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# Postpartum Depression and Associated Factors in Conflict-Affected Women in North-West Syria: A Cross-Sectional Study

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# Abstract

**Background:** Postpartum depression (PPD) constitutes a major public mental health burden globally, with disproportionately elevated prevalence in conflict-affected settings. North-West Syria (NWS), subjected to over a decade of armed conflict, represents a critically underserved humanitarian context in which evidence on PPD remains scarce.

**Methods:** A cross-sectional study was conducted between January and February 2023 in Idlib City and Atmeh displacement camps, NWS. A random sample of 397 postpartum women aged 18-45 years within 3-8 weeks of delivery was recruited from five primary healthcare centres. PPD was assessed using the Arabic-validated Edinburgh Postnatal Depression Scale (EPDS, cut-off >=12). Univariate and multivariate logistic regression were performed using SPSS v26.

**Results:** The overall prevalence of PPD was 59.7% (n=237). The majority were internally displaced persons (IDPs) (91.7%). In univariate analysis, lack of social support (OR=8.924, 95% CI: 5.079-15.680, p<0.001), unintended pregnancy (OR=2.123, 95% CI: 1.373-3.283, p=0.001), and maternal age 26-35 years (OR=2.005, 95% CI: 1.303-3.084, p=0.002) were the strongest predictors. After full multivariate adjustment, only lack of social support (aOR=9.411, 95% CI: 4.891-18.105, p<0.001) and employment outside the home (aOR=2.082, 95% CI: 1.079-4.018, p=0.029) remained independently significant. Unintended pregnancy and maternal age were attenuated to non-significance after adjustment.

**Conclusions:** PPD is highly prevalent among women in NWS. Lack of social support during pregnancy is the strongest independent predictor. Routine PPD screening, community psychosocial support, and integration of family planning services within emergency maternal health programmes are urgently warranted.


# Background

Postpartum depression (PPD) is a clinically significant non-psychotic depressive episode occurring within the first year following childbirth, distinguished from transient 'baby blues' by its persistence beyond two weeks postpartum and its substantial impairment of maternal functioning(1). The World Health Organization (WHO) estimates a global PPD prevalence of approximately 13%, with substantially higher rates reported in low- and middle-income countries (LMICs), particularly those affected by armed conflict, displacement, and severe socioeconomic deprivation(2). Left unaddressed, PPD adversely impacts mother-infant attachment, infant cognitive and emotional development, and long-term maternal mental health outcomes(3). Syria represents one of the most protracted humanitarian crises of the contemporary era. Since the onset of civil conflict in March 2011, more than 614,000 deaths have been recorded and over 14 million Syrians have been displaced, with approximately 6.8 million remaining internally displaced(4, 5). The health system in Syria was severely disrupted during the conflict, resulting in limited access to healthcare services at all levels(6–8). North-West Syria (NWS) is home to 4.5 million people, 63% of whom are internally displaced persons (IDPs)(9). The region is characterised by an overwhelming reliance on humanitarian assistance, a fragmented healthcare system, and critically

limited mental health services (10). Although studies from Syrian refugee populations in neighbouring countries report PPD prevalence rates of approximately 50%(11), no published empirical data have heretofore characterised PPD prevalence or its determinants within the NWS context itself. Existing literature from the broader MENA region identifies wide-ranging PPD prevalence (10-51.8%), attributable in part to methodological heterogeneity and contextual variation(12).

Established risk factors for PPD include low socioeconomic status, inadequate social support, unintended pregnancy, obstetric complications, and conflict-related trauma(11),(13–16). The present study aimed to: (1) determine the prevalence of PPD among postpartum women in NWS; (2) identify sociodemographic, obstetric, and psychosocial predictors using crude and adjusted logistic regression; and (3) examine the independent contributions of key risk factors after controlling for confounders.

## Materials and Methods

# Study Design and Setting

A cross-sectional study was conducted between January and February 2023 across five primary healthcare centres (PHCs) in Idlib City and Harem-Atmeh displacement camps, Idlib Governorate, NWS.

## Population and Eligibility Criteria

The target population comprised women aged 18–45 years between 3 and 8 weeks postpartum attending the selected PHCs. Exclusion criteria included obstetric complications requiring caesarean section or extended hospitalisation; neonatal death or congenital anomaly requiring intensive care; pre-existing severe mental illness; and unwillingness to provide informed consent.

## Sample Size and Sampling

The minimum sample size was calculated at 310 participants based on a prior Damascus-based study (PPD prevalence 28.2% (17), 95% confidence level (Z = 1.645), and 5% margin of error. The target sample was set at 397. Computer-generated random sampling was applied to maternal and child health service registers at each PHC.

## Data Collection

Trained community health workers administered face-to-face structured interviews using KoBoToolbox on Android tablets. Interviews comprised a sociodemographic questionnaire and the Arabic-validated Edinburgh Postnatal Depression Scale (EPDS)(18). The EPDS is a 10-item instrument scored 0–30; a cut-off of > = 12 indicated probable PPD, consistent with validation studies reporting 88% sensitivity and 70% specificity(19).

# Statistical Analysis

Data were analysed using IBM SPSS Statistics v26. Descriptive statistics were computed for all variables. Bivariate associations were assessed using Pearson chi-square tests. Univariate binary logistic regression was performed for each variable separately to estimate crude odds ratios (ORs) with 95% CIs. Multivariate logistic regression was subsequently performed by entering all study variables simultaneously (forced entry) to obtain adjusted odds ratios (aORs). Model fit was evaluated using the Hosmer-Lemeshow test and AUC. Statistical significance was defined at $p < 0.05$.

# Results

### Sociodemographic Characteristics

A total of 397 postpartum women were enrolled. The majority were recruited from Atmeh displacement camps (79.8%; n=317), with 20.2% from Idlib City (n=80). IDP status was documented in 91.7% (n=364). Maternal age was predominantly in the 18-25-year group (46.1%; n=183) and the 26-35-year group (43.3%; n=172). Over half (52.1%) had three or fewer children; 64.7% had attained secondary (high school) education. Economic hardship was pervasive: 73.8% reported income below expenditure levels, and 82.4% were not employed outside the home. Unintended pregnancy was reported by 36.3% (n=144), and 35.0% (n=139) received no social support during pregnancy. Full demographic data are presented in Table 1.

### PPD Prevalence

The overall prevalence of postpartum depression (PPD) among the study participants was 59.7% (237/397). The prevalence of PPD was slightly higher among women residing in Atmeh (59.9%) compared to those in Idlib City (58.8%), although the difference was not statistically significant (p=0.472). PPD prevalence significantly varied according to maternal age (p=0.004), with higher prevalence observed among women aged 26–35 years (67.4%) and 36–45 years (66.7%) compared to those aged 18–25 years (50.8%). Women whose household income was lower than expenses reported a significantly higher prevalence of PPD (66.2%) compared to those whose income was equal to expenses (38.4%) or greater than expenses (55.6%) (p<0.001). Women with unintended pregnancies had a significantly higher prevalence of PPD (70.8%) compared to those with intended pregnancies (53.4%) (p=0.001). Similarly, lack of social support during pregnancy was strongly associated with higher PPD prevalence, with 87.8% of women without social support experiencing PPD compared to 44.6% among those who reported receiving support (p<0.001). Although not statistically significant, higher PPD prevalence was observed among women with 4–5 children (64.0%) and ≥6 children (64.7%) compared to those with ≤3 children (55.6%) (p=0.213). Employed women also showed a higher prevalence of PPD (70.0%) compared to unemployed women (57.5%) (p=0.053). No statistically significant differences (p>0.05) in PPD prevalence were observed according to residency type, education level, or newborn gender (table 1).

**Table 1.** Sociodemographic characteristics and PPD prevalence by category (N=397)

| Variable | n | % | PPD (%) | p-value |
|---|---|---|---|---|
| **Location** | | | | |
| Atmeh | 317 | 79.8 | 59.9 | 0.472 |
| Idlib City | 80 | 20.2 | 58.8 | |
| **Maternal Age** | | | | |
| 18-25 years | 183 | 46.1 | 50.8 | **0.004**** |
| 26-35 years | 172 | 43.3 | 67.4 | |
| 36-45 years | 42 | 10.6 | 66.7 | |
| **Residency Type** | | | | |
| IDP | 364 | 91.7 | 59.6 | 0.534 |
| Host community | 33 | 8.3 | 60.6 | |
| **Number of Children** | | | | |
| <=3 | 207 | 52.1 | 55.6 | 0.213 |
| 4-5 | 139 | 35.0 | 64.0 | |
| >=6 | 51 | 12.8 | 64.7 | |
| **Education Level** | | | | |
| Preparative | 107 | 27.0 | 58.9 | 0.561 |
| High school | 257 | 64.7 | 61.1 | |
| University | 33 | 8.3 | 51.5 | |
| **Economic Status** | | | | |
| Income < Expenses | 293 | 73.8 | 66.2 | **<0.001**** |
| Income = Expenses | 86 | 21.7 | 38.4 | |
| Income > Expenses | 18 | 4.5 | 55.6 | |
| **Employment** | | | | |
| Unemployed | 327 | 82.4 | 57.5 | 0.053 |
| Employed | 70 | 17.6 | 70.0 | |
| **Newborn Gender** | | | | |
| Female | 235 | 59.2 | 62.1 | 0.235 |
| Male | 162 | 40.8 | 56.2 | |

| | | | | |
|---|---|---|---|---|
| **Unintended Pregnancy** | | | | |
| Yes | 144 | 36.3 | 70.8 | **0.001**** |
| No | 253 | 63.7 | 53.4 | |
| **Social Support During Pregnancy** | | | | |
| No | 139 | 35.0 | 87.8 | **<0.001**** |
| Yes | 258 | 65.0 | 44.6 | |
| PPD Prevalence (Overall) | 237 | 59.7 | - | - |

*IDP = Internally Displaced Person. ** p < 0.01 (Pearson chi-square).*

**Bivariate Associations**

Statistically significant bivariate associations with PPD were observed for social support during pregnancy (p<0.001), unintended pregnancy (p=0.001), maternal age (p=0.004), and economic status (p<0.001) (Table 1, Figure 1). Women aged 26-35 years exhibited the highest PPD prevalence (67.4%) compared with 50.8% among women aged 18-25 years. Among those with income below expenditure, PPD prevalence reached 66.2% versus 38.4% among those with balanced income. Among women with unintended pregnancies, 70.8% screened positive for PPD compared with 53.4% of those with intended pregnancies. The most striking contrast was observed for social support: 87.8% of women receiving no social support during pregnancy screened positive for PPD, compared with 44.6% of those who received support.

**Logistic Regression Analysis**

Crude (univariate) and adjusted (multivariate) odds ratios for all study variables are presented together in Table 3 and Figure 2. The multivariate model demonstrated good discriminative ability and calibration (AUC=0.773; Hosmer-Lemeshow chi-sq=2.465, p=0.963; overall LR chi-sq(14)=98.9, p<0.001).

Social support during pregnancy was the strongest predictor of PPD in both crude and adjusted analyses. Women who received no social support had a nearly ninefold higher odds of PPD (OR=8.924, 95% CI: 5.079-15.680, p<0.001). This estimate remained virtually unchanged after full multivariate adjustment (aOR=9.411, 95% CI: 4.891-18.105, p<0.001), confirming that the effect of social support is independent of all other measured variables and is not confounded by demographic or obstetric characteristics.

Employment outside the home emerged as the second independently significant predictor in the adjusted model (aOR=2.082, 95% CI: 1.079-4.018, p=0.029), despite being only borderline significant in univariate analysis (OR=1.725, 95% CI: 0.989-3.009, p=0.055). This strengthening of the association after adjustment suggests that the crude estimate was partially suppressed by confounders. In the NWS

context, employment likely reflects role overload, combining occupational demands with caregiving responsibilities under conditions of ongoing conflict and displacement.

Notably, three variables significant in univariate analysis lost significance after full multivariate adjustment. Unintended pregnancy showed a twofold elevation in crude odds of PPD (OR=2.123, 95% CI: 1.373-3.283, p=0.001); however, this association was substantially attenuated to non-significance after adjustment (aOR=0.841, 95% CI: 0.486-1.454, p=0.535). Similarly, maternal age 26-35 years (crude OR=2.005, p=0.002; aOR=0.684, p=0.419 adjusted) was no longer independently significant. These attenuations suggest that the crude effects of unintended pregnancy and maternal age are largely mediated through lack of social support.

For economic level, the income = expenses category showed a borderline protective trend compared with income < expenses (aOR=0.347, 95% CI: 0.111-1.091, p=0.070) in the adjusted model. IDP status (aOR=1.115, p=0.812), location (aOR=0.577, p=0.112), number of children, education level, newborn gender, and residency type were non-significant in both crude and adjusted analyses.

**Table 3.** Crude (Univariate) and Adjusted (Multivariate) Logistic Regression Analysis of Factors Associated with Postpartum Depression (N=397)

| Variable (Reference category) | OR | CI Lo | CI Hi | p | aOR | CI Lo | CI Hi | p (adj) |
|---|---|---|---|---|---|---|---|---|
| Receiving Social Support during Pregnancy *(No support vs Yes support (ref))* | 8.924 | 5.079 | 15.680 | **<0.001** | **9.411** | **4.891** | **18.105** | **<0.001** |
| Unintended Pregnancy *(Yes (unintended) vs No (ref))* | 2.123 | 1.373 | 3.283 | **0.001** | 0.841 | 0.486 | 1.454 | 0.535 |
| Maternal Age *[overall crude Wald p = 0.004]* | | | | | | | | |
| 26-35 years *(ref: 18-25 years)* | 2.005 | 1.303 | 3.084 | **0.002** | 0.684 | 0.272 | 1.719 | 0.419 |
| 36-45 years *(ref: 18-25 years)* | 1.935 | 0.957 | 3.913 | 0.066 | 1.055 | 0.453 | 2.460 | 0.901 |
| Work Out of Home *(Yes (employed) vs No (ref))* | 1.725 | 0.989 | 3.009 | 0.055 | **2.082** | **1.079** | **4.018** | **0.029** |
| Economic Level *[overall crude Wald p < 0.001]* | | | | | | | | |
| Income < Expenses *(ref: Income > Expenses)* | 1.568 | 0.600 | 4.097 | 0.359 | 0.801 | 0.269 | 2.381 | 0.689 |
| Income = Expenses *(ref: Income > Expenses)* | 0.498 | 0.178 | 1.390 | 0.183 | 0.347 | 0.111 | 1.091 | 0.070 |
| Number of Children *[overall crude Wald p = 0.214]* | | | | | | | | |
| 4 or 5 *(ref: <=3 children)* | 1.424 | 0.915 | 2.215 | 0.117 | 0.994 | 0.557 | 1.773 | 0.984 |
| >=6 *(ref: <=3 children)* | 1.467 | 0.776 | 2.771 | 0.238 | 0.789 | 0.330 | 1.891 | 0.596 |
| Child Gender *(Female vs Male (ref))* | 1.280 | 0.852 | 1.923 | 0.235 | 1.034 | 0.645 | 1.659 | 0.890 |
| Education Level *[overall crude Wald p = 0.564]* | | | | | | | | |
| High School *(ref: Preparative)* | 1.097 | 0.693 | 1.736 | 0.694 | 1.658 | 0.630 | 4.365 | 0.306 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| University *(ref: Preparative)* | 0.742 | 0.339 | 1.625 | 0.456 | 1.548 | 0.651 | 3.685 | 0.323 |
| Residency Type *(IDP vs Host community (ref))* | 0.960 | 0.463 | 1.989 | 0.912 | 1.115 | 0.454 | 2.738 | 0.812 |
| Location *(Atmeh vs Idlib City (ref))* | 1.050 | 0.638 | 1.729 | 0.847 | 0.577 | 0.292 | 1.137 | 0.112 |

*OR = crude odds ratio; aOR = adjusted odds ratio; CI = 95% confidence interval. Bold red = significant in crude analysis (p<0.05). Bold blue = significant in adjusted model (p<0.05). Group headers: overall Wald chi-square p. Multivariate model: forced entry. Model fit: AUC=0.773; Hosmer-Lemeshow p=0.963; LR chi-sq(14)=98.9, p<0.001.*

## Discussion

# Principal Findings

This study provides empirical evidence on postpartum depression (PPD) prevalence among women residing within the Northwest Syria (NWS) conflict zone itself, rather than among refugee populations in neighbouring countries. The observed PPD prevalence of 59.7% substantially exceeds the WHO global estimate of approximately 13%(20) and is markedly higher than the 28.2% reported in Damascus(17) and the approximately 50% observed among Syrian refugee women in Jordan(11). This prevalence, nearly five times the global average, reflects the cumulative mental health burden imposed by protracted conflict, mass displacement, severe economic vulnerability, and the lack of adequate psychosocial support infrastructure. Integrating crude and adjusted analyses, two independent predictors were identified: absence of social support during pregnancy (aOR = 9.411) and employment outside the home (aOR = 2.082). Unintended pregnancy and maternal age -- both significant in univariate analysis -- were attenuated to non-significance after full adjustment, indicating that social support deficits are the proximal mechanism underlying multiple apparent risk factors.

# Role of Social Support

The nearly tenfold increase in PPD odds associated with absence of social support virtually unchanged from crude to adjusted estimate confirms social support as the dominant, unconfounded predictor of PPD in this population(21),(22). Critically, 35% of the sample reported no social support during pregnancy. The destruction of extended family networks through conflict, dislocation from community structures, and isolation enforced by camp living collectively deprive women of the emotional and practical scaffolding that ordinarily moderates the psychological demands of the perinatal period. Community-based psychosocial support programmes that engage religious and community leaders represent the most proximal intervention target identified by this study.

# Unintended Pregnancy: Attenuation after Adjustment

Unintended pregnancy was strongly associated with PPD in univariate analysis (OR = 2.123, p = 0.001), consistent with multiple international meta-analyses(12, 23–25). However, this association was substantially attenuated to non-significance after full multivariate adjustment (aOR = 0.841, p = 0.535). This attenuation suggests that the crude effect is largely mediated through, or confounded by, social support deficits and economic hardship: women experiencing unintended pregnancies in NWS may disproportionately lack social support, and it is this absence of support -- rather than pregnancy intention per se -- that primarily drives elevated PPD risk. Integration of family planning services into emergency health packages therefore remains important, but improving social support may be a more proximal intervention.

# Employment as an Independent Risk Factor

Employment outside the home emerged as a significant independent risk factor in the adjusted model (aOR = 2.082, p = 0.029), strengthening from a borderline crude association (p = 0.055). In NWS, maternal employment likely reflects role overload: the compounding of occupational demands with caregiving responsibilities under conditions of ongoing conflict and displacement a pattern distinct from higher-income settings where employment is typically protective.

# Socioeconomic Status and Displacement

Economic hardship showed a significant bivariate association with PPD (66.2% prevalence among women with income below expenditure, p < 0.001). In the adjusted model, income sufficiency (income = expenses) showed a borderline protective trend (aOR = 0.347, p = 0.070) relative to income deficit. IDP status was not independently associated with PPD in either crude or adjusted analyses (aOR = 1.115, p = 0.812), likely reflecting a ceiling effect in which host community residents face comparable conflict-related adversity to displaced persons.

# Limitations

The cross-sectional design precludes causal inference. The EPDS is a self-report instrument subject to social desirability bias, and symptoms may be underreported given cultural stigma. The sample was drawn exclusively from PHC attendees, potentially underrepresenting women who do not access formal health services. Exclusion of women with obstetric complications limits generalisability to the full postpartum population. The multivariate model used forced entry; future work should consider a priori model specification and longitudinal designs.

## Conclusions

This study establishes that PPD affects approximately three in five postpartum women in North-West Syria, a prevalence among the highest reported globally. Integrating crude and adjusted analyses, absence of social support during pregnancy is the single strongest, unconfounded predictor, followed by employment outside the home. Unintended pregnancy and maternal age, while significant in crude

analyses, were attenuated after adjustment indicating that social support deficits are the proximal mechanism underlying multiple apparent risk factors.

Priority recommendations include: (1) routine PPD screening integrated into all antenatal and postnatal PHC contacts; (2) community-based psychosocial support programmes targeting the perinatal period, with a specific focus on women lacking social support networks; (3) integration of family planning services into emergency maternal health packages; and (4) social protection mechanisms for pregnant and postpartum women in conflict settings.

# Declarations

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**Author Contributions:** A.M.C.E., N.M.O., and M.E.G. designed the study and obtained ethical approval. A.M.C.E. obtained permission from the local authorities and conducted the data collection. All authors contributed to the data analysis, drafting of the manuscript, and critical revision of the paper. All authors reviewed and approved the final version of the manuscript.

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**Ethics approval and consent to participate:** The study was conducted in accordance with the Declaration of Helsinki and approved by the Health Sciences Ethics Committee of Ankara Yıldırım Beyazıt University (Approval No: 2022-996). Additional institutional permissions were obtained from the Green Idlib Health Centre and Southren Atmeh Health Centre. Written informed consent was obtained from all participants prior to participation. Participants were informed about the purpose of the study, their right to decline or withdraw from participation at any time, and the confidentiality of their responses was strictly maintained.

**Consent for Publication:** Not applicable (no individual participant data).

**Availability of Data and Materials:** Anonymised data are available from the corresponding author on reasonable request.

**Competing Interests:** The authors declare no competing interests.

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# Figures

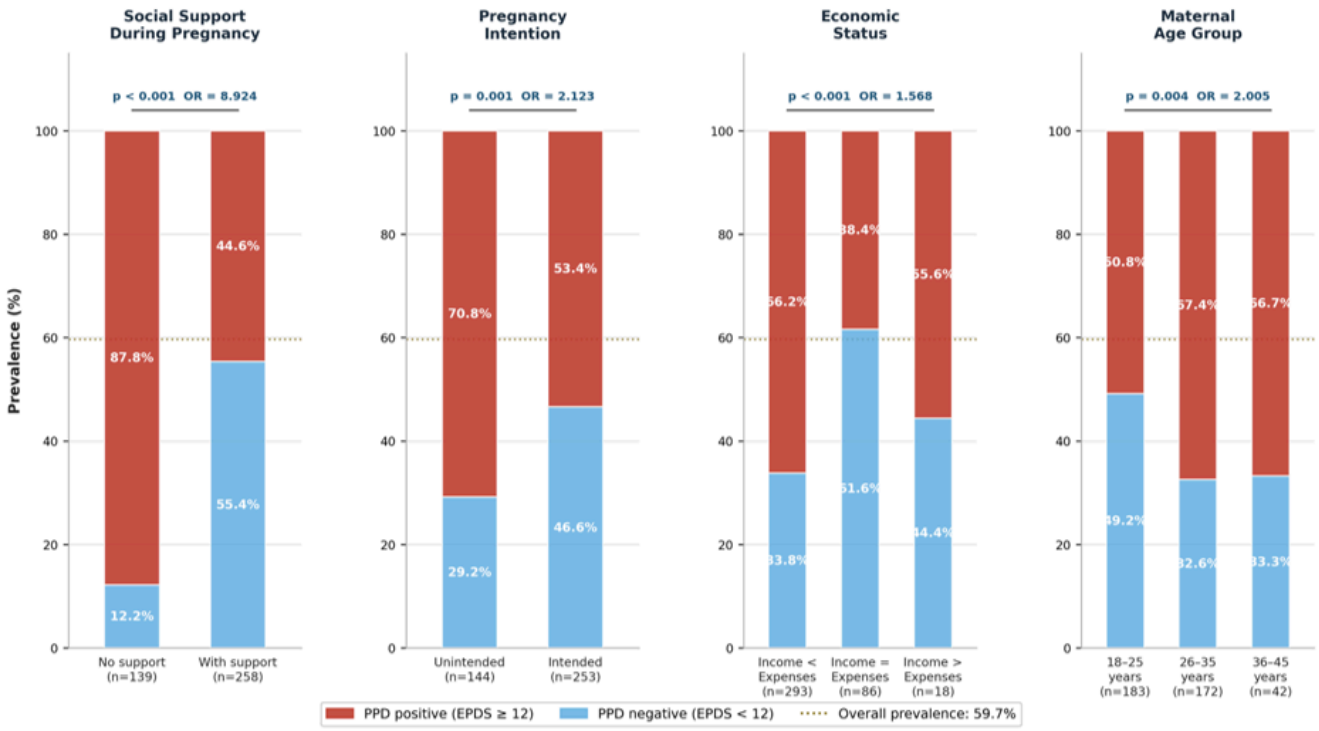
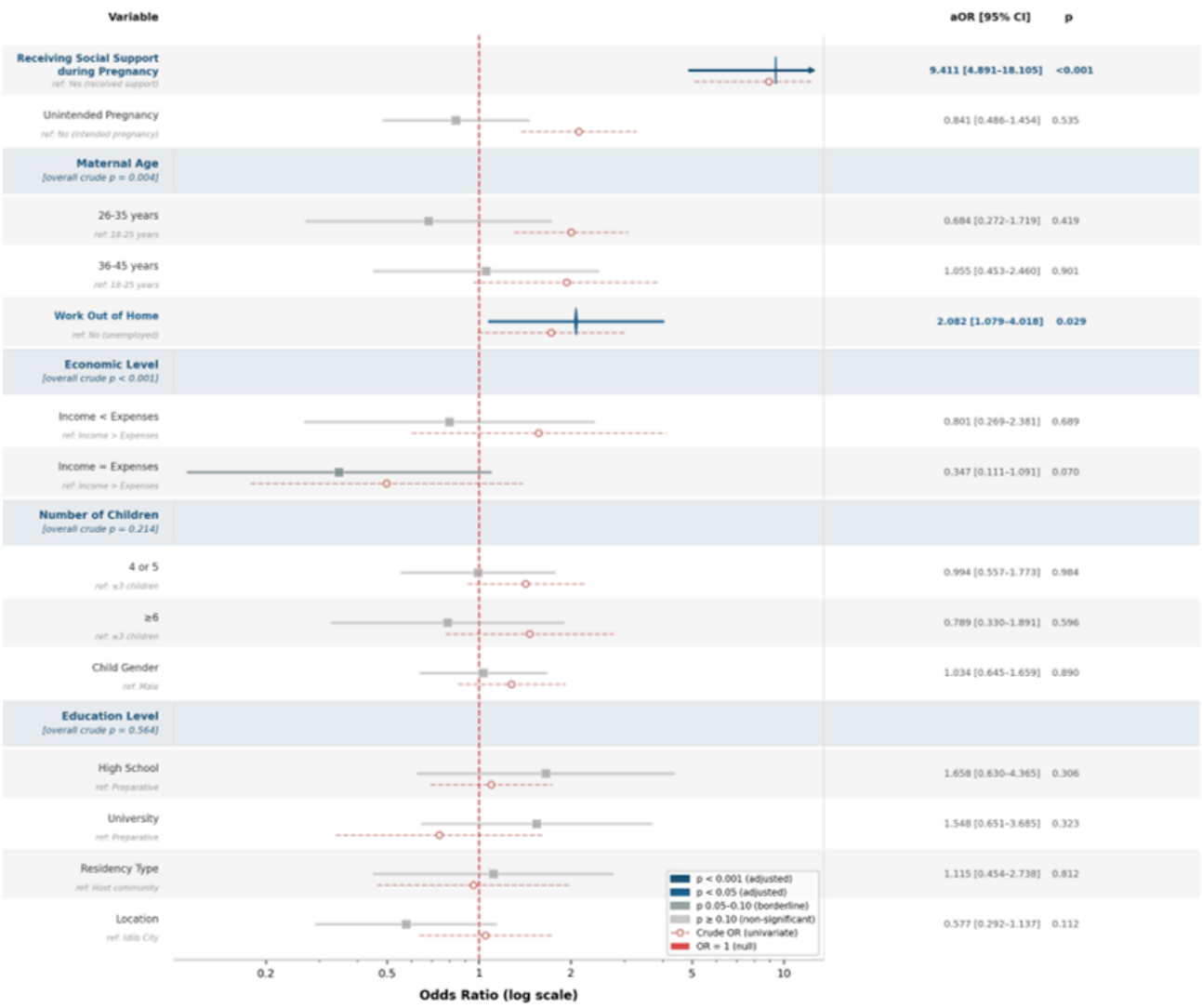



**Figure 1**

*PPD prevalence (%) stratified by four significant predictors: social support during pregnancy, pregnancy intention, economic status, and maternal age group (N=397). Stacked bars show PPD-positive vs. PPD-negative proportions. Dotted line = overall PPD prevalence (59.7%). p-values: Pearson chi-square; ORs: univariate logistic regression.*




## Figure 2

*Crude and adjusted odds ratios for factors associated with PPD (N=397). Filled markers (diamond/square) = adjusted ORs (multivariate); open circles (dashed) = crude ORs (univariate) overlaid for comparison. Blue = statistically significant in adjusted model (p<0.05). Arrow indicates CI extends beyond axis.*