# Unplanned pregnancy and risk of peripartum depression: a prospective cohort study in Saudi pregnant women attending antenatal care clinic

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**Background:** Few studies have been conducted on unintended pregnancies and peripartum depression in Saudi Arabia. This study aimed to evaluate the relationship between unplanned pregnancies and peripartum depression among pregnant women in Jeddah, Saudi Arabia.

**Methods:** This prospective cohort study included pregnant women attending an antenatal care clinic in 2021. The London Measure of Unplanned Pregnancy was used to assess the prevalence of unplanned pregnancy, and the Edinburgh Postnatal Depression Scale (EPDS) was used to assess antenatal and postnatal depression.

**Results:** A total of 236 participants were included, of which 25.8% had unplanned pregnancies, 36.0% had ambivalent pregnancies, and 38.1% had planned pregnancies. EPDS results revealed that 77.5% and 73.35% of the females were negative for antenatal and postnatal depression, respectively. A history of stressful events ($P = 0.001$), husband ($P = 0.020$), and family support ($P = 0.007$) was significantly associated with antenatal EPDS score, whereas age ($P = 0.005$), type of delivery ($P = 0.019$), and family support ($P = 0.031$) were significantly associated with the postnatal score.

**Conclusion:** Unplanned pregnancies may affect the perinatal mental health of women. We demonstrated the importance of family or husbands' support for women with perinatal depression. In addition, our research showed that pregnancy at an early age is a risk factor for postnatal depression. Therefore, these women should be closely monitored not only during their pregnancy but also during the first postpartum year.

**Keywords:** Edinburgh Postnatal Depression Scale, London Measurement of Unplanned Pregnancy, perinatal depression, unplanned pregnancy

## Introduction

Unplanned pregnancy is a term used to describe a wide range of pregnancy circumstances. A woman would be happy about an unplanned pregnancy if she was in a relationship that welcomed a kid, felt capable of caring for a child, or believed that the pregnancy fit within her general intentions for parenthood. Unplanned pregnancy, on the other hand, would be undesirable if

### HIGHLIGHTS

- This prospective cohort study included 236 pregnant women attending an antenatal clinic.
- The Edinburgh Postnatal Depression Scale (EPDS) was used to assess antenatal and postnatal depression.
- Based on the EPDS, 77.5% and 73.35% of subjects were negative for antenatal and postnatal depression, respectively.
- The London Measure of Unplanned Pregnancy was significantly associated with antenatal and postnatal EPDS scores.

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a woman believed it would affect her life plans, such as graduating, leaving a career, and marrying. Unplanned pregnancies can be classified according to the degree of pregnancy intention or the mother's emotional reaction to the pregnancy, such as happy, ambivalent, or unhappy[1]. Multiparity, young age, unemployment, and a history of abortion are risk factors associated with unplanned pregnancies[2]. According to a recent estimate of unintended pregnancy prevalence (2015–2019), 121 million (48%) pregnancies per year are unintended[3]. The rate of unintended pregnancies in the United States in 2011 was 45%[4]. A meta-analysis of 20 studies conducted in the Middle East found that 26% of pregnancies in Iranian women were unwanted or unplanned[5]. Studies in Saudi Arabia have revealed that an unplanned pregnancy is a significant barrier and is associated with multigravid parity and younger age groups[6,7]. Unwanted

pregnancy is known to have a negative impact on maternal and neonatal health. According to one study, women who had an unintended pregnancy had negative attitudes toward healthcare and were at a higher risk of developing antenatal depression[8]. In a prospective cohort study, females with unplanned pregnancies showed a 2.5-fold increase in the prevalence of perinatal depression[9]. According to the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V), peripartum depression is defined as a major depressive disorder that occurs during pregnancy or within 4 weeks after birth[10].

The American College of Obstetricians and Gynecologists (ACOG) recommends screening for depression and anxiety using a standardized, validated tool at least once during the perinatal and postpartum periods[11]. The Edinburgh Postnatal Depression Scale (EPDS) is recommended by the U.S. Preventive Services Task Force (USPSTF) for screening pregnant and postpartum women[12]. Cox et al.[13] developed the EPDS in 1987 to detect postpartum depression and it has been a validated tool for screening depression in the antepartum period[14].

A meta-analysis of 23 studies confirmed the reliability of the EPDS in detecting major depressive disorders in peripartum women[15]. Several studies have reported the prevalence of antenatal and postpartum depression in Arabic countries[16,17]. In a study conducted in the eastern province of Saudi Arabia in 2018, 26.8% of pregnant females reported depressive symptoms, with an increased prevalence among women with unplanned pregnancy[18]. In 2019, a cross-sectional study reported a lower rate of postpartum depression (20.9%)[19]. Few studies have been conducted on unplanned pregnancies and postpartum depression in Saudi Arabia[18–20]. Knowledge, epidemiological data, and the possible association between unplanned pregnancy and postpartum depression will contribute to and reinforce antenatal screening and counseling protocols. This study aimed to evaluate the relationship between unplanned pregnancies and peripartum depression among pregnant females attending antenatal clinics in Jeddah.

## Methods

### Study design, setting, and participants

This was a single-center prospective cohort study of pregnant women attending an antenatal care clinic in King Abdulaziz Medical City, Jeddah, in 2021, in agreement with the STROCSS 2021 guideline[21]. Adult (> 18-year-old) pregnant women attending a low-risk outpatient antenatal care clinic (no history of any medical condition, controlled medical comorbidities including asthma, pre-existing hypertension, and anemia) were eligible for inclusion in the study. The exclusion criteria included high-risk pregnancy (history of gestational diabetes mellitus, maternal autoimmune disease, consumption of teratogenic medications, twin pregnancy), history of mental illness or use of psychotropic medications, and refusal to give consent.

**Table 1**

**Socio-demographic characteristics of the studied population (N = 236)**

| Demographics | Count | % |
|---|---|---|
| Total | 236 | 100.0 |
| Age | | |
| 18–25 years | 91 | 38.6 |
| 26–35 years | 127 | 53.8 |
| 36–44 years | 18 | 7.6 |
| Level of education | | |
| Less than bachelor's degree | 85 | 36.0 |
| Bachelor's degree or above | 151 | 64.0 |
| Occupation | | |
| Unemployed | 191 | 80.9 |
| Employed | 15 | 6.4 |
| Student | 30 | 12.7 |
| Husband's occupation | | |
| Military | 215 | 91.1 |
| Non-military | 21 | 8.9 |
| Family monthly income | | |
| < 5000 SR | 105 | 44.5 |
| 5000–10 000 SR | 107 | 45.3 |
| 10 001–15 000 SR | 15 | 6.4 |
| > 15 000 SR | 9 | 3.8 |

SR, Saudi riyal.

**Table 2**

**Medical histories of the studied patients (N = 236)**

| Variables | Count | % |
|---|---|---|
| Total | 236 | 100.0 |
| Past medical history | | |
| No comorbidities | 211 | 89.4 |
| Hx of one comorbidity | 19 | 8.1 |
| Multiple comorbidites | 6 | 2.5 |
| Number of total pregnancies | | |
| Primigravida | 82 | 34.7 |
| Multigravida (> 1) | 154 | 65.3 |
| Number of total deliveries | | |
| Nulliparity | 96 | 40.7 |
| Multiparity (2 or more births) | 129 | 54.7 |
| Grand parity (> 5 births) | 11 | 4.7 |
| History of previous abortion | | |
| Yes | 63 | 26.7 |
| No | 173 | 73.3 |
| Gestational age at initial screening | | |
| 27–30 weeks | 54 | 22.9 |
| 31–35 weeks | 104 | 44.1 |
| 36–40 weeks | 77 | 32.6 |
| > 40 weeks | 1 | 0.4 |
| Type of delivery | | |
| Spontaneous vaginal delivery | 155 | 65.7 |
| Cesarean section | 66 | 28.0 |
| Instrumental delivery | 15 | 6.4 |
| Hx of maternal complications | | |
| Pre-eclampsia | 8 | 3.4 |
| Antepartum hemorrhage | 1 | 0.4 |
| Postpartum hemorrhage | 10 | 4.2 |
| None | 214 | 90.7 |
| Others | 3 | 1.3 |
| Hx of fetal complications | | |
| Pre-term <37 weeks | 7 | 3.0 |
| Low birth weight <25 kg | 11 | 4.7 |
| NICU admission | 21 | 8.9 |
| None | 194 | 82.2 |
| Others | 3 | 1.3 |

Hx, history; NICU, neonatal intensive care unit.

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**Pregnancy-related characteristics of the studied patients ($N = 236$)**

| Variables | Count | % |
|---|---|---|
| Total | 236 | 100.0 |
| History of any stressful life events? (death, accident, domestic violence, marital conflicts, victim of abuse) | | |
| No | 130 | 55.1 |
| Yes, in the last year | 39 | 16.5 |
| Yes, more than 1 year ago | 67 | 28.4 |
| Family hx of depression or other psychiatric illnesses: | | |
| Yes | 34 | 14.4 |
| No | 202 | 85.6 |
| My Husband is supportive of me during my pregnancy: | | |
| Strongly agree | 113 | 47.9 |
| Agree | 79 | 33.5 |
| Neutral | 28 | 11.9 |
| Disagree | 13 | 5.5 |
| Strongly disagree | 3 | 1.3 |
| My Family is supportive of me during my pregnancy: | | |
| Strongly agree | 129 | 54.7 |
| Agree | 85 | 36.0 |
| Neutral | 15 | 6.4 |
| Disagree | 5 | 2.1 |
| Strongly disagree | 2 | 0.8 |
| London measure of unplanned pregnancy LMUP | | |
| Unplanned pregnancy | 61 | 25.8 |
| Ambivalent | 85 | 36.0 |
| Planned pregnancy | 90 | 38.1 |
| Antenatal Edinburgh Postnatal Depression Scale (EPDS) | | |
| Positive for depression $\geq 13$ | 53 | 22.5 |
| Negative for depression <13 | 183 | 77.5 |
| Postnatal EPDS | | |
| Positive for depression $\geq 13$ | 63 | 26.7 |
| Negative for depression <13 | 173 | 73.3 |

LMUP, The London Measure of Unplanned Pregnancy.

### Sample size

Using the OpenEpi website, sample size calculation is done based on the prevalence of unplanned pregnancy and postpartum depression reported in a similar local study done in the Eastern region[18].



**Figure 1.** Summaries the distribution of antenatal and postnatal Edinburgh Postnatal Depression Scale (EPDS) for different pregnancy types. LMUP, London Measure of Unplanned Pregnancy; EPDS, Edinburgh Postnatal Depression Scale.

The sample size inputs were a ratio of 1.36 for unexposed to exposed, 19% for exposed with the outcome, an odds ratio of 2.42, an alpha error of 0.05, and a power of 80%. The study would require a total sample size of 236 patients using Fleiss with the CC formula.

### Data collection

Data collection sheets and structured questionnaires were used to collect data. A serial study code was used to identify participants. Information on the collection sheet was obtained from our institution's electronic medical records and included the following information (maternal medical history and obstetric history, including the number of previous pregnancies/abortions, type of delivery, and potential obstetric or neonatal complications of the current pregnancy). Participants were also interviewed in the antenatal care clinic using a structured questionnaire that included sociodemographic data (educational level, employment status, family income, husband, and family support) as well as information about pregnancy planning and peripartum depression.
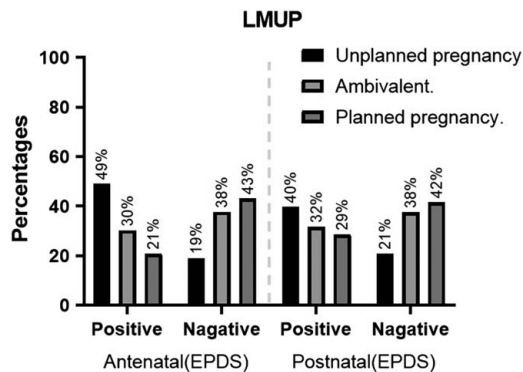
### Pregnancy planning assessment

The London Measure of Unplanned Pregnancy (LMUP) was used to assess the prevalence of unplanned pregnancy[22]. Each item consisted of six questions that addressed the following topics: contraception use, pregnancy timing, intention, desire to have a baby, partner discussions, and preconception preparation. Each response is scored from 0 to 2, with a maximum score of 12. A score of less than 3 indicated an unplanned pregnancy, a score of 4–9 indicated an ambivalent pregnancy, and a score of 10–12 indicated a planned pregnancy. The Arabic version was used because its validity and dependability have been confirmed in Saudi Arabia[23].

### Peripartum depression screening

The Edinburgh Postnatal Depression Scale (EPDS) was used to assess antenatal and postnatal depression. This is a 10-statement scale with four potential responses scored from 0 to 3 depending on severity, with a maximum total score of 30. We used the Arabic version of the EPDS that has been validated in an Emirati female population[24]. With a cutoff score of 13, depression was considered present. Following childbirth, the participants were interviewed between the third and fourth weeks of postpartum depression screening using the EPDS.

### Statistical analysis

SPSS (Statistical Package for the Social Sciences) version 26 (IBM Corporation, Armonk, New York, USA) was used to encode and present data. Using publicly available syntax, SPSS was used to calculate the overall and subscale scores on the Quality of Life Inventory – Disability (QLI-D). The frequencies and percentages of the categorical variables are presented. The QLI-D questionnaire scores were summarized using means and standard deviations. For categorical data with two or more levels, one-way ANOVA (Analysis of Variance) and unpaired $t$-tests were used to evaluate the association between sociodemographic characteristics and QLI-D scores (overall score and subscales). The association between sociodemographic characteristics, comorbidities, and QoL was assessed using Pearson's correlation coefficient. The

**Table 4**

**Association between the antenatal and postnatal Edinburgh Postnatal Depression Scale (EPDS) and London Measure of Unplanned Pregnancy (LMUP) among the studied patients (N = 236)**

| Variables | Total | London Measure of Unplanned Pregnancy (LMUP) | | | P |
| | | Unplanned pregnancy | Ambivalent | Planned pregnancy | |
| --- | --- | --- | --- | --- | --- |
| Total | 236 | 61 (25.8%) | 85 (36.0%) | 90 (38.1%) | — |
| Antenatal Edinburgh Postnatal Depression Scale (EPDS) | | | | | |
| Positive for depression ≥ 13 | 53 | 26 (49.1%) | 16 (30.2%) | 11 (20.8%) | < 0.001[a] |
| Negative for depression <13 | 183 | 35 (19.1%) | 69 (37.7%) | 79 (43.2%) | |
| Postnatal EPDS | | | | | |
| Positive for depression ≥ 13 | 63 | 25 (39.7%) | 20 (31.7%) | 18 (28.6%) | 0.012[a] |
| Negative for depression <13 | 173 | 36 (20.8%) | 65 (37.6%) | 72 (41.6%) | |

[a]Significant using Chi-square tests at <0.05 level.

average score for each domain was calculated by averaging the scores of items with no missing data.

## Results

A total of 236 respondents completed the questionnaires. Most females were aged 26–35 years (53.8%), unemployed (80.9%), had husbands working in the military (91.1%), and had a family monthly income of 5000–10 000 Saudi riyals (45.3%) (Table 1).

The medical history of the patients was also recorded. According to the findings shown in Table 2, 89.4% of females had no history of comorbidities, whereas only 8.1% had one comorbidity. In terms of total pregnancies and total deliveries, 65.3% were multigravida or females who became pregnant for the second time, and 54.7% were multiparous or had two or more births. Most females were in the 31–35 weeks of gestation (44.1%) at initial screening, and 65.7% of the females had spontaneous vaginal delivery. Most of the participants had no history of previous abortion (73.3%), maternal complications (90.7%), or fetal complications (82.2%).

In the present study, 55.1% of participants had no history of any stressful event, but 28.4% had one more than a year ago. In addition, 85.6% had no family history of depression or other psychiatric diseases. In terms of having support, most participants strongly agreed that their husbands and families were supportive during pregnancy, with rates of 47.9% and 54.7%, respectively. The London Measure of Unplanned Pregnancy (LMUP) was used to determine the prevalence of unplanned pregnancy. Results showed that only 25.8% of participants had an unplanned pregnancy, 36.0% had an ambivalent pregnancy, and 38.1% had a planned pregnancy. EPDS revealed that 77.5% and 73.35% of the females were negative for depression based on antenatal and postnatal EPDS, respectively (Table 3). Figure 1 illustrates the distribution of antenatal and postnatal EPDS based on LMUP results.

Statistical computations were performed to determine the factors contributing to antenatal and postnatal depression. Table 4 shows that LMUP was significantly associated with the antenatal (P < 0.001) and postnatal (P = 0.012) EPDS scores. Based on antenatal EPDS scores, only 49.1%, 30.2%, and 20.8% of respondents with an unplanned, ambivalent, or planned pregnancy were positive for depression, respectively. On the contrary, only 39.7%, 31.7%, and 28.6% of individuals with an unplanned, ambivalent, or planned pregnancy were positive for postnatal depression.

Associations were determined between sociodemographic characteristics, medical history of the participants, and LMUP. Only family income was associated with LMUP (P = 0.026) (Table 5).

The association of sociodemographic and medical history with antenatal and postnatal EPDS scores was explored in this study. Tables 6, 7 show that only a history of stressful events (P = 0.001), husbands (P = 0.020), and family support (P = 0.007) were significantly associated with antenatal EPDS.

Chi-square test at 0.05 significance level shows that age (P = 0.005), type of delivery (P = 0.019), and family support (P = 0.031) were significantly associated with postnatal depression. Further analysis revealed significant associations among ages 18–25 years, caesarian delivery, and postnatal depression (Table 8).

## Discussion

This study investigated unplanned pregnancies and the risk of perinatal depression in pregnant women in Jeddah, Saudi Arabia. LMUP scores showed that only 25.8% of participants had an unplanned pregnancy, which was lower than in Namibia (54.5%)[25], India (38.5%)[26], and the Eastern Province of Saudi Arabia (26.4%)[20], but higher than in the Netherlands (5.8%)[27] and Iran (18.2%)[28]. The observed differences in the results could be explained by differences in healthcare systems and cultural differences in sexual education and contraception use. It is possible that one geographical area has more healthcare institutions or that necessary interventions have been carried out within the geographical area. For example, in Namibia, family planning services are centered only on mothers and children and have limitations, especially for adolescents and males[25]. In the Netherlands, sex education programs are available in schools[27].

Studies have confirmed the association between unplanned pregnancy and higher rates of depression during and after pregnancy[27]. Faisal-Cury et al.[9] reported that women who had unplanned pregnancy were 2.5 times more likely to have depression than those who had planned pregnancy. In this study, 97% of the women were diagnosed or treated for depression. However, only 22.5% and 26.7% experienced antenatal and postnatal depression, respectively. This was lower than the findings of Atif et al.[29,] who found that 37% and 30% of Pakistani females reported prenatal and postnatal depression, respectively. In a study by Mersha et al.[30], 25.8% of females

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**Table 5**

**Association between the socio-demographic characteristics and London Measure of Unplanned Pregnancy (LMUP) among the studied patients (N = 236)**

| Variables | Total | London Measure of Unplanned Pregnancy (LMUP) | | | *P* |
|---|---|---|---|---|---|
| | | **Unplanned pregnancy** | **Ambivalent** | **Planned pregnancy** | |
| Total | 236 | 61 (25.8%) | 85 (36.0%) | 90 (38.1%) | — |
| Age | | | | | |
| 18–25 years | 91 | 27 (29.7%) | 31 (34.1%) | 33 (36.3%) | 0.327 |
| 26–35 years | 127 | 30 (23.6%) | 44 (34.6%) | 53 (41.7%) | |
| 36–44 years | 18 | 4 (22.2%) | 10 (55.6%) | 4 (22.2%) | |
| Level of education | | | | | |
| Less than bachelor's degree | 85 | 21 (24.7%) | 34 (40.0%) | 30 (35.3%) | 0.627 |
| Bachelor's degree or above | 151 | 40 (26.5%) | 51 (33.8%) | 60 (39.7%) | |
| Occupation | | | | | |
| Unemployed | 191 | 45 (23.6%) | 71 (37.2%) | 75 (39.3%) | 0.333 |
| Employed | 15 | 7 (46.7%) | 3 (20.0%) | 5 (33.3%) | |
| Student | 30 | 9 (30.0%) | 11 (36.7%) | 10 (33.3%) | |
| Husband's occupation | | | | | |
| Military | 215 | 52 (24.2%) | 82 (38.1%) | 81 (37.7%) | 0.057 |
| Non-military | 21 | 9 (42.9%) | 3 (14.3%) | 9 (42.9%) | |
| Family monthly income | | | | | |
| < 5000 SR | 105 | 27 (25.7%) | 43 (41.0%) | 35 (33.3%) | 0.026[a] |
| 5000–10 000 SR | 107 | 22 (20.6%) | 39 (36.4%) | 46 (43.0%) | |
| 10 001–15 000 SR | 15 | 8 (53.3%) | 3 (20.0%) | 4 (26.7%) | |
| > 15 000 SR | 9 | 4 (44.4%) | 0 (0.0%) | 5 (55.6%) | |
| Past medical history | | | | | |
| No comorbidities | 211 | 51 (24.2%) | 80 (37.9%) | 80 (37.9%) | 0.337 |
| Hx of one comorbidity | 19 | 8 (42.1%) | 4 (21.1%) | 7 (36.8%) | |
| Multiple comorbidites | 6 | 2 (33.3%) | 1 (16.7%) | 3 (50.0%) | |
| Number of total pregnancies | | | | | |
| Primigravida | 82 | 19 (23.2%) | 31 (37.8%) | 32 (39.0%) | 0.784 |
| Multigravida (> 1) | 154 | 42 (27.3%) | 54 (35.1%) | 58 (37.7%) | |
| Number of total deliveries | | | | | |
| Nulliparity | 96 | 21 (21.9%) | 36 (37.5%) | 39 (40.6%) | 0.264 |
| Multiparity (2 or more births) | 129 | 36 (27.9%) | 43 (33.3%) | 50 (38.8%) | |
| Grand parity (> 5 births) | 11 | 4 (36.4%) | 6 (54.5%) | 1 (9.1%) | |
| History of previous abortion | | | | | |
| Yes | 63 | 14 (22.2%) | 25 (39.7%) | 24 (38.1%) | 0.685 |
| No | 173 | 47 (27.2%) | 60 (34.7%) | 66 (38.2%) | |
| Gestational age at initial screening | | | | | |
| 27–30 weeks | 54 | 13 (24.1%) | 19 (35.2%) | 22 (40.7%) | 0.560 |
| 31–35 weeks | 104 | 26 (25.0%) | 34 (32.7%) | 44 (42.3%) | |
| 36–40 weeks | 77 | 22 (28.6%) | 32 (41.6%) | 23 (29.9%) | |
| > 40 wk | 1 | 0 (0.0%) | 0 (0.0%) | 1 (100.0%) | |
| Type of delivery | | | | | |
| Spontaneous vaginal delivery | 155 | 44 (28.4%) | 57 (36.8%) | 54 (34.8%) | 0.186 |
| Cesarean section | 66 | 13 (19.7%) | 26 (39.4%) | 27 (40.9%) | |
| Instrumental delivery | 15 | 4 (26.7%) | 2 (13.3%) | 9 (60.0%) | |
| Hx of maternal complications | | | | | |
| Pre-eclampsia | 8 | 0 (0.0%) | 4 (50.0%) | 4 (50.0%) | 0.087 |
| Antepartum hemorrhage | 1 | 1 (100.0%) | 0 (0.0%) | 0 (0.0%) | |
| Postpartum hemorrhage | 10 | 0 (0.0%) | 7 (70.0%) | 3 (30.0%) | |
| None | 214 | 59 (27.6%) | 74 (34.6%) | 81 (37.9%) | |
| Others | 3 | 1 (33.3%) | 0 (0.0%) | 2 (66.7%) | |
| Hx of fetal complications | | | | | |
| Pre-term <37 weeks | 7 | 0 (0.0%) | 5 (71.4%) | 2 (28.6%) | 0.244 |
| Low birth weight <25 kg | 11 | 2 (18.2%) | 2 (18.2%) | 7 (63.6%) | |
| NICU admission | 21 | 7 (33.3%) | 6 (28.6%) | 8 (38.1%) | |
| None | 194 | 51 (26.3%) | 70 (36.1%) | 73 (37.6%) | |
| Others | 3 | 1 (33.3%) | 2 (66.7%) | 0 (0.0%) | |
| History of any stressful life events? (death, accident, domestic violence, marital conflicts, victim of abuse) | | | | | |
| No | 130 | 26 (20.0%) | 48 (36.9%) | 56 (43.1%) | 0.099 |
| Yes, in the last year | 39 | 16 (41.0%) | 12 (30.8%) | 11 (28.2%) | |
| Yes, more than 1 year ago | 67 | 19 (28.4%) | 25 (37.3%) | 23 (34.3%) | |

**Table 5**

(*Continued*)

| Variables | Total | London Measure of Unplanned Pregnancy (LMUP) | | | P |
|---|---|---|---|---|---|
| | | Unplanned pregnancy | Ambivalent | Planned pregnancy | |
| Family hx of depression or other psychiatric illnesses: | | | | | |
| Yes | 34 | 9 (26.5%) | 10 (29.4%) | 15 (44.1%) | 0.651 |
| No | 202 | 52 (25.7%) | 75 (37.1%) | 75 (37.1%) | |
| My Husband is supportive of me during my pregnancy: | | | | | |
| Strongly agree | 113 | 24 (21.2%) | 38 (33.6%) | 51 (45.1%) | 0.238 |
| Agree | 79 | 22 (27.8%) | 29 (36.7%) | 28 (35.4%) | |
| Neutral | 28 | 7 (25.0%) | 13 (46.4%) | 8 (28.6%) | |
| Disagree | 13 | 6 (46.2%) | 4 (30.8%) | 3 (23.1%) | |
| Strongly disagree | 3 | 2 (66.7%) | 1 (33.3%) | 0 (0.0%) | |
| My Family is supportive of me during my pregnancy: | | | | | |
| Strongly agree | 129 | 30 (23.3%) | 45 (34.9%) | 54 (41.9%) | 0.685 |
| Agree | 85 | 23 (27.1%) | 34 (40.0%) | 28 (32.9%) | |
| Neutral | 15 | 6 (40.0%) | 3 (20.0%) | 6 (40.0%) | |
| Disagree | 5 | 2 (40.0%) | 2 (40.0%) | 1 (20.0%) | |
| Strongly disagree | 2 | 0 (0.0%) | 1 (50.0%) | 1 (50.0%) | |

[a]Significant using Chi-square tests at <0.05 level.

Hx, history; NICU, neonatal intensive care unit; SR, Saudi riyal.

suffer from perinatal depression, with unplanned pregnancy being one of the leading causes.

This study also explored the factors and variables associated with prenatal depression. Previous research has found that multiparity, young age, unemployment, and a history of abortion are risk factors for unplanned pregnancy. According to Goossens et al.[31], multiparity, low education, being unmarried, experiencing domestic violence from a partner, and a history of substance abuse are all associated with fewer planned pregnancies. The results of the current study indicated that only a history of stressful events ($P = 0.001$), husband ($P = 0.020$), and family support ($P = 0.007$) were significantly associated with antenatal EPDS. Age ($P = 0.005$), delivery type ($P = 0.019$), and family support ($P = 0.031$) were significantly associated with postpartum depression. The results for antenatal depression are similar to the results found in studies by Dadi et al.[32] and Yin et al.[33]. Postnatal results in the current study are somewhat similar to those of Atuhaire et al.[34], wherein postpartum depression was associated with five factors, including limited relative social assistance, HIV status, rural residence, perinatal complications, and excessive crying of the baby. However, Inthaphatha et al.[35]'s cross-sectional study found that unplanned pregnancy, low birth satisfaction, and prenatal depression were distinct risk factors for postnatal depression.

Notably, in this study, family or husband support was significantly associated with antenatal and postnatal depression. Previous research suggests a connection between social support and perinatal depression. Depression has been reported to be inversely related to social support in pregnant women, with women with lower family support reporting more symptoms than those with higher family support[36]. Furthermore, studies have shown that a lack of high social support is a risk factor for postnatal depression[37].

In addition to social support, the study showed a correlation between ages 18–25 years old, cesarean delivery, and postnatal depression. Similar findings were found in a study by Bradshaw et al.[38] in which 18–24-year-old females reported the highest depression symptoms. Silverman et al.[39] reported that young women and cesarian deliveries have an increased risk of postpartum depression.

This study resolves the numerous limitations of previous research on this topic. The researchers prospectively investigated the relationship between pregnancy intention, as measured by the LMUP, a tool used to measure the prevalence of unplanned pregnancies with defined psychometric properties, and subsequent maternal and neonatal outcomes. One of the strengths of this study is the large number of participants and numerous assessments, which allowed us to assess the impact of potential confounding factors.

This study had several limitations. First, most women in the study had a non-complicated pregnancy, which may explain the lower incidence of perinatal depression in our sample. The relationship between pregnancy intention and perinatal depression may differ between women with pre-term births and those with complicated pregnancies.

## Conclusion

According to the LMUP results, only 25.8% of participants had an unplanned pregnancy. A history of stressful events, husbands' support, and family support were associated with antenatal EPDS results, whereas age, delivery type, and family support were associated with postnatal EPDS scores. Our findings indicate that unplanned pregnancies may affect perinatal mental health. Furthermore, this study demonstrated the importance of family or husbands' support for women with perinatal depression. Additionally, research has shown that young age during pregnancy could be a cause of postnatal depression. A significant clinical implication of our findings is that these women should be closely monitored not only during pregnancy but also during the first postpartum year.

## Ethics approval

Ethical standards established by institutional and national research committees, the 1964 Helsinki Declaration and its

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**Table 6**

**Association between the socio-demographic characteristics and the antenatal Edinburgh Postnatal Depression Scale (EPDS) among the studied patients ($N = 236$).**

| Variables | Total | Antenatal (EPDS) | | P |
| --- | --- | --- | --- | --- |
| | | Positive | Negative | |
| Total | 236 | 53 (22.5%) | 183 (77.5%) | — |
| Age | | | | |
| 18–25 years | 91 | 27 (29.7%) | 64 (70.3%) | 0.062 |
| 26–35 years | 127 | 21 (16.5%) | 106 (83.5%) | |
| 36–44 years | 18 | 5 (27.8%) | 13 (72.2%) | |
| Level of education | | | | |
| Less than bachelor's degree | 85 | 18 (21.2%) | 67 (78.8%) | 0.723 |
| Bachelor's degree or above | 151 | 35 (23.2%) | 116 (76.8%) | |
| Occupation | | | | |
| Unemployed | 191 | 40 (20.9%) | 151 (79.1%) | 0.500 |
| Employed | 15 | 4 (26.7%) | 11 (73.3%) | |
| Student | 30 | 9 (30.0%) | 21 (70.0%) | |
| Husband's occupation | | | | |
| Military | 215 | 48 (22.3%) | 167 (77.7%) | 0.876 |
| Non-military | 21 | 5 (23.8%) | 16 (76.2%) | |
| Family monthly income | | | | |
| < 5000 SR | 105 | d (24.8%) | 79 (75.2%) | 0.715 |
| 5000–10 000 SR | 107 | 22 (20.6%) | 85 (79.4%) | |
| 10 001–15 000 SR | 15 | 4 (26.7%) | 11 (73.3%) | |
| > 15 000 SR | 9 | 1 (11.1%) | 8 (88.9%) | |
| Past medical history | | | | |
| No comorbidities | 211 | 47 (22.3%) | 164 (77.7%) | 0.266 |
| Hx of one comorbidity | 19 | 6 (31.6%) | 13 (68.4%) | |
| Multiple comorbidites | 6 | 0 (0.0%) | 6 (100.0%) | |
| Number of total pregnancies | | | | |
| Primigravida | 82 | 15 (18.3%) | 67 (81.7%) | 0.263 |
| Multigravida (> 1) | 154 | 38 (24.7%) | 116 (75.3%) | |
| Number of total deliveries | | | | |
| Nulliparity | 96 | 17 (17.7%) | 79 (82.3%) | 0.238 |
| Multiparity (2 or more births) | 129 | 32 (24.8%) | 97 (75.2%) | |
| Grand parity (> 5 births) | 11 | 4 (36.4%) | 7 (63.6%) | |
| History of previous abortion | | | | |
| Yes | 63 | 17 (27.0%) | 46 (73.0%) | 0.315 |
| No | 173 | 36 (20.8%) | 137 (79.2%) | |
| Gestational age at initial screening | | | | |
| 27–30 weeks | 54 | 10 (18.5%) | 44 (81.5%) | 0.799 |
| 31–35 weeks | 104 | 24 (23.1%) | 80 (76.9%) | |
| 36–40 weeks | 77 | 19 (24.7%) | 58 (75.3%) | |
| > 40 weeks | 1 | 0 (0.0%) | 1 (100.0%) | |
| Type of delivery | | | | |
| Spontaneous vaginal delivery | 155 | d (25.8%) | 115 (74.2%) | 0.225 |
| Cesarean section | 66 | 11 (16.7%) | 55 (83.3%) | |
| Instrumental delivery | 15 | 2 (13.3%) | 13 (86.7%) | |
| Hx of maternal complications | | | | |
| Pre-eclampsia | 8 | 0 (0.0%) | 8 (100.0%) | 0.567 |
| Antepartum hemorrhage | 1 | 0 (0.0%) | 1 (100.0%) | |
| Postpartum hemorrhage | 10 | 2 (20.0%) | 8 (80.0%) | |
| None | 214 | 50 (23.4%) | 164 (76.6%) | |
| Others | 3 | 1 (33.3%) | 2 (66.7%) | |
| Hx of fetal complications | | | | |
| Pre-term <37 weeks | 7 | 1 (14.3%) | 6 (85.7%) | 0.855 |
| Low birth weight <25 kg | 11 | 2 (18.2%) | 9 (81.8%) | |
| NICU admission | 21 | 5 (23.8%) | 16 (76.2%) | |
| None | 194 | 45 (23.2%) | 149 (76.8%) | |
| Others | 3 | 0 (0.0%) | 3 (100.0%) | |
| History of any stressful life events? (death, accident, domestic violence, marital conflicts, victim of abuse) | | | | |
| No | 130 | 19 (14.6%) | 111 (85.4%) | 0.001[a] |
| Yes, in the last year | 39 | 17 (43.6%) | 22 (56.4%) | |
| Yes, more than 1 year ago | 67 | 17 (25.4%) | 50 (74.6%) | |

## Table 6

**(Continued)**

| Variables | Total | Antenatal (EPDS) | | P |
|---|---|---|---|---|
| | | **Positive** | **Negative** | |
| Family hx of depression or other psychiatric illnesses: | | | | |
| Yes | 34 | 8 (23.5%) | 26 (76.5%) | 0.871 |
| No | 202 | 45 (22.3%) | 157 (77.7%) | |
| My Husband is supportive of me during my pregnancy: | | | | |
| Strongly agree | 113 | d (14.2%) | 97 (85.8%) | 0.020ᵃ |
| Agree | 79 | 22 (27.8%) | 57 (72.2%) | |
| Neutral | 28 | 8 (28.6%) | 20 (71.4%) | |
| Disagree | 13 | 5 (38.5%) | 8 (61.5%) | |
| Strongly disagree | 3 | 2 (66.7%) | 1 (33.3%) | |
| My Family is supportive of me during my pregnancy: | | | | |
| Strongly agree | 129 | 19 (14.7%) | 110 (85.3%) | 0.007ᵃ |
| Agree | 85 | 29 (34.1%) | 56 (65.9%) | |
| Neutral | 15 | 5 (33.3%) | 10 (66.7%) | |
| Disagree | 5 | 0 (0.0%) | 5 (100.0%) | |
| Strongly disagree | 2 | 0 (0.0%) | 2 (100.0%) | |

[a]Significant using Chi-square tests at <0.05 level.
Hx, history; NICU, neonatal intensive care unit; SR, Saudi riyal.

## Table 7

**Predictors of antenatal Edinburgh Postnatal Depression Scale (EPDS) among the studied patients.**

| Variables in the equation | | | | 95% CI for Exp (B) | | |
|---|---|---|---|---|---|---|
| **Dependent variable: antenatal (EPDS)** | **B** | **SE** | **Exp (B)** | **Lower** | **Upper** | **P** |
| Step 1ᵃ | | | | | | |
| History of any stressful life events? | | | | | | 0.005ᵇ |
| History of any stressful life events? (No) | 0.372 | 0.408 | 1.450 | 0.652 | 3.223 | 0.362 |
| History of any stressful life events? (Yes, in the last year) | −1.100 | 0.471 | 0.333 | 0.132 | 0.838 | 0.020ᵇ |
| My Husband is supportive of me during my pregnancy | | | | | | 0.087 |
| My Husband is supportive of me during my pregnancy (Strongly agree) | 2.766 | 1.276 | 15.890 | 1.303 | 193.770 | 0.030ᵇ |
| My Husband is supportive of me during my pregnancy (Agree) | 2.924 | 1.331 | 18.621 | 1.371 | 252.845 | 0.028ᵇ |
| My Husband is supportive of me during my pregnancy (Neutral) | 2.900 | 1.376 | 18.181 | 1.225 | 269.895 | 0.035ᵇ |
| My Husband is supportive of me during my pregnancy (Disagree) | 1.449 | 1.442 | 4.260 | 0.252 | 71.907 | 0.315 |
| My Family is supportive of me during my pregnancy | | | | | | 0.088 |
| My Family is supportive of me during my pregnancy (Strongly agree) | −19.685 | 27 534.192 | 0.000 | 0.000 | | 0.999 |
| My Family is supportive of me during my pregnancy (Agree) | −20.952 | 27 534.192 | 0.000 | 0.000 | | 0.999 |
| My Family is supportive of me during my pregnancy (Neutral) | −20.962 | 27 534.192 | 0.000 | 0.000 | | 0.999 |
| My Family is supportive of me during my pregnancy (Disagree) | 1.078 | 32 099.358 | 2.940 | 0.000 | | > 0.999 |
| Constant | 18.863 | 27 534.192 | 155 638 917.538 | | | 0.999 |

[a]Variable(s) entered on step 1: History of any stressful life events?, My Husband is supportive of me during my pregnancy, My Family is supportive of me during my pregnancy.
[b]Significant using Binary Logistic Regression Model, with Backward Conditional Elimination with Enter Criteria = 0.05, Elimination = 0.10.

associated regulations, and comparable ethical principles were followed in this cross-sectional study involving human subjects. The Institutional Review Board of King Abdullah International Medical Research Center, Riyadh, Saudi Arabia, approved this study, with reference number IRBC/1793/21 and protocol registration number NRJ21J/136/06.

## Consent

All study participants provided written informed consent before agreeing to participate.

## Author contribution

All authors contributed to the conception and design of this study. The materials were prepared, data were gathered, and the analysis was carried out by Imtinan Khalid Alsahafi, Eman Alblady, and Layan Shaker Alahmadi. The first draft of the paper

**Table 8**

Association between the socio-demographic characteristics and the postnatal Edinburgh Postnatal Depression Scale (EPDS) among the studied patients ($N = 236$).

| Variables | Total | Postnatal (EPDS) | | P |
| --- | --- | --- | --- | --- |
| | | Positive | Negative | |
| Total | 236 | 63 (26.7%) | 173 (73.3%) | — |
| Age | | | | |
| 18–25 years | 91 | 34 (37.4%) | 57 (62.6%) | 0.005[a] |
| 26–35 years | 127 | 28 (22.0%) | 99 (78.0%) | |
| 36–44 years | 18 | 1 (5.6%) | 17 (94.4%) | |
| Level of education | | | | |
| Less than bachelor's degree | 85 | 19 (22.4%) | 66 (77.6%) | 0.258 |
| Bachelor's degree or above | 151 | 44 (29.1%) | 107 (70.9%) | |
| Occupation | | | | |
| Unemployed | 191 | 48 (25.1%) | 143 (74.9%) | 0.414 |
| Employed | 15 | 6 (40.0%) | 9 (60.0%) | |
| Student | 30 | 9 (30.0%) | 21 (70.0%) | |
| Husband's occupation | | | | |
| Military | 215 | 56 (26.0%) | 159 (74.0%) | 0.471 |
| Non-military | 21 | 7 (33.3%) | 14 (66.7%) | |
| Family monthly income | | | | |
| < 5000 SR | 105 | 29 (27.6%) | 76 (72.4%) | 0.411 |
| 5000–10 000 SR | 107 | 28 (26.2%) | 79 (73.8%) | |
| 10 001–15 000 SR | 15 | 2 (13.3%) | 13 (86.7%) | |
| > 15 000 SR | 9 | 4 (44.4%) | 5 (55.6%) | |
| Past medical history | | | | |
| No comorbidities | 211 | 58 (27.5%) | 153 (72.5%) | 0.710 |
| Hx of one comorbidity | 19 | 4 (21.1%) | 15 (78.9%) | |
| Multiple comorbidites | 6 | 1 (16.7%) | 5 (83.3%) | |
| Number of total pregnancies | | | | |
| Primigravida | 82 | 25 (30.5%) | 57 (69.5%) | 0.336 |
| Multigravida (> 1) | 154 | 38 (24.7%) | 116 (75.3%) | |
| Number of total deliveries | | | | |
| Nulliparity | 96 | 28 (29.2%) | 68 (70.8%) | 0.115 |
| Multiparity (2 or more births) | 129 | 35 (27.1%) | 94 (72.9%) | |
| Grand parity (> 5 births) | 11 | 0 (0.0%) | 11 (100.0%) | |
| History of previous abortion | | | | |
| Yes | 63 | 18 (28.6%) | 45 (71.4%) | 0.694 |
| No | 173 | 45 (26.0%) | 128 (74.0%) | |
| Gestational age at initial screening | | | | |
| 27–30 weeks | 54 | 12 (22.2%) | 42 (77.8%) | 0.693 |
| 31–35 weeks | 104 | 31 (29.8%) | 73 (70.2%) | |
| 36–40 weeks | 77 | 20 (26.0%) | 57 (74.0%) | |
| > 40 weeks | 1 | 0 (0.0%) | 1 (100.0%) | |
| Type of delivery | | | | |
| Spontaneous vaginal delivery | 155 | 43 (27.7%) | 112 (72.3%) | 0.019[a] |
| Cesarean section | 66 | 12 (18.2%) | 54 (81.8%) | |
| Instrumental delivery | 15 | 8 (53.3%) | 7 (46.7%) | |

| | | | | |
|---|---|---|---|---|
| Hx of maternal complications | | | | |
| Pre-eclampsia | 8 | 4 (50.0%) | 4 (50.0%) | 0.166 |
| Antepartum hemorrhage | 1 | 0 (0.0%) | 1 (100.0%) | |
| Postpartum hemorrhage | 10 | 1 (10.0%) | 9 (90.0%) | |
| None | 214 | 56 (26.2%) | 158 (73.8%) | |
| Others | 3 | 2 (66.7%) | 1 (33.3%) | |
| Hx of fetal complications | | | | |
| Pre-term <37 weeks | 7 | 1 (14.3%) | 6 (85.7%) | 0.872 |
| Low birth weight <25 kg | 11 | 4 (36.4%) | 7 (63.6%) | |
| NICU admission | 21 | 5 (23.8%) | 16 (76.2%) | |
| None | 194 | 52 (26.8%) | 142 (73.2%) | |
| Others | 3 | 1 (33.3%) | 2 (66.7%) | |
| History of any stressful life events? (death, accident, domestic violence, marital conflicts, victim of abuse) | | | | |
| No | 130 | 27 (20.8%) | 103 (79.2%) | 0.054 |
| Yes, in the last year | 39 | 15 (38.5%) | 24 (61.5%) | |
| Yes, more than 1 year ago | 67 | 21 (31.3%) | 46 (68.7%) | |
| Family hx of depression or other psychiatric illnesses: | | | | |
| Yes | 34 | 13 (38.2%) | 21 (61.8%) | 0.100 |
| No | 202 | 50 (24.8%) | 152 (75.2%) | |
| My Husband is supportive of me during my pregnancy: | | | | |
| Strongly agree | 113 | 27 (23.9%) | 86 (76.1%) | 0.241 |
| Agree | 79 | 24 (30.4%) | 55 (69.6%) | |
| Neutral | 28 | 5 (17.9%) | 23 (82.1%) | |
| Disagree | 13 | 5 (38.5%) | 8 (61.5%) | |
| Strongly disagree | 3 | 2 (66.7%) | 1 (33.3%) | |
| My Family is supportive of me during my pregnancy: | | | | |
| Strongly agree | 129 | 29 (22.5%) | 100 (77.5%) | 0.031[a] |
| Agree | 85 | 24 (28.2%) | 61 (71.8%) | |
| Neutral | 15 | 6 (40.0%) | 9 (60.0%) | |
| Disagree | 5 | 4 (80.0%) | 1 (20.0%) | |
| Strongly disagree | 2 | 0 (0.0%) | 2 (100.0%) | |

[a]Significant using Chi-square tests at <0.05 level.

Hx, history; NICU, neonatal intensive care unit; SR, Saudi riyal.

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was written by Sultan Fahad Magliah and earlier drafts were reviewed by all authors. All authors examined and approved the final draft.

## Conflicts of interest disclosure

The authors declare that there are no conflicts of interest.

## Research registration unique identifying number (UIN)

1. Name of the registry: Research Registry http://www.researchregistry.com.
2. Unique identifying number or registration ID: researchregistry 9510.
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): https://researchregistry. knack.com/research-registry#user-researchregistry/registerre searchdetails/6500a93989b2af0027794524/.

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## Data availability statement

The datasets generated and analyzed during the current study are not publicly available because the data are contained within our hospital's electronic medical records but are available from the corresponding author upon reasonable request.

## Provenance and peer review

Not invited paper.

## Acknowledgements

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