



Original Research

Trends in the prevalence of antenatal depression and social support among pregnant women in China, 2016–2021: A repeated cross-sectional study

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ABSTRACT

Objectives: To evaluate temporal trends and associations between social support and antenatal depression among women in late pregnancy.**Study design:** A repeated cross-sectional design was used. A total of 3404 pregnant women at their 30–42 weeks of pregnancy were recruited from the two largest maternity hospitals in Zhejiang Province, China between 2016 and 2021.**Methods:** The primary outcome was the prevalence of antenatal depression, and it was measured by the Chinese version of the Edinburgh Postnatal Depression Scale. We also assessed the level of social support, including support from family members, support from friends, and support from significant others of social support.**Results:** From 2016 to 2021, the prevalence of antenatal depression among women in late pregnancy had increased significantly from 31.82 % to 60.59 % ($p < 0.001$ for trend). In the meantime, level of social support had decreased significantly ($p < 0.001$ for trend). Logistic regression results suggested that those with higher levels of social support tended to report lower rates of antenatal depression.**Conclusions:** There was an increasing trend of antenatal depression among pregnant women in China between 2016 and 2021, along with a decreasing trend of social support.

1. Introduction

Antenatal depression is prevalent among pregnant women. Studies suggest that its prevalence is about 20.7 % among pregnant women, and this figure tends to be higher among those from low- and middle-income countries (i.e., 15 %–50 %).^{1,2} In China, a cross-sectional study showed that the prevalence of antenatal depression was 28.5 % among 292 women in their third trimester of pregnancy in 2013.³ However, this study was conducted about a decade ago. Since new childbirth policies have been introduced over the past few years, the situation may have changed. Antenatal depression can lead to negative consequences, such as an increased risk of preterm birth, low birth weight, and intrauterine growth restriction. It is also recognized as the strongest predictor of

postnatal depression and might even lead to serious outcomes such as suicide.^{4–6}

Social support is defined as the financial, instrumental, emotional and psychological support that individuals receive from their family, friends, and community members.⁷ According to the literature, it is an important protective factor against depression, as it could buffer the negative effects of stress on mental and physical health, and help people adapt and cope with stressful events.^{8,9} Studies also suggest that social support may be helpful for depression, anxiety and self-harm during pregnancy.^{10,11} For example, one study among Turkish pregnant women showed that the emotional and instrumental support was negatively associated with antenatal depression.¹² In Italy, women with high levels of social support were less likely to experience antenatal depression and

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more likely to cope positively with stressful life events.¹³ Similarly, a community-based survey of 755 Chinese pregnant women also found that social support had direct and moderating effects on their perceived stress and their antenatal depressive symptoms.¹⁴

The family planning policy of China has undergone major changes in recent decades. For example, the one-child policy which lasted for 36 years was replaced by a universal two-child policy in October 2015.¹⁵ From June 2018 onwards, certain families (e.g., one-child couples, remarried couples, etc.) were allowed to have up to three children. In May 2021, the Chinese government extended the three-child policy to all families.¹⁶ With all these policy changes, it is worth assessing how they might affect pregnant women especially on areas such as antenatal depression. However, since pregnant women are a special group, it is challenging to follow the prevalence of antenatal depression using a traditional cohort design, as it is difficult to predict whether women will become pregnant again after giving birth.^{17,18} Instead, a repeated cross-sectional study design may be more appropriate, as it allows data to be collected from different subjects of the same target population at regular intervals.¹⁹ In addition, existing studies assessing the relationship between antenatal depression and social support have mostly used a cross-sectional design which can only show their relationship at specific time points.^{7,9,13} This design enables their relationship to be examined over a longer period of time and may provide more robust evidence.

The current study aims to 1) examine the secular trends of antenatal depression and social support among Chinese pregnant women from 2016 to 2021, and 2) explore the relationship between antenatal depression and social support during this period.

2. Methods

2.1. Study design

A repeated cross-sectional design was used to assess the prevalence of antenatal depression among pregnant women in their third trimester between 2016 and 2021. This study was conducted at the two largest maternity hospitals (the Women's Hospital School of Medicine Zhejiang University and Hangzhou Women's Hospital) in Zhejiang Province, China. The inclusion criteria were: 1) 18 years old and above, 2) women in their 30–42 weeks of pregnancy, and 3) having prenatal check-ups at the hospital. Those with cognitive disabilities or without a smartphone to scan the QR code (albeit very minimum) were excluded from the current study.

The triage nurses at the outpatient clinics of the two hospitals initially established contact with potential participants and subsequently screened out those with cognitive disabilities and those who were unwilling to join the study. Eligible participants were referred to us and were then required to fill in one questionnaire while they were waiting for their prenatal check-ups. The questionnaire was created on an e-platform called Wen Juan Xing (i.e., a professional survey e-platform in China). Participants could access the survey through scanning the QR code with their mobile phones. In certain scenarios (e.g., poor connection), some participants may have started the questionnaire twice. For such participants, only the first completion was kept in the final analysis.

2.2. Measurements

Antenatal depression was measured by the Chinese version Edinburgh Postnatal Depression Scale (C-EPDS). It consists of 10 items, covering domains such as anhedonia, self-blame, anxiety, fear or panic, thoughts of self-harm.²⁰ Each item was rated on a 4-point Likert scale ranging from 0 (not at all) to 3 (always). As such, the total score ranged from 0 to 30.²¹ With reference to the Diagnostic and Statistical Manual of Mental DSM-5 diagnosis of major depression, a cut-off score of 9–12 is considered as mild and moderate depression, and a score of 13 and above is categorized as severe depression in the current study.^{21,22} This

scale has been used in China before and showed good reliability in measuring prenatal and postnatal depression (i.e., Cronbach's alpha was 0.714–0.760, test-retest reliability was 0.803–0.814, and content validity ratio was 0.933).^{23–25} In the current study, the internal reliability of the C-EPDS was 0.883.

Social support was measured by the Chinese version of the Perceived Social Support Scale (PSSS). This scale was developed by Zimet and adapted by Jiang QJ.^{26,27} It has 12 items and measures three domains of social support, namely support from family members (SFM, 4 items), support from friends (SF, 4 items), and support from significant others (SSO, 4 items). Each item is scored on a 7-point Likert scale (1 = very strongly disagree to 7 = very strongly agree). The total score ranges from 12 to 84, with the cut-off points - 12–36 score (low level), 37–60 (medium level), and 61–84 (high level). This scale has been used among Chinese populations before and has shown good internal reliability (i.e., Cronbach's alpha was 0.880, and test-retest reliability was 0.850.²⁸ In the current study, its internal reliability was 0.940.

2.3. Statistical analysis

Data entry was done manually through EpiData 3.1 (The Epidata Association, Odense, Denmark). Single-entry method was used and approximately 15 % of the entries were randomly selected and cross-checked by another member of the study team to ensure data entry quality. Data were then analyzed using SPSS 23.0 (SPSS Inc., Chicago, IL, USA). Descriptive analyses were performed for the socio-demographic variables. Both frequency (percentage) and mean (standard deviation (SD)) of antenatal depression and social support were calculated and presented. The significance of linear trends was examined by including the antenatal depression 1-year cycle in the linear regression models (similar for social support). Changes in antenatal depression and social support was calculated as the absolute difference from the earliest year 2016 to the latest year 2021. Binary logistic regression was conducted to explore the relationship between social support and antenatal depression. The full model used the outcome of antenatal depression (total score <9 = no, total score ≥9 = yes) as the dependent variable, and SFM, SF, SSO, age, district, education level, occupation, personal monthly income, planned pregnancy, previous unsuccessful experience (e.g., abortion) as the independent variables.²¹ Interactions between each type of support and year were also explored. The significance level for all regressions was set at $P < 0.05$.

3. Results

3.1. Population characteristics

A total of 3404 women in late pregnancy aged 18–43 years were included in this analysis, and their socio-demographic characteristics are presented in Table 1. The socio-demographic characteristics of the pregnant women had changed significantly from 2016 to 2021. For example, the proportion of pregnant women from rural areas had increased from 39.7 % to 54.1 %, those with a low level of education had increased from 33.4 % to 57.1 %, the proportion of housewife had increased from 6.6 % to 14.7 %, the proportion of pregnant women with a monthly income below 4,500RMB (≈USD 632) had increased from 44.4 % to 50.6 %, the proportion of un-planned pregnancy had increased from 20.3 % to 48.8 %, and those with previous unsuccessful experience (e.g., abortion) had increased from 30.9 % to 44.1 %.

3.2. Trends in the prevalence of antenatal depression and social support

From 2016 to 2021 (see Table 2), the average score of antenatal depression had significantly increased from 7.39 ± 3.80 to 10.84 ± 6.05 ($p < 0.001$). The average score of social support also decreased significantly from 66.54 ± 10.51 to 53.89 ± 13.36 ($p < 0.001$). For the social support domains scores, the SFM score had significantly decreased from

Table 1
Sample characteristics ($\bar{X} \pm SD/n(\%)$).

Variate	2016 (n = 572)	2017 (n = 993)	2018 (n = 772)	2019 (n = 526)	2020 (n = 371)	2021 (n = 170)
Average age	28.32 ± 3.04	27.42 ± 3.89	27.49 ± 4.27	27.24 ± 4.15	27.03 ± 4.11	27.22 ± 3.97
District						
Urban	345 (60.3)	442 (44.5)	297 (38.5)	207 (39.4)	142 (38.3)	78 (45.9)
Rural	227 (39.7)	551 (55.5)	475 (61.5)	319 (60.6)	229 (61.7)	92 (54.1)
Education						
High school or below	191 (33.4)	532 (53.6)	481 (62.3)	332 (63.1)	234 (63.1)	97 (57.1)
Undergraduate college or above	381 (66.6)	461 (46.4)	291 (37.7)	194 (36.9)	137 (36.9)	73 (42.9)
Occupation						
Employed	534 (93.4)	864 (87.0)	646 (83.7)	447 (85.0)	314 (84.6)	145 (85.3)
Housewife	38 (6.6)	129 (13.0)	126 (16.3)	79 (15.0)	57 (15.4)	25 (14.7)
Personal monthly income						
≤ 4500 RMB	254 (44.4)	459 (46.2)	375 (48.6)	259 (49.2)	173 (46.6)	86 (50.6)
> 4500 RMB	318 (55.6)	534 (53.8)	397 (51.4)	267 (50.8)	198 (53.4)	84 (49.4)
Planned pregnancy						
Yes	456 (79.7)	563 (56.7)	382 (49.5)	274 (52.1)	198 (53.4)	87 (51.2)
No	116 (20.3)	430 (43.3)	390 (50.5)	252 (47.9)	173 (46.6)	83 (48.8)
Previous unsuccessful experience (e.g., abortion)						
Yes	177 (30.9)	359 (36.2)	334 (43.3)	212 (40.3)	130 (35.0)	75 (44.1)
No	395 (69.1)	634 (63.8)	438 (56.7)	314 (59.7)	241 (65.0)	95 (55.9)

23.61 $\pm$ 4.09 to 19.29 $\pm$ 5.68 ($p < 0.001$ for trend), the SF score had significantly decreased from 22.29 $\pm$ 3.87 to 18.29 $\pm$ 5.22 ($p < 0.001$ for trend), and the SSO score had significantly decreased from 20.64 $\pm$ 4.22 to 16.31 $\pm$ 5.40 ($p < 0.001$ for trend). The mean differences of SFM, SF, and SSO scores between 2021 and 2016 were 4.320, 4.002, and 4.332 respectively, with a similar decreasing trend ($p < 0.001$). Fig. 1 shows that between 2016 and 2021 there is a steady increasing trend of antenatal depression and a decreasing trend of social support.

3.3. Influence of social support on antenatal depression

Table 3 shows the results of the binary logistic regression. In late pregnancy, women with a higher SFM score (OR, 0.886 [95%CI, 0.867–0.905]), higher SF score (OR, 0.941 [0.919–0.964]) and higher SSO score (OR, 0.955 [0.935–0.975]) tended to report less antenatal depression. After adjustment for the sociodemographic variables, higher SFM (OR, 0.874 [0.830–0.921]) and SSO score (OR, 0.921

[0.876–0.969]) were still associated with lower prevalence of antenatal depression. Fig. 2 shows that the trend of the adjusted OR of social support on antenatal depression score, which remained stable around 0.8.

4. Discussion

This six-year repeated cross-sectional survey revealed an overall increasing trend of antenatal depression among pregnant women in China from 2016 to 2021, despite the implementation of the universal two-child policy which seems to reduce the pressure they faced from the traditional culture of gender preference. This finding is consistent with those from existing studies suggesting an overall increase in the prevalence of depression among pregnant women in middle-income countries over the past decade.^{29,30} There are a few potential explanations - firstly, with the rapid urbanization and economic development, the financial burden associated with raising children has increased tremendously, and these pressures would then affect the psychological well-being of pregnant women.^{31,32} Secondly, although the stress of gender preference is much less after the implementation of the new child policy, such preferences would still put pressure on pregnant women, especially those who have already given birth to one or more female babies.³³

Our study also found that social support among pregnant women in China has decreased over the six years evaluation period. A detailed look at the domains suggested that all three domains of social support, including SFM, SF and SO, were decreasing over time. Similar trends have also been reported in research from Portugal, Germany, and China.^{17,34,35} There are two possible reasons for this. Firstly, the huge urbanization movement in China over the past few decades had transformed a large proportion of the traditional extended families into the nuclear family structure, and a smaller family size is usually indicative of less support from family members.^{17,34,36} As family members now lives far away from each other, this may reduce their intention to seek for help from their family member. Secondly, the relationships between stress and social support might be bi-directional as stress might affect the perception of social support among individuals, including pregnant women.^{37,38} However, this is just an assumption, more research is needed to further investigate this area.

The policy changes seemed to also affect the trends of antenatal depression and social support. More specifically, there was a sudden increase in antenatal depression scores six months after the implementation of the two-child policy. This seems different from the popular views on the negative impact of the one-child policy which believed that it can cause stress to families in light of the traditional son preference culture, and that the relaxation of this policy might reduce such pressure.^{15,18} A potential explanation could be that the percentage of multiparous women increased significantly from 22.8 % to 30.8 % after the implementation of the two-child policy.³⁹ Compared to their primiparous counterparts, they need to look after the first child as well as their own health, and they may also receive less support from the family

Table 2
Antenatal depression and social support domain and total scores ((%/ $\bar{X} \pm SD$)).

Variate	2016 (n = 572)	2017 (n = 993)	2018 (n = 772)	2019 (n = 526)	2020 (n = 371)	2021 (n = 170)	P for trend	2016 vs 2021 Mean difference (95% CI) ^a
Antenatal depression rate (EPDS scores ≥ 9)	182 (31.82)	497 (50.05)	406 (52.59)	290 (55.13)	223 (60.11)	103 (60.59)	<0.001	–
Antenatal depression	7.39 $\pm$ 3.80	9.31 $\pm$ 5.08	9.87 $\pm$ 5.50	10.24 $\pm$ 5.57	10.69 $\pm$ 5.58	10.84 $\pm$ 6.05	<0.001	3.447 (2.118–4.776)
Higher social support rate (PSSS scores ≥ 61)	427 (74.65)	533 (53.68)	326 (42.23)	219 (41.63)	158 (42.59)	56 (32.94)	<0.001	–
Social support	66.54 $\pm$ 10.51	60.32 $\pm$ 12.85	57.58 $\pm$ 13.45	57.13 $\pm$ 13.16	56.95 $\pm$ 13.36	53.89 $\pm$ 14.71	<0.001	12.654 (9.361–15.947)
SFM score	23.61 $\pm$ 4.09	21.67 $\pm$ 5.08	20.70 $\pm$ 5.52	20.57 $\pm$ 5.28	20.69 $\pm$ 5.43	19.29 $\pm$ 5.68	<0.001	4.320 (3.002–5.637)
SF score	22.29 $\pm$ 3.87	20.38 $\pm$ 4.70	19.60 $\pm$ 4.90	19.31 $\pm$ 4.74	19.19 $\pm$ 4.99	18.29 $\pm$ 5.22	<0.001	4.002 (2.800–5.204)
SSO score	20.64 $\pm$ 4.22	18.26 $\pm$ 5.04	17.28 $\pm$ 5.21	17.25 $\pm$ 5.24	17.07 $\pm$ 5.38	16.31 $\pm$ 5.40	<0.001	4.332 (3.039–5.625)

^a Measurement data is estimated using the analysis of covariance model, and with Bonferroni confidence interval adjustment.

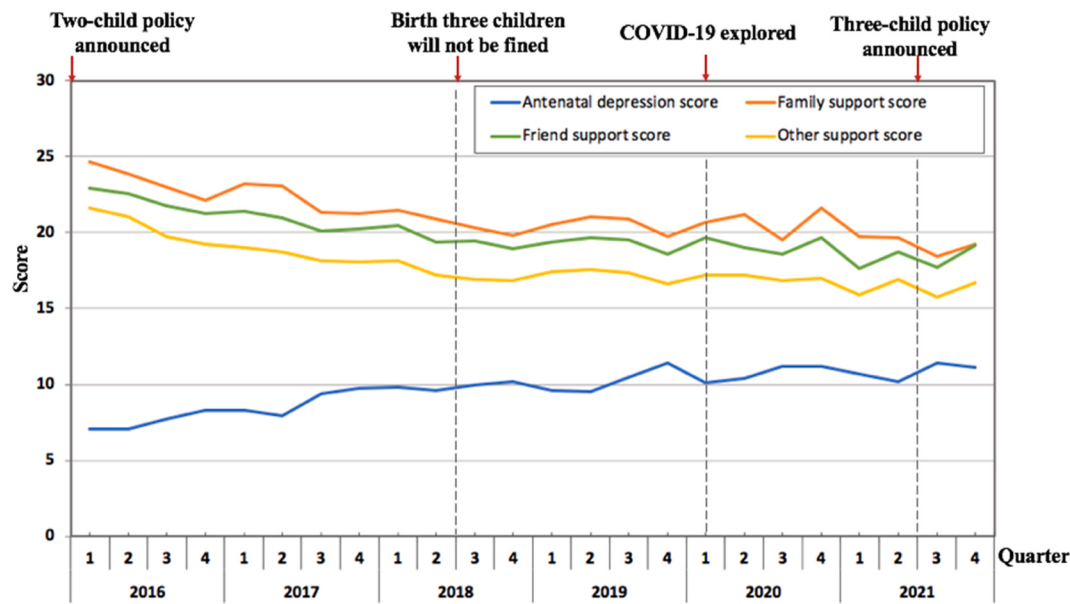


Fig. 1. Trends in antenatal depression scores and three domains of social support among Chinese women in late pregnancy.

Table 3
Binary logistic model for antenatal depression outcomes and social support.

Variate	Model 1: full model			Model 2: adjusted model ^a		
	OR	P	95%CI	OR	P	95%CI
SFM score	0.886	<0.001	0.867,0.905	0.874	<0.001	0.830,0.921
SF score	0.941	<0.001	0.919,0.964	0.963	0.208	0.909,1.021
SSO score	0.955	<0.001	0.935,0.975	0.921	0.001	0.876,0.969
Year				0.892	0.481	0.649,1.226
Year*SFM score				1.005	0.567	0.989,1.020
Year*SF score				0.993	0.424	0.976,1.010
Year*SSO score				1.012	0.107	0.997,1.028

^a Adjust for age, district, education level, occupation, personal monthly income, planned pregnancy, previous unsuccessful experience (e.g., abortion).

as they are now considered as experienced parents.^{40,41} Moreover, due to the popularity of cesarean section, pregnant women who have undergone this procedure may experience anxiety about future pregnancies, especially if they face family pressure about pregnancy after the new two- and three-child policies are announced.^{42,43}

There are also two other obvious changes including the highest antenatal depression score at late 2019 and the sudden increase of both social support and antenatal depression scores at late 2020. The former may be due to the fact that 2019 was the pig year on lunar calendar, and pig usually represents fortune and happiness in traditional Chinese culture, as such some of the pregnant women might face the pressure to get pregnant and give birth in that particular year.^{44,45} For the latter one, it may be due to the outbreak of Covid-19, as it was an additional stressor for pregnant women and in the meantime also led to the family tending to travel less and spend more time together.

The current findings from this study have practical implications. First of all, the prevalence of antenatal depression among pregnant women in late pregnancy has been increasing consistently, indicating the need for more support services for them. Secondly, given the increasing trend of antenatal depression after the implementation of new child-birth policies, policymakers should simultaneously develop supportive services, as this may help to reduce the negative effects of such policy adjustments. Lastly, a stable negative relationship between social support and antenatal depression was observed in our study, which further emphasizes the importance of social support for pregnant women.

There are two major strengths for the current study. Firstly, it is the first study to examine the trend in antenatal depression and its

association with social support using a repeated cross-sectional design. This design also allowed us to see the impact of the new childbirth policies implemented in China, as it covers the main time points of the two-child and three-child policies. Secondly, the study sample is large, which makes the study findings more robust and trustworthy.

The study also has several limitations. Firstly, the study was conducted only among pregnant women who met certain inclusion and exclusion criteria and from only one province in China, which may affect the generalizability of the findings. Secondly, since the data collection started in March 2016, so it is not possible for us to compare the trends of antenatal depression before and after the implementation of the two-child policy. Finally, the repeated cross-sectional study design does not yet allow us to establish the causal relationship between antenatal depression and social support. However, this is the best study design that has been used to date, taking into account the uniqueness of pregnant women.

4.1. Conclusions

Overall, findings of the current study show that the prevalence of antenatal depression among pregnant women in China had increased significantly from 2016 to 2021. In the meantime, social support had also decreased significantly. The implementation of the two-child and three-child policies did not seem to reverse these trends. Antenatal depression was significantly negatively associated with social support at different time points, indicating the importance of social support for pregnant women.

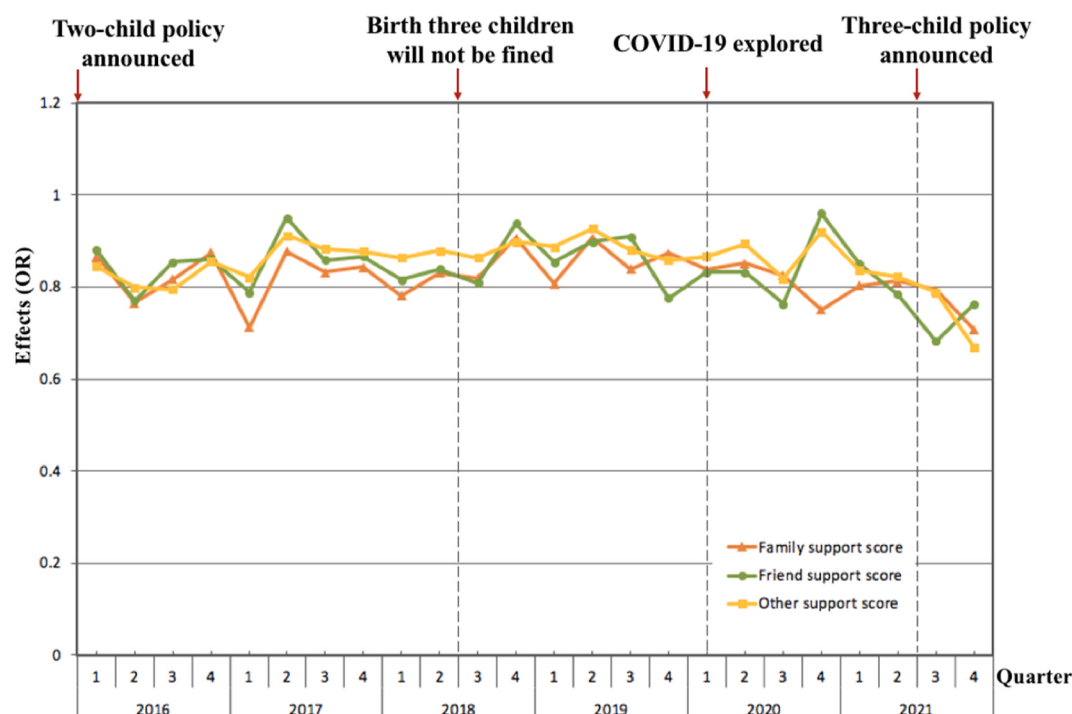


Fig. 2. Odds ratios of social support on antenatal depression among Chinese women in late pregnancy.

† Based on binary logistic regression, adjusted for age, district, education level, occupation, personal monthly income, planned pregnancy, previous unsuccessful experience (e.g., abortion).

Author statements

Ethics approval

This study was approved by the Ethics Board of Hangzhou Normal University (University of Zhejiang, China; Ethics ID 2016014). Written informed consent was obtained from each participant before enrolment. A copy of the signed consent form was given to each participant.

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Competing interests

The authors declare that they have no competing interests.

Author contributions

CZ and CL performed the data analysis and drafted the manuscript. QFH, XLL, YXJ, XL and WJZ. Tan collected the data and made critical revisions. QY revised and edited the manuscript. All authors approved the final version of the manuscript for submission.

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