EXPLORING ANTENATAL DEPRESSION AMONG WOMEN IN NORTHERN VIETNAM: WHICH LIFE EVENTS MATTER?

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Antenatal depression (AD) causes serious consequences to both mothers and their babies. This study aimed to estimate the prevalence and contributing factors, focusing on obstetric history and psychosocial factors of depression among pregnant women in northern Vietnam. A cross-sectional study was conducted at a maternity hospital and a private clinic in Thai Binh province, targeting women between 24 and 28 weeks of gestation from January to August 2023. The Edinburgh Postnatal Depression Scale assessed depressive symptoms, and Firth logistic regression identified associated factors. Out of 859 participants, 22.9% (95%CI: 20.2-25.9) showed signs of depressive symptoms. We did not find a significant association between obstetric historical factors and AD. However, we found various factors associated with high risk of AD among pregnant women, including history of depression (AOR = 61.46, 95%CI: 3.06 – 9133.33), anxiety (AOR = 30.93, 95%CI: 20.12 – 48.69), exposure to second hand smoke (AOR = 1.91, 95%CI: 1.22 – 2.99), and unwanted pregnancy (AOR = 2.21, 95%CI: 1.31 – 3.73). The prevalence of AD was high in our study. The findings highlight the need for greater awareness and early intervention for maternal depression in Northern Vietnam.

Keywords: Ddepression, antenatal depression, associated factor, pregnant women, Vietnam.

I. INTRODUCTION

Maternal mental health disorders during pregnancy are a significant public health concern globally, representing a substantial health burden and impacting both maternal and child well-being. Among these disorders, antenatal depression (AD) is recognized as the most common mental health issue experienced during pregnancy. According to a report of the World Health Organization, around 12% of pregnant women worldwide suffer from depression. The prevalence rates of AD differ within and between countries. In high-income countries, the prevalence of AD ranges from approximately 7% to 20%, while AD appears to be more prevalent in low- and middle-income countries (LMICs).[1]

Research has indicated that AD is associated with adverse pregnancy outcomes such as preterm birth (PTB) and low birth weight (LBW), which are leading causes of infant morbidity and mortality.[2,3] Dadi et al. (2020) illustrated the risk of LBW and PTB was 1.49 times (95%CI: 1.32 - 1.68) and 1.40 times (95%CI: 1.16 - 1.69) higher, respectively, among children of depressed mothers.[4] Furthermore, children of depressed women during prenatal period were more

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likely to report sleep disorders.[5] A prospective cohort study determined that depression in the mid-and late pregnancy stages may increase the likelihood of behavioral issues in offspring such as developing emotional, internalizing, withdrawn, aggressive, and externalizing problems.[6]

Regarding the effect on maternal mental health, Fisher et al explored that pregnant women experiencing AD were more likely to have negative emotion such as anxiety, sadness, irritability, loss of interests, unexplained crying, feelings of helplessness, and changes in appetite. In severe cases, symptoms may include suicidal thoughts, or self-destructive behavior.[7] Depression during pregnancy can also affect mother's willingness to seek medical attention and adhere to recommended medical and psychological interventions. It may lead to engagement in higher-risk behaviors such as substance use and misuse.[8] The continuity of maternal depressive symptoms throughout the perinatal period contributed to the development of depressive symptoms after birth, negatively affecting external breastfeeding duration.[9]

In Vietnam, AD has received less attention compared to postpartum depression. Studies focusing on AD and related factors are very limited. Some published studies conducted in various locations within Vietnam have reported prevalence rates ranging from 4.9% to 28.7%, underscoring the high variability influenced by study location, assessment tools, and participants characteristics.[3,10-12]

Thai Binh, a coastal province located in northern Vietnam, has a predominantly rural population with unique social and cultural characteristics; it differs significantly from other regions with studies on AD, such as Hanoi capital or Ho Chi Minh city. With a predominant population living in rural areas, Thai Binh has a traditional socio-cultural context, with strong influences from family and community that may affect AD awareness, diagnose and treatment. Notably, this province has a long-standing cultural history with several other northern provinces: wet rice production. It is also a part of the Red River Delta. Due to the dearth of AD-related research in this area, there is a substantial data gap that makes it difficult to devise intervention techniques that are both successful and pertinent to the local context. Therefore, this study was conducted to estimate the prevalence and contributing factors of AD among pregnant women in northern Vietnam, focusing on obstetric and psychosocial factors, thereby enhancing our understanding and contributing to the health improvement of women and future generations

II. MATERIALS AND METHODS

1. Subjects

Participants were pregnant women aged 18 years and older, at 24 - 28 weeks of gestation, residing in Thai Binh province, and attending prenatal care at either health facility. Pregnant women were excluded if they: 1) declined participation or were unable to complete the questionnaire due to communication or reading difficulties; (2) had pre-gestational diabetes or severe chronic diseases (e.g. anemia, heart diseases, liver diseases).

2. Methods

Study design

This research is a formed part of the project titles "Living Together with Chronic Disease: Informal Support for Diabetes Management in Vietnam (VALID-II)". As a part of the project, a quantitative cross-sectional study was conducted from January to August 2023. Depression symptoms were among variables assessed.

Study setting and timeline

Thai Binh, a coastal province in Vietnam's Red River Delta. The province is located about 110 kilometers southeast of Hanoi capital, covering an area of 1,585km^2. The population was estimated at around 1.87 million in 2021, with 88% residing in rural areas where wet-rice cultivation is the main economic activity (Report of Thai Binh Department of Statistics, 2022).

Data were collected from January to August 2023 at Thai Binh Maternity Hospital and Kim Ngan Clinic in Thai Binh City. The hospital is a public health facility providing a range of services related to maternal and child health, while the clinic is a private provider of maternal care.

Sample size and Sampling

The required sample size was calculated using the single population proportion formula, based on a 24.5% prevalence of AD from a study in four obstetric hospitals in Vietnam.[10] With a 95% confidence level, 3% margin of error, and an additional 5% to account for potential data loss, the minimum required sample size was 830.

From January to August 2023, women who visited prenatal care between 25 to 28 weeks of their pregnancy were invited to participate in the study.

Measurements

Face-to-face interviews were conducted to collect their sociodemographic status, reproductive history, psychosocial risks and depression symptom.

The dependent variable: Antenatal depression: The Edinburgh Postnatal Depression Scale (EPDS) is a self-rating scale developed by Cox and colleagues to assess the severity of depressive symptoms experienced over past 7 days.[13] The EPDS has shown strong internal consistency among mothers, with a coefficient alpha of 0.87. Moreover, the scale exhibits a sensitivity ranging from 80% to 100% and specificity ranging from 80% to 95% in identifying depressive symptoms.[14] AAlthough this instrument was initially designed to identified postpartum depression, numerous studies have demonstrated that it can also be used to screen for AD.[15]

Independent variables: Maternal sociodemographic characteristics included maternal age, education, marital status, source of income, and economic status (average/rich or poor/near-poor) was assessed based on the woman's self-perception of her household's economic situation. Obstetric characteristics included history of gestational diabetes mellitus (GDM), nulliparity, history of LBW – defined as the mother having delivered one or more previous infant's birth weight less than 2,500 grams, history of treatment for polycystic ovary syndrome (PCOS), history of abortion, miscarriages, stillbirth and no male child. A history of depression refers to women who had been previously diagnosed with depression and/or had received antidepressant treatment. Unwanted pregnancy is described as a pregnancy that occurs when a woman does not intend to become pregnant, frequently as a result of her incapacity to manage the circumstances of sexual activity or lack of knowledge about contraceptive. Second hand smoke exposure happens when women breathe in smoke breathed out by smokers or from burning tobacco products. Anxiety is a feeling in which a woman expects danger, disaster, or misfortune to strike, marked by apprehension and physical signs of stress. It is generally regarded as a prolonged, future-oriented emotional response, often without a specific or immediate threat. In this study, anxiety was assessed via three anxiety-related items EPDS-3A with cut-off point 4/5.[16]

Data analysis

Data analyses were conducted in R, using RStudio (version 4.4.0). Descriptives statistics were used to summarize the participants' sociodemographic, obstetric and psychosocial characteristics. Participants were divided into 2 groups depression and non-depression based on their total EPDS score with a cutoff point of 9/10.[3,10,17]

The research dataset exhibits separation, specifically, there was no instance of a woman with a history of depression who was not depressed at the time of the study, which led to unstable estimates in traditional logistic regression. Therefore, Firth logistic regression models were used to generate crude odd ratios (OR) and adjusted odds ratios (AOR) with 95%CI to examine the factors associated with AD, with a considered statistical significance level of $\alpha < 0.05$.

In the multivariable analysis, missing data were addressed by complete-case analysis, whereby observations with any missing values were omitted. We acknowledge that method may result in some loss of information and a reduction in sample size. However, the proportion of missing data was small (approximately 2.3%), so excluding these observations is unlikely to significantly affect the analysis results. We assumed that the missing data was missing completely at random, which means that the missingness was not related to the values of the variables in the model. This method helps ensure the consistency and reliability of the findings.

3. Research ethics

The research *was approved* by the Ethics Council in Biomedical Research of Thai Binh University of Medicine and Pharmacy, Vietnam (No. 1325/HDDD dated 1st December 2022). Official research has been issued by the Ministry of Health of Vietnam and Thai Binh Health Department. Written informed consent was given to all study participants before the interviews began.

III. RESULTS

Characteristics of the participants

Table 1. Sociodemographic, obstetric, psychosocial characteristics and prevalence of antenatal depression and anxiety among pregnant women in Northern Vietnam, 2023 (n = 859)

Variable	n	%
Sociodemographic characteristics		
Age group in years		
Mean (SD)	28 (5.4)	
< 25	243	28.3
≥ 25	616	71.7
Education		
Secondary school or below	86	10.0
High school or above	773	90.0

Variable	n	%
Sociodemographic characteristics		
Source of income		
Have income (e.g., workers, free labor…)	758	88.2
No income (e.g., unemployed, housewife…)	101	11.8
Economic status (self-report)		
Average and rich	853	99.4
Poor/near poverty	5	0.6
Marital status		
Married and live together	798	93.1
Married and not living together	47	5.5
Living together but not married	3	0.4
Marriage and separation	2	0.2
Not married	7	0.8
Obstetric characteristics		
History of GDM		
No	827	96.7
Yes	28	3.3
Nulliparous women		
No	526	61.2
Yes	333	38.8
History of LBW		
No	839	97.7
Yes	20	2.3
History of treatment for PCOS		
No	814	94.8
Yes	45	5.2
History of abortion		
No	792	92.2
Yes	67	7.8
History of miscarriages		
No	789	91.9
Yes	70	8.1

Variable	n	%
Obstetric characteristics		
History of stillbirth		
No	791	92.1
Yes	68	7.9
Have no male child		
No	247	28.8
Yes	612	71.2
Psychosocial characteristics		
History of depression		
No	853	99.4
Yes	5	0.6
Unwanted pregnancy		
No	687	81.0
Yes	161	19.0
Exposure to secondhand smoke		
No	564	65.9
Yes	292	34.1
Anxiety (EPDS-3A)		
No	643	74.9
Yes	216	25.1
Prevalence of Antenatal Depression		
EPDS		
Mean (SD)	6.3 (4.1)	
Antenatal Depression		
No	662	77.1 [74.1 - 79.8]
Yes	197	22.9 [20.2 - 25.9]

SD: Standard Deviation

Table 1 presents the characteristics of participants. Among 859 pregnant women who participated in the study, the mean age was 28 ± 5.4 years old, of whom 71.7% were aged 25 or older. Most of the participant (90%) had finished high school or higher education and had a source of income (88.2%). Nearly all pregnant women (99.4%) self-identified as having average or rich economic status. Most of them were married and living with their spouse (93.1%). About obstetric characteristics, only 3.3% had a history of

gestational diabetes mellitus (GDM), for 38.8% of the recruited participants, this was their first pregnancy, and 71.2% reported not having any male child. Regarding adverse pregnancy outcomes, 2.3% had a history of LBW infants, 5.2% had received treatment for polycystic ovary syndrome (PCOS), 7.8% had a history of abortion, 8.1% had experienced miscarriage, and 7.9% reported a history of stillbirth. In terms of psychosocial characteristics, only 0.6% of participants reported a history of depression, 19.0% of the pregnancies were reported as unwanted, and 34.1% of the women were exposed to secondhand smoke during pregnancy. Based on the EPDS-3A, 25.1% of the women showed symptoms of anxiety.

Main findings

Table 1 also presents the prevalence of AD, defined as an EPDS score ≥ 10, which was 22.9% (95% CI: 20.2% – 25.9%).

Table 2. Crude and Adjusted Odds Ratios (OR) for factors associated with depression among pregnant women, Northern Vietnam, 2023

Variables	Antenatal Depression n (%)	Crude OR (95%CI)	Adjusted OR (95%CI) (Full model)	Adjusted OR (95%CI) (Reduced model)
Sociodemographic characteristics				
Economic status (self-report)				
Average and rich	193 (22.6)	1	1	1
Poor/near poverty	3 (60.0)	4.78 (0.92 - 28.86)	6.42 (0.56 - 54.62)	6.00 (0.56 – 50.74)
Obstetric characteristics				
History of GDM				
No	189 (22.9)	1	1	
Yes	8 (28.6)	1.40 (0.58 - 3.06)	1.25 (0.37 - 3.93)	NA
Nulliparous women				
No	126 (24.0)	1	1	
Yes	71 (21.3)	0.86 (0.62 - 1.20)	0.68 (0.38 - 1.22)	NA
History of LBW				
No	190 (22.6)	1	1	
Yes	7 (35.0)	1.89 (0.73 - 4.59)	2.01 (0.51 - 7.03)	NA

Variables	Antenatal Depression n (%)	Crude OR (95%CI)	Adjusted OR (95%CI) (Full model)	Adjusted OR (95%CI) (Reduced model)
Obstetric characteristics				
History of treatment for PCOS				
No	189 (23.2)	1	1	
Yes	8 (17.8)	0.75 (0.33 - 1.53)	0.51 (0.16 - 1.45)	NA
History of abortion				
No	178 (22.5)	1	1	
Yes	19 (28.4)	1.38 (0.78 - 2.37)	1.17 (0.51 - 2.62)	NA
History of miscarriages				
No	185 (23.4)	1	1	
Yes	12 (17.1)	0.70 (0.35 - 1.27)	0.64 (0.25 - 1.52)	NA
History of stillbirth				
No	180 (22.8)	1	1	
Yes	17 (25.0)	1.15 (0.64 - 1.99)	1.10 (0.46 - 2.51)	NA
Have no male child				
No	57 (23.1)	1	1	
Yes	140 (22.9)	0.98 (0.70 - 1.41)	1.26 (0.72 - 2.21)	NA
Psychosocial characteristics				
History of depression				
No	192 (22.5)	1	1	1
Yes	5 (100.0)	37.8 (4.26 - 4970.43)***	58.49 (2.92 - 8791.64)**	61.46 (3.06 - 9133.33)**
Unwanted pregnancy				
No	142 (20.7)	1	1	1
Yes	52 (32.3)	1.83 (1.25 - 2.67)**	2.09 (1.22 - 3.58)**	2.21 (1.31 - 3.73)**

Variables	Antenatal Depression n (%)	Crude OR (95%CI)	Adjusted OR (95%CI) (Full model)	Adjusted OR (95%CI) (Reduced model)
Psychosocial characteristics				
Exposure to secondhand smoke				
No	107 (19.0)	1	1	1
Yes	90 (30.8)	1.9 (1.37 - 2.63)***	1.86 (1.19 - 2.92)**	1.91 (1.22 - 2.99)**
Anxiety				
No	47 (7.3)	1	1	1
Yes	150 (69.4)	28.42 (1.96 - 43.36)***	30.35 (19.70 - 47.90)***	30.93 (20.12 - 48.69)***

****: p < 0.001; **: p < 0.01; *: p < 0.05*

Crude ORs were calculated using available data (maximum n = 859); adjusted ORs from multivariable models were based on complete cases (n = 839)

Table 2 presents factors associated with AD among participants. In the binary analysis, several factors showed strong associations with AD, including history of depression (OR = 37.8, 95% CI: 4.26 - 4970.43), anxiety (OR = 28.42, 95% CI: 1.96 - 43.36), exposure to second hand smoke (OR = 1.9, 95% CI: 1.37 - 2.63), and unwanted pregnancy (OR = 1.83, 95% CI: 1.25 - 2.67). After adjusting for economic status, the full and reduced multivariable models confirmed significant associations for history of depression (AOR = 58.49 and 61.46, respectively), anxiety (AOR = 30.35 and 30.93), exposure to secondhand smoke (AOR = 1.86 and 1.91), and unwanted pregnancy (AOR = 2.09 and 2.21). Socioeconomic disadvantage (poor or near poor) also showed an increased risk of depression, though not statistically significant.

Regarding obstetric characteristics, all selected variables were included in the full model, while the reduced model retained only those with significant associations. Obstetric history variables such as the history of GDM, nulliparity, LBW infants, PCOS, abortion, stillbirth, miscarriage, and having no male child, were not statistically significant and were therefore excluded. However, the removal did not substantially change the AORs of the remaining factors, suggesting that these variables were not confounders and may not play a key role in AD in this population.

IV. DISCUSSION

This study examined the prevalence of AD among pregnant women in Thai Binh province, Northern Vietnam, in 2023, and explored its association with environmental factors such as second-hand smoke exposure, and unwanted pregnancy. In our study, the prevalence of AD was 22.9%, which is higher than the rate of high-income countries (7% to 20%), and falls within the mid-range for LMICs (20.7% to 24.7%).[1] When compared by region, our figure is close to the average for East Asia and the Pacific (21.4%), and lower than the highest reported in

the Middle East and North Africa (31.5%).[18]

Compared with other previous hospital-based studies that used the same depressive assessment tool (EPDS), and the same cut-off point (9/10), the prevalence of AD in our study was lower than some reported but higher than others. For example, a study in Sri Lankan reported a prevalence of 16.2%, while in India, the rate was 23.2%, and China, a neighboring country to Vietnam, reported a higher prevalence of 29.6%.[19-21]

Within Vietnam, our hospital-based study in Thai Binh province (Northern Vietnam) showed a lower rate than that reported in studies conducted in Ho Chi Minh City (28.7%), Can Tho (27.1%), and a multi-site study (24.5%), but higher than Hue (8.7%).[10-12,22] These differences may stem from the timing of data collection (gestational age), population characteristics, socio-economic context, and assessment tools. In Vietnam, about 60% of studies used the EPDS, which helps to increase comparability. However, differences in cut-off scores (with four out of five studies using a cut-off of 9/10, and one study using 12/13), social context, and level of family support may affect the prevalence rate. A study conducted by the Australian Department of Health on standardization content and cutoff points for identifying depression recommended using a cutoff point of 9/10 as the most suitable for detecting depression among Vietnamese individuals in the research population.[23]

Significant risk factors included a history of depression, unwanted pregnancy, exposure to second hand smoke and anxiety during pregnancy. The history of depression was the strongest predictor of AD in our study (AOR = 61.46), where 100% of pregnant women with history of depression treatment were currently experiencing depression. However, these were accompanied by wide confidence intervals, reflecting the small sample size in the exposed group. This suggested the necessity of additional research with larger sample sizes to more accurately confirm this association and the need for early mental health support in women with prior depressive episodes.

Unwanted pregnancy (AOR = 2.21) and second hand smoke exposure (AOR = 1.91) were significantly associated with AD, aligning with global findings. A systematic review and meta-analysis found that pregnant women exposed to second hand smoke increased the odds of depressive symptoms 1.77 times compared to unexposed women.[24]

Exposure to second hand smoke during pregnancy, especially when the smoker is a husband, partner or family member, and unwanted pregnancy are significant factors associated with depression during pregnancy. These factors reflect women's lack of control over their own bodies and living environment. They indicate a power imbalance in the family, where women lack of the right to make decisions about reproduction or to protect their own health, which results in a sense of powerlessness that is an important psychological factor contributing to the development of AD. In Vietnam, particularly in northern provinces, remnants of patriarchal traditions and Confucian-influenced gender norms such as male dominance and son preference continue to shape family dynamics. In such contexts, women are often constrained by traditional roles and expectations such as childbearing, housework, and submission to their husbands, making it difficult for them to make important decisions about their health, childbearing plans, or living space. This can easily result in increased psychological distress, a lack of support, and a sense of not being heard.

In addition to second hand smoke and

unwanted pregnancy, our study identified anxiety as a significant contributor to AD. Researchers in India reported that anxious pregnant women are 3.9 times more likely to experience depression, while in Malaysia, the odds ratio was 1.6.[25,26] However, the odds were significantly higher in our study - nearly 31 times ($p < 0.001$). This suggests that anxiety may be a good indicator for depression in similar settings.

Unlike some previous studies, no significant association was found between AD and economic status, history of abortion, stillbirth, miscarriage, GDM, PCOS treatment, LBW infants, or absence of a male child. In term of history of pregnancy termination, Kumar and Robson (1978) first observed that history of abortion was strongly link to AD. The authors also explained that a manifestation of a "dormant grief reaction" - that is, the latent sorrow that remains unresolved after termination of pregnancy. This term could also be able to explain partly the unexpected results in our study.[27] Nonetheless, our small subgroup sizes for these outcomes (e.g., n = 68 for stillbirth) limit power and may conceal true effects, as logistic regression requires at least ten outcome events per predictor to yield stable estimates.

Previous studies demonstrates that GDM diagnosis can precipitate anxiety and depression. However, our data showed only modest, non-significant trend, possibly due to reluctance to disclose medical complications or heterogeneous screening practices. Similarly, history of LBW infant showed elevated crude ORs but no significant adjusted effects. Maternal anxiety over prior LBW outcomes can fuel anticipatory stress, yet cultural norms of stoicism may suppress open discussion, masking statistical associations. In Vietnam, sons are considered to be the ones to continue the family line and worship ancestors, so many families consider having a son mandatory. Not having a son can be considered a failure and cause women to suffer mental pressure and be criticized. However, our study did not reveal a significant link between "having no male child" and AD.

Overall, this study would be one of the first studies on depression among pregnant women conducted in Northern Vietnam. With a fairly large sample size, the study allowed us to examine accurately the prevalence of AD among pregnant women in northern Vietnam when using the standardized and validated Vietnamese-translated version of EPDS.

However, this study has some limitations. Firstly, due to cultural factors in Vietnam, women may be reluctant to disclose sensitive health information, especially in face-to-face interviews. This may be a major cause of underreporting depressive symptoms and key exposures such as a history of abortion, obstetric diseases or emotions from obstetric events they have experienced. Secondly, even though the EPDS is a commonly accepted screening tool for depression during pregnancy, individuals who scored ≥ 10 were not contacted for clinical diagnostic evaluations, which limited the capacity to confirm depression diagnoses. Additionally, the study was limited to women between the ages of 24 and 28 weeks and was carried out in hospital and clinical settings, where participants might have underlying medical issues. Therefore, it's possible that the results don't accurately reflect depression symptoms in larger community populations or during all trimesters.

V. CONCLUSION

Antenatal depression is a significantly public health concern with serious implications for both mothers and children, yet it has

gotten little attention in Vietnam. This study highlights key risk factors for AD, including the history of depression, unwanted pregnancies, secondhand smoking exposure or anxiety. These findings underscore the need for integrated prenatal care services, early screening, and culturally competent mental health interventions. Routine antenatal depression screening in primary healthcare facilities, training of healthcare providers in the use of EPDS, and strengthening of referral systems for women at risk are specifically recommended. Future research should use mixed methods approaches to explore hidden emotional burdens, using computer-assisted or self-administered survey technologies to reduce reporting bias, and employ longitudinal designs to clarify reciprocal relationships with PCOS and GDM. Larger sample sizes are also needed to strengthen evidence on rare exposures such as stillbirth and LBW.

Overall, these insights are crucial for developing effective interventions and guiding maternal mental health policies.

A comprehensive approach that addressed both biological and social determinants of AD, including family dynamics and social factors, will support equitable maternal healthcare and better mental health outcomes for pregnant women in Vietnam.

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