicule of their partners, which may also lead to the low reporting rate of IPV.

We observed a significant and positive association between IPV and prenatal anxiety and depression during the COVID-19 pandemic. This is consistent with other reports[6 7 9 29] in which IPV was identified as a chronic stressful condition that increased the risk of depression and anxiety during pregnancy. We also found that IPV subtypes had different effects on

prenatal anxiety and depression; for instance, mental violence was associated with an increased risk of both conditions. A higher rate of psychological (emotional and verbal) abuse was shown to be more closely associated with mental health outcomes than physical violence[30], possibly because psychological violence directly attacks a person's self-perception and can cause post-traumatic stress disorder and anxiety through mechanisms such as guilt, self-hatred, and regret[31]. The adverse consequences of physical violence such as fractures, lacerations, and head trauma are amplified during pregnancy and increased the risk of prenatal anxiety and depression in our cohort. Sexual violence did not appear to be associated with prenatal anxiety in our research, which contradicts earlier findings[32]; this may be due to participants' reluctance to report this form of IPV according to the norms of Chinese culture. There was also the possibility that the positive rate is too low to show an association between sexual violence and prenatal anxiety. Future studies can be guided to increase the sample size to verify the results of the present study.

Strengths and limitations

This study is the first investigation of the relationship between IPV and prenatal anxiety and depression in pregnant women during the COVID-19 pandemic in China. The participants were representative of the entire population of Shenzhen. However, there were several limitations to our study. Firstly, we were unable to establish causality between the two outcomes because of the cross-sectional study design. Secondly, symptoms of depression and anxiety were evaluated only once and therefore, it was not possible to detect any trends over the course of pregnancy. Thirdly, non-pregnant women should have been included as controls

to obtain a more comprehensive view of the effects of IPV on pregnant women. Finally, the present study reported a low prevalence of IPV, which may lead to false negative results in analysing correlations. Future studies should expand the sample size to verify the results of this study. These issues can be addressed in future studies with a prospective, longitudinal, meditational, and mixed method designs that also examine the mental health consequences of IPV for pregnant women.

Conclusion

Violence against women represents a key priority in achieving gender equality around the world. The prevalence of IPV in pregnant women in China cannot to be underestimated. Our results suggest that IPV among pregnant women during the COVID-19 pandemic was associated with prenatal anxiety and depression. Prenatal care can identify pregnant women who experience IPV so that they can be connected with services that offer protection. Eliminating violence against pregnant women requires practical and long-term interventions by the government and civil society starting from education within the family.

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Data Availability Statement

The datasets generated and analysed during the current study are not publicly available due to privacy restrictions but are available from the corresponding author on reasonable request.

Contributors

All authors made substantial contributions to this study. FW, WL, PL, and MZ were responsible for study conception and initiation, design, and supervised implementation. FW, CC, QL, WH, and CZ acquired the data. FW, WL, LZ, YW, and QC interpreted the data and performed statistical analyses. FW drafted the manuscript. All authors contributed to the critical revision of the manuscript and gave final approval for its publication.

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Competing interests

None declared.

Ethics approval

The Institutional Review Board of Shenzhen Maternity and Child Healthcare Hospital approved this study (authorization no. SFYLS [2020] 032) and granted an amended approval in 2020.

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5,6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6,7,8,9
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5,6
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6,7,8
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8,9
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8,9
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	8,9,10,11
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	
		(*b*) Report category boundaries when continuous variables were categorized	6,7,8
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	12,13,14,15
Discussion			
Key results	18	Summarise key results with reference to study objectives	15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	17
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16,17
Generalisability	21	Discuss the generalisability (external validity) of the study results	17
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	19

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Association between intimate partner violence and prenatal anxiety and depression in pregnant women: A cross-sectional survey during the COVID-19 epidemic in Shenzhen, China

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Secondary Subject Heading:	Mental health
Keywords:	Depression & mood disorders < PSYCHIATRY, Anxiety disorders < PSYCHIATRY, COVID-19

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Association between intimate partner violence and prenatal anxiety and depression in pregnant women: A cross-sectional survey during the COVID-19 epidemic in Shenzhen, China

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Abstract

Objectives: Intimate partner violence (IPV) against women remains a major global public health problem with harmful consequences for individuals and society. People's lifestyles have been greatly affected by the coronavirus disease 2019 (COVID-19) pandemic. This study investigated the prevalence of and relationship between IPV and anxiety and depression in pregnant Chinese women during the pandemic.

Design: Cross-sectional study.

Setting: This investigation was conducted in Shenzhen City, Guangdong Province, China from September 15 to December 15, 2020.

Participants: A total of 3434 pregnant women were screened with the Abuse Assessment Screen Questionnaire to evaluate IPV and General Anxiety Disorder and Patient Health Questionnaire to evaluate symptoms of anxiety and depression, respectively. Pregnant women with perinatal health records at Shenzhen District Maternity and Child Healthcare Hospitals who consented to participate were enrolled. Women with psychotic disorders such as schizophrenia, mania, or substance dependence and pregnant women who refused to participate were excluded. Data were analysed with the chi-squared test and by logistic regression analysis.

Results: The prevalence of IPV among pregnant women was 2.2%. Mental violence was the most common type of violence (2.2%), followed by physical (0.6%) and sexual (0.7%) violence. The prevalence of anxiety and depression symptoms was 9.8% and 6.9%, respectively. After adjusting for covariates, there was a statistically significant association between IPV and prenatal anxiety (odds ratio OR=4.136, 95% confidence interval CI: 2.436,

7.022) and depression (OR=4.136, 95% CI: 2.436, 7.022).

Conclusions: IPV increased the risk of prenatal anxiety and depression in pregnant women in China during the COVID-19 pandemic. Efforts should be made by the government and civil society to promote long-lasting antenatal interventions to ensure the safety and protect the mental health of pregnant women.

Strengths and limitations of this study

1. This is the first investigation of the relationship between IPV and prenatal anxiety and depression in pregnant women during the COVID-19 pandemic in China.
2. Causality between these two outcomes was not established.
3. IPV was likely under-reported by the study participants.
4. Some results should be interpreted with caution because of the small sample size.

1. Introduction

Intimate partner violence (IPV) against women including physical, mental, and sexual abuse is an important clinical and public health issue[1,2]. In 2016, the World Health Organization highlighted various forms of interpersonal violence, particularly those occurring in the home and inflicted by intimate partners and other family members and remaining hidden, stigmatized, and largely unrecognized by health and other service providers[3]. A previous study showed that pregnant women were vulnerable to the initiation or exacerbation of IPV[4] and were 2.7 to 3.9 times more likely to be victims of physical violence and twice as likely to be subjected to sexual violence compared with non-pregnant women[5]. In China, IPV prevalence in pregnant women has been reported as 18.32% in Wuhan[6] and 11.3% in Changsha[7]. Prenatal depression and anxiety are common sequelae of IPV[8,9].

The coronavirus disease 2019 (COVID-19) outbreak began in December 2019 in Wuhan City, Hubei Province, China[10] and suddenly and radically altered the population's habits and lifestyles, with a drastic reduction in any form of socialization. Physical distancing and self-isolation strongly impacted people's lives[11], including those of pregnant women and their partners. Protecting the physical and mental wellbeing of pregnant women is important for a healthy society. However, only one study to date[12] has examined the prevalence of IPV among pregnant women since the start of the COVID-19 pandemic, and there have been no studies investigating the association between IPV and prenatal anxiety and depression in this group.

Shenzhen is one of the most economically developed and populous cities in mainland China whose activities have been severely impacted by the restrictions imposed in response

to the pandemic. The present study aimed to establish the prevalence of IPV among pregnant women in Shenzhen during the COVID-19 pandemic and the association between IPV and prenatal anxiety and depression.

2. Methods

2.1 Research design and study population

This cross-sectional survey was conducted from September 15 to December 15, 2020 and enrolled women at all stages of pregnancy in Shenzhen City, Guangdong Province, China. Shenzhen is an economic centre and the fourth largest city in mainland China in terms of economic aggregate; there are fewer migrant workers than other large cities and most of its population is urban. The study participants were recruited from 10 representative administrative areas of Shenzhen that can provide reference values for areas in other countries with similar characteristics. Pregnant women were recruited from maternity and child healthcare hospitals in each of the 10 administrative areas using a multi-stage random sampling method[13]. Briefly, women at all stages of pregnancy who came to the hospital for regular check-ups between September 15 and December 15, 2020 were enrolled. A full description of the objectives, contents, procedures, associated benefits, and risks of the present study was provided at the beginning of the electronic questionnaire completed by participants when they registered for the check-up. Investigators including trained doctors, nurses, and medical students provided guidance for filling out the questionnaire. Pregnant women with perinatal health records at Shenzhen District Maternity and Child Healthcare Hospitals who consented to participate were enrolled. Women with psychotic disorders such

as schizophrenia, mania, or substance dependence and pregnant women who could not complete the questionnaire within the allotted time were excluded. The sample size calculation formula for cross-sectional studies was used to determine the minimum theoretical sample size for this study. The admissible error was 0.15, α=0.05, and based on previous studies, the expected prevalence was 5%[14]; 3416 people were therefore required to represent the population of Shenzhen. A total of 3437 women who met the inclusion criteria were enrolled; those who completed the questionnaire in less than 100 s were excluded, leaving 3434 women in the study from all 10 administrative areas of Shenzhen. Thus, the response rate was 99.9% (3434/3437). There were about 160,000 live births in the Maternal and Child Health Hospital system of Shenzhen in 2020, which represents our sample size of about 2% of the total number of newborns in Shenzhen. The study was approved by the Institutional Review Board of Shenzhen Maternity and Child Healthcare Hospitals and was conducted in Shenzhen.

2.2 Measurements

2.2.1 General characteristics of the study population

General information obtained on each participant included age, education level, partner's education level, work status after pregnancy, partner's work status, marital status, living situation, psychological counselling before pregnancy, vaginal bleeding and pregnancy complications, pregnancy intention, intimacy between partners since COVID-19, and household income since COVID-19.

2.2.2 Family care

The Family Adaptation Partnership Growth and Resolved (APGAR) index was used for family care assessment[15]. The APGAR has five items, each answered on a 3-point Likert scale from "Often" (2 points) to "Rarely" (0 points). The total score was 0–10 points. A high APGAR score (7–10 points) indicated good family functioning; a mid-range score (4–6 points) indicated moderate family dysfunction; and a low score (0–3) indicated severe family dysfunction.

2.2.3 Lifestyle characteristics

Lifestyle characteristics including smoking and drinking by a pregnant woman and her partner, exercise, and sitting time per day were recorded. Smoking was defined as an average of one cigarette a day in recent years. Drinking was defined as consuming alcohol once a week on average. Exercise was defined as having engaged in walking, yoga, or other physical activities more than three times during the past week. The above definitions were in accordance with previous research[16]. Sitting time per day was categorized as ≤1, 1 to <3, 3 to <5, 5 to <10, and ≥10 h.

2.2.4 Assessment of IPV

The Abuse Assessment Screen Questionnaire was used to assess IPV during pregnancy. This scale is widely used as a tool to screen IPV in pregnant women and has good validity and reliability[17]. The scale assesses three aspects of domestic violence—i.e., mental, physical, and sexual—and has eight items. The response to each item was "Yes" or "No." If the respondent

answered "Yes" to one or more of questions 5 to 7, she was identified as a victim of domestic violence during pregnancy[18].

2.2.5 Assessment tool for prenatal anxiety

The 7-Item Generalized Anxiety Disorder scale (GAD-7)[19] is used as a screening tool for GAD in primary care patients and is easily understood and can be completed quickly. The scale has seven items, each scored on a 4-point scale ranging from 0 to 3 for a total score between 0 and 21, with a higher score indicating more severe anxiety symptoms. A GAD-7 score ≥7 was the cut-off for prenatal anxiety.

2.2.6 Assessment tool for prenatal depression

Prenatal depression was assessed with the 9-Item Patient Health Questionnaire (PHQ-9), which consists of nine questions pertaining to depression symptoms over the prior 2 weeks, each with four possible responses: "Not at all," "Several days," "More than half of the days," and "Nearly every day," corresponding to 0, 1, 2, and 3 points, respectively. The total score ranges from 0 to 27[20]. Participants with a score ≥10 were considered to have prenatal depression.

2.3 Statistical analysis

Data were kept anonymous and non-identifiable and were analysed using SPSS v25.0 (SPSS Inc, Chicago, IL, USA). Some continuous variables such as age and family care (APGAR), prenatal anxiety (GAD-7), and prenatal depression (PHQ-9) scores were treated as

categorical variables. The chi-squared test, calibration chi-squared test, or Fisher's exact test was used to compare baseline characteristics between women who had experienced IPV (IPV group) and those who had not (No-IPV group). Multivariate logistic regression with the enter method was used to estimate odds ratio (OR) and 95% confidence interval (CI) of associations between IPV and prenatal anxiety and depression. A two-tailed test with $P<0.05$ was considered statistically significant.

2.4 Patients or public involvement statement

Neither the patients nor the public were involved in the design, conduct, reporting, or dissemination of this work.

3. Results

Of 3437 pregnant women without psychotic disorders who completed the electronic questionnaire, three were excluded because their completion time was <100 s. Thus, 3434 participants were ultimately included in the analysis. The mean age of the participants was 28.97±4.57 years (Table 1). There were significant differences in age, professional psychological counselling, family care, pregnancy complications, partner intimacy since COVID-19, household income since COVID-19, smoking habits, drinking habits of the participant and her partner, exercise, and sitting time per day between the IPV and No-IPV groups, whereas no intergroup differences were observed in the participant and her partner's education level, work status, and other characteristics. A total of 77 participants (2.2%) experienced at least one form of IPV during pregnancy; mental violence was the most

common (n=57, 1.7%), followed by physical (n=19, 0.6%) and sexual (n=7, 0.7%) violence.

Table 1. General characteristics of the study participants

Variable	No-IPV	IPV	χ^2	*P**
Age (years)			17.528	**0.002**
≤19	28 (0.8)	4 (5.2)		
20–24	507 (15.1)	13 (16.9)		
25–29	1341 (39.9)	30 (39.0)		
30–34	1096 (32.6)	19 (24.7)		
≥35	385 (11.5)	11 (14.3)		
Education level			4.895[a]	0.418
Master's degree or higher	140 (4.2)	7 (9.1)		
Undergraduate	919 (27.4)	18 (23.4)		
College degree	912 (27.2)	21 (27.3)		
High school degree	699 (20.8)	14 (18.2)		
Junior high school diploma	670 (20.0)	17 (22.1)		
Primary school or lower	17 (0.5)	0 (0.0)		
Partner's education level			6.761[a]	0.215
Master's degree or higher	202 (6.0)	6 (7.8)		
Undergraduate	998 (29.7)	22 (28.6)		
College degree	844 (25.1)	18 (23.4)		
High school degree	698 (20.8)	13 (16.9)		
Junior high school diploma	600 (17.9)	16 (20.8)		
Primary school or lower	15 (0.4)	2 (2.6)		
Work status after pregnancy			0.007	0.933
Employed	2065 (61.5)	47 (61.0)		
Unemployed	1292 (38.5)	30 (39.0)		
Partner's working status			0.024[b]	0.876
Employed	3217 (95.8)	73 (94.8)		
Unemployed	140 (4.2)	4 (5.2)		
Marital status			0.440	0.507
Married	3118 (92.9)	70 (90.9)		
Unmarried/divorced/widowed	239 (7.1)	7 (9.1)		
Living situation			3.337	0.189
Couple alone	2263 (67.4)	54 (70.1)		
Living with in-laws	844 (25.1)	14 (18.2)		
Living with parents	250 (7.4)	9 (11.7)		
Professional psychological counselling			17.816	**<0.001**
Not received	3125 (93.1)	62 (80.5)		
Received	232 (6.9)	15 (19.5)		
Family care			45.788	**<0.001**

Good functioning	1992 (59.3)	18 (23.4)		
Moderately dysfunction	872 (26.0)	31 (40.3)		
Severe dysfunction	493 (14.7)	28 (36.4)		
Gestational age			0.944	0.624
First trimester	1122 (33.4)	22 (28.6)		
Second trimester	1122 (33.4)	29 (37.7)		
Third trimester	1113 (33.2)	26 (33.8)		
Vaginal bleeding			2.623	0.105
No	2537 (75.6)	52 (67.5)		
Yes	820 (24.4)	25 (32.5)		
Pregnancy complications			6.730	**0.009**
No	2601 (77.5)	50 (64.9)		
Yes	756 (22.5)	27 (35.1)		
Pregnancy intention			3.641[a]	0.144
Planned conception	1796 (53.5)	33 (42.9)		
Unplanned pregnancy	1452 (43.3)	41 (53.2)		
Artificial insemination	109 (3.2)	3 (3.9)		
Intimacy with partner since COVID-19			64.846	**<0.001**
Essentially unchanged	2554 (76.1)	47 (61.0)		
Strained	65 (1.9)	12 (15.6)		
More intimate	738 (22.0)	18 (23.4)		
Household income since COVID-19			12.921[a]	**0.004**
Essentially unchanged	1805 (53.8)	30 (39.0)		
Increased	60 (1.8)	5 (6.5)		
Decreased by 20%–50%	1165 (34.7)	30 (39.0)		
Decrease by ≥50%	327 (9.7)	12 (15.6)		
Smoking			19.565[b]	**<0.001**
No	3302 (98.4)	70 (90.9)		
Yes	55 (1.6)	7 (9.1)		
Partner's smoking habits			1.217	0.270
No	2082 (62.0)	43 (55.8)		
Yes	1275 (38.0)	34 (44.2)		
Drinking			8.892[b]	**0.003**
No	3195 (95.2)	67 (87.0)		
Yes	162 (4.8)	10 (13.0)		
Partner's drinking habits			7.672	**0.006**
No	2441 (72.7)	45 (58.4)		
Yes	916 (27.3)	32 (41.6)		
Exercise			4.327	**0.038**
No	2412 (71.8)	47 (61.0)		
Yes	945 (28.2)	30 (39.0)		
Sitting time per day, h			14.533	**0.006**
≤1	454 (13.5)	19 (24.7)		
1–3	1069 (31.8)	21 (27.3)		

3–5	829 (24.7)	11 (14.3)
5–10	831 (24.8)	18 (23.4)
≥10	174 (5.2)	8 (10.4)

Data are presented as n (%).
[a]Fisher's exact test.
[b]Calibration chi-squared test.
*Values in bold face are statistically significant at $P<0.05$.

There were differences in the prevalence of anxiety and depression between IPV and No-IPV groups (Tables 2 and 3). According to GAD-7 scale score, the incidence of mild anxiety symptoms was 15.2% (523/3434), while moderate and severe anxiety symptoms were observed in 2.5% (85/3434) and 1.0% (35/3434) of participants, respectively. Using a cut-off value of 7, the incidence of anxiety symptoms was 9.8% (337/3434). According to PHQ-9 scale score, 22.0% of participants (757/3434) had mild depressive symptoms, 6.1% (210/3434) had moderate depressive symptoms, and 0.8% (28/3434) had severe depressive symptoms. Using a cut-off value of 10, the incidence of depressive symptoms was 6.9% (238/3434). Participants who experienced mental, physical, and sexual violence had higher rates of prenatal anxiety and depression than those who did not report IPV.

Table 2. Prevalence of anxiety among study participants

IPV or IPV subtype	No prenatal anxiety	Prenatal anxiety	χ^2	*P**
Overall IPV			97.172	**<0.001**
No	3053 (98.6)	304 (90.2)		
Yes	44 (1.4)	33 (9.8)		
Mental violence			83.936	**<0.001**
No	3066 (99.0)	311 (92.3)		
Yes	31 (1.0)	26 (7.7)		
Physical violence			44.591[a]	**<0.001**
No	3089 (99.7)	326 (96.7)		
Yes	8 (0.3)	11 (3.3)		
Sexual violence			13.594[a]	**<0.001**

No	3082 (99.5)	329 (97.6)
Yes	15 (0.5)	8 (2.4)
Total	3097 (90.2)	337 (9.8)

Data are presented as n (%).
[a]Calibration chi-squared test.
*Values in bold face are statistically significant at $P<0.05$.
IPV, intimate partner violence.

Table 3. Prevalence of depression among study participants

IPV or IPV subtype	No prenatal depression	Prenatal depression	χ^2	*P**
Overall IPV			64.257	**<0.001**
No	3142 (98.3)	215 (90.3)		
Yes	54 (1.7)	23 (9.7)		
Mental violence			36.892[a]	**<0.001**
No	3155 (98.7)	222 (93.3)		
Yes	41 (1.3)	16 (6.7)		
Physical violence			31.369[a]	**<0.001**
No	3185 (99.7)	230 (96.6)		
Yes	11 (0.3)	8 (3.4)		
Sexual violence			23.669[a]	**<0.001**
No	3181 (99.5)	230 (96.6)		
Yes	15 (0.5)	8 (3.4)		
Total	3196 (93.1)	238 (6.9)		

Data are presented as n (%).
[a]Calibration chi-squared test.
*Values in bold face are statistically significant at $P<0.05$.
IPV, intimate partner violence.

After adjusting for potential confounding factors, IPV was significantly associated with prenatal anxiety in the multivariate logistic regression analysis (Table 4). Participants who had experienced IPV were 4.207 times more likely to have experienced prenatal anxiety (OR=4.207, 95% CI: 2.469, 7.166). Mental violence (OR=4.394, 95% CI: 2.444, 8.179) and physical violence (OR=8.869, 95% CI: 3.224, 26.102) were significantly associated with prenatal anxiety; however, there was no association between sexual violence and anxiety.

Table 4. Association between intimate partner violence and prenatal anxiety

Variable	OR (95% CI)	*P*
IPV[a]	4.207 (2.469, 7.166)	**<0.001**
Mental violence[b]	4.471 (2.444, 8.179)	**<0.001**
Physical violence[b]	9.174 (3.224, 26.102)	**<0.001**
Sexual violence[b]	2.018 (0.733, 5.556)	0.174

[a]Adjusted for age, participant and her partner's education level, participant and her partner's work status, marital status, living situation, professional psychological counselling, family care, gestational age, vaginal bleeding, pregnancy complications, pregnancy intention, intimacy with partner since COVID-19, household income since COVID-19, participant and her partner's smoking habits, participant and her partner's drinking habits, exercise, sitting time per day, and IPV subtype.

[b]Adjusted for age, participant and her partner's education level, participant and her partner's work status, marital status, living situation, professional psychological counselling, family care, gestational age, vaginal bleeding, pregnancy complications, pregnancy intention, intimacy with partner since COVID-19, household income since COVID-19, participant and her partner's smoking habits, participant and her partner's drinking habits, exercise, sitting time per day, and IPV subtype.

*Values in bold face are statistically significant at $P<0.05$.

CI, confidence interval; IPV, intimate partner violence; OR, odds ratio.

In the logistic regression analysis, participants who reported IPV were more likely to develop prenatal depression after adjusting for confounding factors (OR=3.864, 95% CI: 2.095, 7.125). Mental violence (OR=3.259, 95% CI: 1.590, 6.678), physical violence (OR=10.176, 95% CI: 3.495, 29.627), and sexual violence (OR=4.121, 95% CI: 1.457, 11.659) were all associated with an increased risk of prenatal depression (Table 5).

Table 5. Association between intimate partner violence and prenatal depression

Variable	OR (95% CI)	P
IPV[a]	3.864 (2.095, 7.125)	**<0.001**
Mental violence[b]	3.259 (1.590, 6.678)	**0.001**
Physical violence[b]	10.176 (3.495, 29.627)	**<0.001**
Sexual violence[b]	4.121 (1.457, 11.659)	**0.008**

[a]Adjusted for age, participant and her partner's education level, participant and her partner's work status, marital status, living situation, professional psychological counselling, family care, gestational age, vaginal bleeding, pregnancy complications, pregnancy intention, intimacy with partner since COVID-19, household income since COVID-19, participant and her partner's smoking habits, participant and her partner's drinking habits, exercise, sitting time per day, and IPV subtype.
[b]Adjusted for age, participant and her partner's education level, participant and her partner's work status, marital status, living situation, professional psychological counselling, family care, gestational age, vaginal bleeding, pregnancy complications, pregnancy intention, intimacy with partner since COVID-19, household income since COVID-19, participant and her partner's smoking habits, participant and her partner's drinking habits, exercise, sitting time per day, and IPV subtype.
*Values in bold face are statistically significant at $P<0.05$.
CI, confidence interval; IPV, intimate partner violence; OR, odds ratio.

4. Discussion

The prevalence of IPV during the COVID-19 pandemic among pregnant women in Shenzhen, China, was 2.2%. This is comparable to the rate reported in a cross-sectional study conducted in London, UK (3%)[21] but much lower than that reported in Pakistan (35%)[22]. The disparities in prevalence are likely attributable to cultural, economic, and regional differences. The COVID-19 pandemic has radically changed the lives of individuals. In particular, COVID-19 quarantine made the home a very dangerous place for victims of domestic violence as they were forced to spend more time with their abusive partners and away from people who could validate their experiences and offer help. IPV was also exacerbated by the economic crisis linked to COVID-19 with some pregnant women unable to leave their partners for economic reasons[23], which likely influenced the reported prevalence of IPV. However, there has not been consistent screening for IPV because of limited time and resources, a reluctance to potentially offend pregnant women, insufficient training and reimbursement, and perceived lack of institutional support. It is therefore essential that healthcare professionals address

safety and violence faced by their pregnant patients at home. Telehealth provides an opportunity for IPV screening and the provision of resources as well as contraceptive and mental health counselling[24].

Mental violence (1.7%) was the most common form of IPV among the study participants, which is consistent with findings from other studies conducted in China[7], Thailand[25], and Ethiopia[26]. We observed similar rates of physical (0.6%) and sexual (0.7%) violence, although these were lower than that reported in Ethiopia during the COVID-19 pandemic[12]. The difference may be explained by the Chinese cultural norm of avoiding discussions of unpleasant personal circumstances in order to "save face"[16], with the result that violence during pregnancy is frequently underreported[27]. It is worth noting that our results may have been biased by the fact that outcomes were assessed by self-report[28]. Although we informed the subjects that the survey was for scientific research purposes only and that they were filling out the electronic questionnaire anonymously, it is possible that the subjects concealed or avoided fully reporting their experiences of violence. On the other hand, the survey results were based on participants' recall of past events; participants may have forgotten about or ignored their experiences of IPV, especially psychological violence such as belittling and ridiculing, which may have decreased the reported rate of IPV.

We observed a significant and positive association between IPV and prenatal anxiety and depression during the COVID-19 pandemic. This is consistent with other reports[6 7 9 29] in which IPV was identified as a chronic stressful condition that increased the risk of depression and anxiety during pregnancy. We also found that IPV subtypes had different effects on prenatal anxiety and depression; for instance, mental violence was associated with an

increased risk of both conditions. A higher rate of psychological (emotional and verbal) abuse was shown to be more closely associated with mental health outcomes than physical violence[30], possibly because psychological violence directly attacks a person's self-perception and can cause post-traumatic stress disorder and anxiety through mechanisms such as guilt, self-hatred, and regret[31]. The adverse consequences of physical violence such as fractures, lacerations, and head trauma are amplified during pregnancy and increased the risk of prenatal anxiety and depression in our cohort. Sexual violence did not appear to be associated with prenatal anxiety in our research, which contradicts earlier findings[32]; this may be due to participants' reluctance to report this form of IPV according to the norms of Chinese culture. It is also possible that the positive rate was too low to show an association between sexual violence and prenatal anxiety. This warrants closer investigation in future studies with a larger sample size.

Strengths and limitations

This study is the first investigation of the relationship between IPV and prenatal anxiety and depression in pregnant women during the COVID-19 pandemic in China. The participants were representative of the entire population of Shenzhen. However, there were several limitations to our study. Firstly, we were unable to establish causality between the two outcomes because of the cross-sectional study design. Secondly, symptoms of depression and anxiety were evaluated only once and therefore, it was not possible to detect any trends over the course of pregnancy. Thirdly, non-pregnant women should have been included as controls to obtain a more comprehensive view of the effects of IPV on pregnant women. Finally, we

found a low prevalence of IPV, which may lead to false negative results when analysing correlations. Future investigations should expand the sample size to confirm the results of this study. These issues can be addressed in future studies with a prospective, longitudinal, meditational, and mixed method designs that also examine the mental health consequences of IPV for pregnant women.

Conclusion

Violence against women is a key priority for achieving gender equality around the world. The prevalence of IPV in pregnant women in China cannot be underestimated. Our results suggest that IPV among pregnant women during the COVID-19 pandemic was associated with prenatal anxiety and depression. Prenatal care can identify pregnant women who experience IPV so that they can be connected with services that offer protection. Eliminating violence against pregnant women requires practical and long-term interventions by the government and civil society starting from education within the family.

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Data Availability Statement

The datasets generated and analysed during the current study are not publicly available due to privacy restrictions but are available from the corresponding author on reasonable request.

Contributors

All authors made substantial contributions to this study. FW, WL, PL, and MZ were responsible for study conception and initiation, design, and supervised implementation. FW, CC, QL, WH, and CZ acquired the data. FW, WL, LZ, YW, and QC interpreted the data and performed statistical analyses. FW drafted the manuscript. All authors contributed to the critical revision of the manuscript and gave final approval for its publication.

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Competing interests

None declared.

Ethics approval

The Institutional Review Board of Shenzhen Maternity and Child Healthcare Hospital approved this study (authorization no. SFYLS [2020] 032) and granted an amended approval in 2020.

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5,6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6,7,8,9
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5,6
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6,7,8
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8,9
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8,9
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	8,9,10,11
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	
		(*b*) Report category boundaries when continuous variables were categorized	6,7,8
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	12,13,14,15
Discussion			
Key results	18	Summarise key results with reference to study objectives	15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	17
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16,17
Generalisability	21	Discuss the generalisability (external validity) of the study results	17
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	19

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Association between intimate partner violence and prenatal anxiety and depression in pregnant women: A cross-sectional survey during the COVID-19 epidemic in Shenzhen, China

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Association between intimate partner violence and prenatal anxiety and depression in pregnant women: A cross-sectional survey during the COVID-19 epidemic in Shenzhen, China

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Abstract

Objectives: Intimate partner violence (IPV) against women remains a major global public health problem with harmful consequences for individuals and society. People's lifestyles have been greatly affected by the coronavirus disease 2019 (COVID-19) pandemic. This study investigated the prevalence of and relationship between IPV and anxiety and depression in pregnant Chinese women during the pandemic.

Design: Cross-sectional study.

Setting: This investigation was conducted in Shenzhen City, Guangdong Province, China from September 15 to December 15, 2020.

Participants: A total of 3434 pregnant women were screened with the Abuse Assessment Screen Questionnaire to evaluate IPV and General Anxiety Disorder and Patient Health Questionnaire to evaluate symptoms of anxiety and depression, respectively. Pregnant women with perinatal health records at Shenzhen District Maternity and Child Healthcare Hospitals who consented to participate were enrolled. Women with psychotic disorders such as schizophrenia, mania, or substance dependence and pregnant women who refused to participate were excluded. Data were analysed with the chi-squared test and by logistic regression analysis.

Results: The prevalence of IPV among pregnant women was 2.2%. Mental violence was the most common type of violence (2.2%), followed by physical (0.6%) and sexual (0.7%) violence. The prevalence of anxiety and depression symptoms was 9.8% and 6.9%, respectively. After adjusting for covariates, there was a statistically significant association between IPV and prenatal anxiety (odds ratio OR=4.136, 95% confidence interval CI: 2.436,

7.022) and depression (OR=4.136, 95% CI: 2.436, 7.022).

Conclusions: IPV increased the risk of prenatal anxiety and depression in pregnant women in China during the COVID-19 pandemic. Efforts should be made by the government and civil society to promote long-lasting antenatal interventions to ensure the safety and protect the mental health of pregnant women.

Strengths and limitations of this study

1. This is the first investigation of the relationship between IPV and prenatal anxiety and depression in pregnant women during the COVID-19 pandemic in China.
2. Causality between these two outcomes was not established.
3. IPV was likely under-reported by the study participants.
4. Some results should be interpreted with caution because of the small sample size.

1. Introduction

Intimate partner violence (IPV) against women including physical, mental, and sexual abuse is an important clinical and public health issue[1,2]. In 2016, the World Health Organization highlighted various forms of interpersonal violence, particularly those occurring in the home and inflicted by intimate partners and other family members and remaining hidden, stigmatized, and largely unrecognized by health and other service providers[3]. A previous study showed that pregnant women were vulnerable to the initiation or exacerbation of IPV[4] and were 2.7 to 3.9 times more likely to be victims of physical violence and twice as likely to be subjected to sexual violence compared with non-pregnant women[5]. In China, IPV prevalence in pregnant women has been reported as 18.32% in Wuhan[6] and 11.3% in Changsha[7]. Prenatal depression and anxiety are common sequelae of IPV[8,9].

The coronavirus disease 2019 (COVID-19) outbreak began in December 2019 in Wuhan City, Hubei Province, China[10] and suddenly and radically altered the population's habits and lifestyles, with a drastic reduction in any form of socialization. Physical distancing and self-isolation strongly impacted people's lives[11], including those of pregnant women and their partners. Protecting the physical and mental wellbeing of pregnant women is important for a healthy society. However, only one study to date[12] has examined the prevalence of IPV among pregnant women since the start of the COVID-19 pandemic, and there have been no studies investigating the association between IPV and prenatal anxiety and depression in this group.

Shenzhen is one of the most economically developed and populous cities in mainland China whose activities have been severely impacted by the restrictions imposed in response

to the pandemic. The present study aimed to establish the prevalence of IPV among pregnant women in Shenzhen during the COVID-19 pandemic and the association between IPV and prenatal anxiety and depression.

2. Methods

2.1 Research design and study population

This cross-sectional survey was conducted from September 15 to December 15, 2020 and enrolled women at all stages of pregnancy in Shenzhen City, Guangdong Province, China. Shenzhen is an economic centre and the fourth largest city in mainland China in terms of economic aggregate; there are fewer migrant workers than other large cities and most of its population is urban. The study participants were recruited from 10 representative administrative areas of Shenzhen that can provide reference values for areas in other countries with similar characteristics. Pregnant women were recruited from maternity and child healthcare hospitals in each of the 10 administrative areas using a multi-stage random sampling method[13]. Briefly, women at all stages of pregnancy who came to the hospital for regular check-ups between September 15 and December 15, 2020 were enrolled. A full description of the objectives, contents, procedures, associated benefits, and risks of the present study was provided at the beginning of the electronic questionnaire completed by participants when they registered for the check-up. Investigators including trained doctors, nurses, and medical students provided guidance for filling out the questionnaire. Pregnant women with perinatal health records at Shenzhen District Maternity and Child Healthcare Hospitals who consented to participate were enrolled. Women with psychotic disorders such

as schizophrenia, mania, or substance dependence and pregnant women who could not complete the questionnaire within the allotted time were excluded. The sample size calculation formula for cross-sectional studies was used to determine the minimum theoretical sample size for this study. The admissible error was 0.15, α=0.05, and based on previous studies, the expected prevalence was 5%[14]; 3416 people were therefore required to represent the population of Shenzhen. A total of 3437 women who met the inclusion criteria were enrolled; those who completed the questionnaire in less than 100 s were excluded, leaving 3434 women in the study from all 10 administrative areas of Shenzhen. Thus, the response rate was 99.9% (3434/3437). There were about 160,000 live births in the Maternal and Child Health Hospital system of Shenzhen in 2020, which represents our sample size of about 2% of the total number of newborns in Shenzhen. The study was approved by the Institutional Review Board of Shenzhen Maternity and Child Healthcare Hospitals and was conducted in Shenzhen.

2.2 Measurements

2.2.1 General characteristics of the study population

General information obtained on each participant included age, education level, partner's education level, work status after pregnancy, partner's work status, marital status, living situation, psychological counselling before pregnancy, vaginal bleeding and pregnancy complications, pregnancy intention, intimacy between partners since COVID-19, and household income since COVID-19.

2.2.2 Family care

The Family Adaptation Partnership Growth and Resolved (APGAR) index was used for family care assessment[15]. The APGAR has five items, each answered on a 3-point Likert scale from "Often" (2 points) to "Rarely" (0 points). The total score was 0–10 points. A high APGAR score (7–10 points) indicated good family functioning; a mid-range score (4–6 points) indicated moderate family dysfunction; and a low score (0–3) indicated severe family dysfunction.

2.2.3 Lifestyle characteristics

Lifestyle characteristics including smoking and drinking by a pregnant woman and her partner, exercise, and sitting time per day were recorded. Smoking was defined as an average of one cigarette a day in recent years. Drinking was defined as consuming alcohol once a week on average. Exercise was defined as having engaged in walking, yoga, or other physical activities more than three times during the past week. The above definitions were in accordance with previous research[16]. Sitting time per day was categorized as ≤1, 1 to <3, 3 to <5, 5 to <10, and ≥10 h.

2.2.4 Assessment of IPV

The Abuse Assessment Screen Questionnaire was used to assess IPV during pregnancy. This scale is widely used as a tool to screen IPV in pregnant women and has good validity and reliability[17]. The scale assesses three aspects of domestic violence—i.e., mental, physical, and sexual—and has eight items. The response to each item was "Yes" or "No." If the respondent

answered "Yes" to one or more of questions 5 to 7, she was identified as a victim of domestic violence during pregnancy[18].

2.2.5 Assessment tool for prenatal anxiety

The 7-Item Generalized Anxiety Disorder scale (GAD-7)[19] is used as a screening tool for GAD in primary care patients and is easily understood and can be completed quickly. The scale has seven items, each scored on a 4-point scale ranging from 0 to 3 for a total score between 0 and 21, with a higher score indicating more severe anxiety symptoms. A GAD-7 score ≥7 was the cut-off for prenatal anxiety.

2.2.6 Assessment tool for prenatal depression

Prenatal depression was assessed with the 9-Item Patient Health Questionnaire (PHQ-9), which consists of nine questions pertaining to depression symptoms over the prior 2 weeks, each with four possible responses: "Not at all," "Several days," "More than half of the days," and "Nearly every day," corresponding to 0, 1, 2, and 3 points, respectively. The total score ranges from 0 to 27[20]. Participants with a score ≥10 were considered to have prenatal depression.

2.3 Statistical analysis

Data were kept anonymous and non-identifiable and were analysed using SPSS v25.0 (SPSS Inc, Chicago, IL, USA). Some continuous variables such as age and family care (APGAR), prenatal anxiety (GAD-7), and prenatal depression (PHQ-9) scores were treated as

categorical variables. The chi-squared test, calibration chi-squared test, or Fisher's exact test was used to compare baseline characteristics between women who had experienced IPV (IPV group) and those who had not (No-IPV group). Multivariate logistic regression with the enter method was used to estimate odds ratio (OR) and 95% confidence interval (CI) of associations between IPV and prenatal anxiety and depression. A two-tailed test with $P<0.05$ was considered statistically significant.

2.4 Patient and public involvement

Neither the patients nor the public was involved in the design, conduct, reporting, or dissemination of this work. However, women in the recruitment populations have expressed a high degree of interest in the issue of mental health.

3. Results

Of 3437 pregnant women without psychotic disorders who completed the electronic questionnaire, three were excluded because their completion time was <100 s. Thus, 3434 participants were ultimately included in the analysis. The mean age of the participants was 28.97±4.57 years (Table 1). There were significant differences in age, professional psychological counselling, family care, pregnancy complications, partner intimacy since COVID-19, household income since COVID-19, smoking habits, drinking habits of the participant and her partner, exercise, and sitting time per day between the IPV and No-IPV groups, whereas no intergroup differences were observed in the participant and her partner's education level, work status, and other characteristics. A total of 77 participants (2.2%)

experienced at least one form of IPV during pregnancy; mental violence was the most common (n=57, 1.7%), followed by physical (n=19, 0.6%) and sexual (n=7, 0.7%) violence.

Table 1. General characteristics of the study participants

Variable	No-IPV	IPV	χ^2	*P**
Age (years)			17.528	**0.002**
≤19	28 (0.8)	4 (5.2)		
20–24	507 (15.1)	13 (16.9)		
25–29	1341 (39.9)	30 (39.0)		
30–34	1096 (32.6)	19 (24.7)		
≥35	385 (11.5)	11 (14.3)		
Education level			4.895[a]	0.418
Master's degree or higher	140 (4.2)	7 (9.1)		
Undergraduate	919 (27.4)	18 (23.4)		
College degree	912 (27.2)	21 (27.3)		
High school degree	699 (20.8)	14 (18.2)		
Junior high school diploma	670 (20.0)	17 (22.1)		
Primary school or lower	17 (0.5)	0 (0.0)		
Partner's education level			6.761[a]	0.215
Master's degree or higher	202 (6.0)	6 (7.8)		
Undergraduate	998 (29.7)	22 (28.6)		
College degree	844 (25.1)	18 (23.4)		
High school degree	698 (20.8)	13 (16.9)		
Junior high school diploma	600 (17.9)	16 (20.8)		
Primary school or lower	15 (0.4)	2 (2.6)		
Work status after pregnancy			0.007	0.933
Employed	2065 (61.5)	47 (61.0)		
Unemployed	1292 (38.5)	30 (39.0)		
Partner's working status			0.024[b]	0.876
Employed	3217 (95.8)	73 (94.8)		
Unemployed	140 (4.2)	4 (5.2)		
Marital status			0.440	0.507
Married	3118 (92.9)	70 (90.9)		
Unmarried/divorced/widowed	239 (7.1)	7 (9.1)		
Living situation			3.337	0.189
Couple alone	2263 (67.4)	54 (70.1)		
Living with in-laws	844 (25.1)	14 (18.2)		
Living with parents	250 (7.4)	9 (11.7)		
Professional psychological counselling			17.816	**<0.001**
Not received	3125 (93.1)	62 (80.5)		

Received	232 (6.9)	15 (19.5)		
Family care			45.788	**<0.001**
Good functioning	1992 (59.3)	18 (23.4)		
Moderately dysfunction	872 (26.0)	31 (40.3)		
Severe dysfunction	493 (14.7)	28 (36.4)		
Gestational age			0.944	0.624
First trimester	1122 (33.4)	22 (28.6)		
Second trimester	1122 (33.4)	29 (37.7)		
Third trimester	1113 (33.2)	26 (33.8)		
Vaginal bleeding			2.623	0.105
No	2537 (75.6)	52 (67.5)		
Yes	820 (24.4)	25 (32.5)		
Pregnancy complications			6.730	**0.009**
No	2601 (77.5)	50 (64.9)		
Yes	756 (22.5)	27 (35.1)		
Pregnancy intention			3.641[a]	0.144
Planned conception	1796 (53.5)	33 (42.9)		
Unplanned pregnancy	1452 (43.3)	41 (53.2)		
Artificial insemination	109 (3.2)	3 (3.9)		
Intimacy with partner since COVID-19			64.846	**<0.001**
Essentially unchanged	2554 (76.1)	47 (61.0)		
Strained	65 (1.9)	12 (15.6)		
More intimate	738 (22.0)	18 (23.4)		
Household income since COVID-19			12.921[a]	**0.004**
Essentially unchanged	1805 (53.8)	30 (39.0)		
Increased	60 (1.8)	5 (6.5)		
Decreased by 20%–50%	1165 (34.7)	30 (39.0)		
Decrease by ≥50%	327 (9.7)	12 (15.6)		
Smoking			19.565[b]	**<0.001**
No	3302 (98.4)	70 (90.9)		
Yes	55 (1.6)	7 (9.1)		
Partner's smoking habits			1.217	0.270
No	2082 (62.0)	43 (55.8)		
Yes	1275 (38.0)	34 (44.2)		
Drinking			8.892[b]	**0.003**
No	3195 (95.2)	67 (87.0)		
Yes	162 (4.8)	10 (13.0)		
Partner's drinking habits			7.672	**0.006**
No	2441 (72.7)	45 (58.4)		
Yes	916 (27.3)	32 (41.6)		
Exercise			4.327	**0.038**
No	2412 (71.8)	47 (61.0)		
Yes	945 (28.2)	30 (39.0)		
Sitting time per day, h			14.533	**0.006**

≤1	454 (13.5)	19 (24.7)
1–3	1069 (31.8)	21 (27.3)
3–5	829 (24.7)	11 (14.3)
5–10	831 (24.8)	18 (23.4)
≥10	174 (5.2)	8 (10.4)

Data are presented as n (%).
[a]Fisher's exact test.
[b]Calibration chi-squared test.
*Values in bold face are statistically significant at $P<0.05$.

There were differences in the prevalence of anxiety and depression between IPV and No-IPV groups (Tables 2 and 3). According to GAD-7 scale score, the incidence of mild anxiety symptoms was 15.2% (523/3434), while moderate and severe anxiety symptoms were observed in 2.5% (85/3434) and 1.0% (35/3434) of participants, respectively. Using a cut-off value of 7, the incidence of anxiety symptoms was 9.8% (337/3434). According to PHQ-9 scale score, 22.0% of participants (757/3434) had mild depressive symptoms, 6.1% (210/3434) had moderate depressive symptoms, and 0.8% (28/3434) had severe depressive symptoms. Using a cut-off value of 10, the incidence of depressive symptoms was 6.9% (238/3434). Participants who experienced mental, physical, and sexual violence had higher rates of prenatal anxiety and depression than those who did not report IPV.

Table 2. Prevalence of anxiety among study participants

IPV or IPV subtype	No prenatal anxiety	Prenatal anxiety	χ^2	*P**
Overall IPV			97.172	**<0.001**
No	3053 (98.6)	304 (90.2)		
Yes	44 (1.4)	33 (9.8)		
Mental violence			83.936	**<0.001**
No	3066 (99.0)	311 (92.3)		
Yes	31 (1.0)	26 (7.7)		
Physical violence			44.591[a]	**<0.001**
No	3089 (99.7)	326 (96.7)		

Yes	8 (0.3)	11 (3.3)		
Sexual violence			13.594[a]	**<0.001**
No	3082 (99.5)	329 (97.6)		
Yes	15 (0.5)	8 (2.4)		
Total	3097 (90.2)	337 (9.8)		

Data are presented as n (%).
[a]Calibration chi-squared test.
*Values in bold face are statistically significant at $P<0.05$.
IPV, intimate partner violence.

Table 3. Prevalence of depression among study participants

IPV or IPV subtype	No prenatal depression	Prenatal depression	χ^2	*P**
Overall IPV			64.257	**<0.001**
No	3142 (98.3)	215 (90.3)		
Yes	54 (1.7)	23 (9.7)		
Mental violence			36.892[a]	**<0.001**
No	3155 (98.7)	222 (93.3)		
Yes	41 (1.3)	16 (6.7)		
Physical violence			31.369[a]	**<0.001**
No	3185 (99.7)	230 (96.6)		
Yes	11 (0.3)	8 (3.4)		
Sexual violence			23.669[a]	**<0.001**
No	3181 (99.5)	230 (96.6)		
Yes	15 (0.5)	8 (3.4)		
Total	3196 (93.1)	238 (6.9)		

Data are presented as n (%).
[a]Calibration chi-squared test.
*Values in bold face are statistically significant at $P<0.05$.
IPV, intimate partner violence.

After adjusting for potential confounding factors, IPV was significantly associated with prenatal anxiety in the multivariate logistic regression analysis (Table 4). Participants who had experienced IPV were 4.207 times more likely to have experienced prenatal anxiety (OR=4.207, 95% CI: 2.469, 7.166). Mental violence (OR=4.394, 95% CI: 2.444, 8.179) and physical violence (OR=8.869, 95% CI: 3.224, 26.102) were significantly associated with

prenatal anxiety; however, there was no association between sexual violence and anxiety.

Table 4. Association between intimate partner violence and prenatal anxiety

Variable	OR (95% CI)	*P*
IPV[a]	4.207 (2.469, 7.166)	**<0.001**
Mental violence[b]	4.471 (2.444, 8.179)	**<0.001**
Physical violence[b]	9.174 (3.224, 26.102)	**<0.001**
Sexual violence[b]	2.018 (0.733, 5.556)	0.174

[a]Adjusted for age, participant and her partner's education level, participant and her partner's work status, marital status, living situation, professional psychological counselling, family care, gestational age, vaginal bleeding, pregnancy complications, pregnancy intention, intimacy with partner since COVID-19, household income since COVID-19, participant and her partner's smoking habits, participant and her partner's drinking habits, exercise, sitting time per day, and IPV subtype.
[b]Adjusted for age, participant and her partner's education level, participant and her partner's work status, marital status, living situation, professional psychological counselling, family care, gestational age, vaginal bleeding, pregnancy complications, pregnancy intention, intimacy with partner since COVID-19, household income since COVID-19, participant and her partner's smoking habits, participant and her partner's drinking habits, exercise, sitting time per day, and IPV subtype.
*Values in bold face are statistically significant at $P<0.05$.
CI, confidence interval; IPV, intimate partner violence; OR, odds ratio.

In the logistic regression analysis, participants who reported IPV were more likely to develop prenatal depression after adjusting for confounding factors (OR=3.864, 95% CI: 2.095, 7.125). Mental violence (OR=3.259, 95% CI: 1.590, 6.678), physical violence (OR=10.176, 95% CI: 3.495, 29.627), and sexual violence (OR=4.121, 95% CI: 1.457, 11.659) were all associated with an increased risk of prenatal depression (Table 5).

Table 5. Association between intimate partner violence and prenatal depression

Variable	OR (95% CI)	P
IPV[a]	3.864 (2.095, 7.125)	**<0.001**
Mental violence[b]	3.259 (1.590, 6.678)	**0.001**

Physical violence[b]	10.176 (3.495, 29.627)	**<0.001**
Sexual violence[b]	4.121 (1.457, 11.659)	**0.008**

[a]Adjusted for age, participant and her partner's education level, participant and her partner's work status, marital status, living situation, professional psychological counselling, family care, gestational age, vaginal bleeding, pregnancy complications, pregnancy intention, intimacy with partner since COVID-19, household income since COVID-19, participant and her partner's smoking habits, participant and her partner's drinking habits, exercise, sitting time per day, and IPV subtype.

[b]Adjusted for age, participant and her partner's education level, participant and her partner's work status, marital status, living situation, professional psychological counselling, family care, gestational age, vaginal bleeding, pregnancy complications, pregnancy intention, intimacy with partner since COVID-19, household income since COVID-19, participant and her partner's smoking habits, participant and her partner's drinking habits, exercise, sitting time per day, and IPV subtype.

*Values in bold face are statistically significant at $P<0.05$.

CI, confidence interval; IPV, intimate partner violence; OR, odds ratio.

4. Discussion

The prevalence of IPV during the COVID-19 pandemic among pregnant women in Shenzhen, China, was 2.2%. This is comparable to the rate reported in a cross-sectional study conducted in London, UK (3%)[21] but much lower than that reported in Pakistan (35%)[22]. The disparities in prevalence are likely attributable to cultural, economic, and regional differences. The COVID-19 pandemic has radically changed the lives of individuals. In particular, COVID-19 quarantine made the home a very dangerous place for victims of domestic violence as they were forced to spend more time with their abusive partners and away from people who could validate their experiences and offer help. IPV was also exacerbated by the economic crisis linked to COVID-19 with some pregnant women unable to leave their partners for economic reasons[23], which likely influenced the reported prevalence of IPV. However, there has not been consistent screening for IPV because of limited time and resources, a reluctance to potentially offend pregnant women, insufficient training and reimbursement, and perceived

lack of institutional support. It is therefore essential that healthcare professionals address safety and violence faced by their pregnant patients at home. Telehealth provides an opportunity for IPV screening and the provision of resources as well as contraceptive and mental health counselling[24].

Mental violence (1.7%) was the most common form of IPV among the study participants, which is consistent with findings from other studies conducted in China[7], Thailand[25], and Ethiopia[26]. We observed similar rates of physical (0.6%) and sexual (0.7%) violence, although these were lower than that reported in Ethiopia during the COVID-19 pandemic[12]. The difference may be explained by the Chinese cultural norm of avoiding discussions of unpleasant personal circumstances in order to "save face"[16], with the result that violence during pregnancy is frequently underreported[27]. It is worth noting that our results may have been biased by the fact that outcomes were assessed by self-report[28]. Although we informed the subjects that the survey was for scientific research purposes only and that they were filling out the electronic questionnaire anonymously, it is possible that the subjects concealed or avoided fully reporting their experiences of violence. On the other hand, the survey results were based on participants' recall of past events; participants may have forgotten about or ignored their experiences of IPV, especially psychological violence such as belittling and ridiculing, which may have decreased the reported rate of IPV.

We observed a significant and positive association between IPV and prenatal anxiety and depression during the COVID-19 pandemic. This is consistent with other reports[6 7 9 29] in which IPV was identified as a chronic stressful condition that increased the risk of depression and anxiety during pregnancy. We also found that IPV subtypes had different effects on

prenatal anxiety and depression; for instance, mental violence was associated with an increased risk of both conditions. A higher rate of psychological (emotional and verbal) abuse was shown to be more closely associated with mental health outcomes than physical violence[30], possibly because psychological violence directly attacks a person's self-perception and can cause post-traumatic stress disorder and anxiety through mechanisms such as guilt, self-hatred, and regret[31]. The adverse consequences of physical violence such as fractures, lacerations, and head trauma are amplified during pregnancy and increased the risk of prenatal anxiety and depression in our cohort. Sexual violence did not appear to be associated with prenatal anxiety in our research, which contradicts earlier findings[32]; this may be due to participants' reluctance to report this form of IPV according to the norms of Chinese culture. It is also possible that the positive rate was too low to show an association between sexual violence and prenatal anxiety. This warrants closer investigation in future studies with a larger sample size.

Strengths and limitations

This study is the first investigation of the relationship between IPV and prenatal anxiety and depression in pregnant women during the COVID-19 pandemic in China. The participants were representative of the entire population of Shenzhen. However, there were several limitations to our study. Firstly, we were unable to establish causality between the two outcomes because of the cross-sectional study design. Secondly, symptoms of depression and anxiety were evaluated only once and therefore, it was not possible to detect any trends over the course of pregnancy. Thirdly, non-pregnant women should have been included as controls

to obtain a more comprehensive view of the effects of IPV on pregnant women. Finally, we found a low prevalence of IPV, which may lead to false negative results when analysing correlations. Future investigations should expand the sample size to confirm the results of this study. These issues can be addressed in future studies with a prospective, longitudinal, meditational, and mixed method designs that also examine the mental health consequences of IPV for pregnant women.

Conclusion

Violence against women is a key priority for achieving gender equality around the world. The prevalence of IPV in pregnant women in China cannot be underestimated. Our results suggest that IPV among pregnant women during the COVID-19 pandemic was associated with prenatal anxiety and depression. Prenatal care can identify pregnant women who experience IPV so that they can be connected with services that offer protection. Eliminating violence against pregnant women requires practical and long-term interventions by the government and civil society starting from education within the family.

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Data Availability Statement

The datasets generated and analysed during the current study are not publicly available due to

privacy restrictions but are available from the corresponding author on reasonable request.

Contributors

All authors made substantial contributions to this study. FW, WL, PL, and MZ were responsible for study conception and initiation, design, and supervised implementation. FW, CC, QL, WH, and CZ acquired the data. FW, WL, LZ, YW, and QC interpreted the data and performed statistical analyses. FW drafted the manuscript. All authors contributed to the critical revision of the manuscript and gave final approval for its publication.

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Competing interests

None declared.

Ethics approval

The Institutional Review Board of Shenzhen Maternity and Child Healthcare Hospital approved this study (authorization no. SFYLS [2020] 032) and granted an amended approval in 2020.

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5,6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6,7,8,9
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5,6
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6,7,8
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8,9
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8,9
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	8,9,10,11
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	
		(*b*) Report category boundaries when continuous variables were categorized	6,7,8
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	12,13,14,15
Discussion			
Key results	18	Summarise key results with reference to study objectives	15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	17
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16,17
Generalisability	21	Discuss the generalisability (external validity) of the study results	17
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	19

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.