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**Abstract**

**Objective:** (a) to assess prevalence of depression, anxiety and Post-traumatic Stress Disorder (PTSD) and their comorbidity among women during the perinatal period (b) to examine course of those disorders from pregnancy to six months postpartum (c) to determine the rates of new-onset cases at 4-6 weeks and 6 months postpartum.

**Design:** A longitudinal population-based study in which participants completed psychosocial measures of depression, anxiety and PTSD in pregnancy ( $n = 950$ ), 4-6 weeks ( $n = 858$ ) and 6 months ( $n = 829$ ) after birth.

**Setting:** A consecutive sample of pregnant women were recruited from three maternity hospitals in three cities of Turkey: Istanbul, Ankara and Izmir.

**Measures:** Edinburgh Postnatal Depression Scale (EPDS), Hospital Anxiety and Depression Scale (HADS), and Posttraumatic Diagnostic Scale (PDS) were used to assess depression, anxiety and PTSD, respectively.

**Findings:** Depression and PTSD peaks at 4-6 weeks postpartum and then fell at 6 months postpartum, whereas anxiety followed a gradually declining linear-pattern from pregnancy to 6 months postpartum. The prevalence of depression was 14.6% in pregnancy, 32.6% at 4-6 weeks and 18.5% at 6 months postpartum, respectively. The prevalence of PTSD was 5.8% in pregnancy, 11.9% at 4-6 weeks postpartum and 9.2% at 6 months postpartum. Anxiety was highest in pregnancy (29.6%) and then decreased to 24.6% 4-6 weeks after birth and to 16.2% 6 months after birth. New-onset cases were most apparent at 4-6 weeks postpartum: 24.6% for depression; 13.7% for anxiety and 8.9% for PTSD.

**Key conclusions:** A relatively high prevalence of psychological disorders was identified during the perinatal period. Anxiety was most prevalent in pregnancy, and depression and PTSD were highest at 4-6 weeks postpartum. Depression was more common than anxiety 4-6 weeks and 6 months after birth and highly comorbid with anxiety throughout this period. New-onset cases were observed at both 4-6 weeks and 6 months postpartum.

**Implications:** High rates of affective disorders in pregnancy and after birth highlight three main points: first, it is important to have effective perinatal screening to identify women with psychological needs; second, providing early treatment to women experiencing severe psychological problems is essential to ensure psychological well-being of those women and to prevent chronicity; and finally, psychosocial screening and interventions should be offered until at least 6 months after birth to catch new-onset cases.

**Keywords:** Perinatal mental health, depression, anxiety, PTSD, pregnancy, postpartum

**Introduction**

Perinatal affective disorders are common and constitute a significant health problem all over the world. There has been a growing interest in mental health during pregnancy and after birth in recent years, yet relatively little is known about women from Middle East countries, including Turkey (Klainin and Arthur, 2009; O'Mahony et al., 2010). There are significant differences between countries in awareness, prevalence rates, and treatment of perinatal mental health disorders (Rahman et al., 2013). Consequently, the World Health Organization (WHO) has developed an action plan to ensure the effective provision of perinatal mental health care and the equity of outcomes across the world (WHO, 2013). A review of women's mental health in pregnancy and after birth carried out by the WHO, found that women in low- and middle-income countries are at increased risk with an average prevalence of 16% reporting prenatal and 20% reporting postnatal psychological disorders (Fisher et al., 2012).

Common perinatal mental health disorders include depression, anxiety and PTSD. Depression is broadly defined as a state of low mood or loss of pleasure or interest in activities, while anxiety is generally characterized by feelings of tension, worried thoughts and physical changes (American Psychiatric Association, 2013). Post-traumatic stress disorder (PTSD) refers to a cluster of psychological symptoms that develop following exposure to a severe stressor or traumatic event (Fink, 2010).

Despite being well-recognized, studies on perinatal affective disorders have predominantly focused on postpartum depression. There are therefore gaps in the literature in both high and low income countries (Howard et al., 2014). First, perinatal anxiety has been far less researched compared to perinatal depression (Agius et al., 2016; Goodman et al., 2016), although there is adequate evidence that anxiety may be as or more prevalent than depression during the perinatal period (Brockington et al., 2006; Fairbrother et al., 2016; Lee et al., 2007; Paul et al., 2013). A recent review reported that the prevalence of anxiety disorder is

## **Running head: PERINATAL MENTAL HEALTH**

15.8% in pregnancy and 17.1% after birth (Fairbrother et al., 2016). Two other reviews also found that anxiety disorders are diagnosed in between 4% and 39% of pregnant women and 8.5% of postpartum women (Goodman et al., 2016, 2014). Both pre- and postpartum anxiety are associated with an adverse impact on maternal and child health (Alder et al., 2007; Ding et al., 2014; Dunkel Schetter and Tanner, 2012; Glover, 2015).

Second, there is increasing evidence women may have PTSD in pregnancy and develop PTSD as a result of a traumatic birth. A recent review found the prevalence of PTSD was 3.3% in pregnancy and 4% after birth (Yildiz et al., 2017). However, most research on perinatal PTSD using diagnostic measures has been conducted in Western countries (Yildiz et al., 2017). The course of PTSD after birth also remains little understood (McKenzie-McHarg et al., 2015).

Third, even though previous literature on the comorbidity of depression, anxiety and PTSD is abundant in different populations, particularly in war veterans (Ginzburg et al., 2010), there is a lack of research on the comorbidity of depression, anxiety and PTSD in perinatal period (Agius et al., 2016; Reck et al., 2009). In a recent review, three studies were identified examining the triple co-existence of depression, anxiety and PTSD after birth and the prevalence was found as ranging from 2% to 3%; (Agius et al., 2016). However, no study investigating the triple comorbidity in pregnancy has been identified (Agius et al., 2016). The triple co-existence of depression, anxiety and PTSD during perinatal period may compound the psychological distress the woman has already experienced, perpetuate the course of each, maintain the occurrence, and cause poorer treatment outcomes. Hence, there is a need to understand more profoundly the nature and prevalence of comorbidity of these aforementioned disorders.

## **Running head: PERINATAL MENTAL HEALTH**

Finally, many studies on perinatal mental health have used cross-sectional designs (George et al., 2013). This is problematic given the fact that postpartum psychological disorders are frequently preceded by antepartum psychopathology. Longitudinal research is important to determine whether postpartum disorders are new cases or pre-existing psychological disorders present in pregnancy. Evidence on the course of anxiety is also mixed with contradictory findings as to whether anxiety increases or decreases after birth (Ayers et al., 2015).

Turkey is a middle-income country which is undergoing a period of rapid social and economic change. This may impact upon the rates and prevalence of perinatal mental health. The nature and the extent of perinatal affective disorders may differ in women with non-Western backgrounds, which would also have implications for diagnosis and treatment. However, research on Turkish women's perinatal mental health is still in its infancy. Studies that have been conducted, largely focus on depression and find high prevalence rates ranging from 10.9% to 28% in pregnancy (Eskici et al., 2012; Ortaarik et al., 2012; Yanikkerem et al., 2013) and 13.5 to 28.3% after birth (Ozbasaran et al., 2011; Ozmen et al., 2014). A few studies have investigated antenatal anxiety with varying rates from 29% to 40.5% (Arslan et al., 2011; Ortaarik et al., 2012; Tunc et al., 2012). This research suggests perinatal affective disorders may be highly prevalent in Turkey. However, this research is limited in scope and methodology, with the majority of studies conducted on relatively small samples using cross-sectional designs. The research is also predominantly on depression and has not examined postpartum anxiety or perinatal PTSD in Turkey. This study addresses these gaps and examines PTSD, anxiety and depression during and after pregnancy in a large sample of Turkish women.

In light of the gaps identified, the aims of the study were: (i) to determine the prevalence of depression, anxiety and PTSD in pregnancy, at 4-6 weeks and 6 months after birth in a

## **Running head: PERINATAL MENTAL HEALTH**

longitudinal manner, (ii) to examine the course of each from pregnancy to 6 months postpartum, (iii) to examine comorbidity of depression, anxiety and PTSD at three assessment time points.

### **Method**

#### *Study design*

The Pregnancy and Childbirth in Turkey (PACT) study was a longitudinal study of mental health in women during pregnancy and after birth who live in different regions of Turkey. Women completed questionnaire measures of depression, anxiety, and PTSD in pregnancy, 4-6 weeks and 6 months postpartum.

#### *Study setting*

PACT was a multi-centre study conducted between May 2014 and May 2015. Data were collected in three sites of Turkey which have the highest birth rate in Turkey: Istanbul, Ankara and Izmir (Turkish Statistical Institute, 2014). These three cities are geographically located in West Turkey and central Anatolia. Women were recruited from state maternity hospitals which offer free antenatal care to all women, including low and high-risk pregnancies. Women are required to have bi-monthly or monthly antenatal visits at these hospitals.

#### *Sampling*

Sample size calculations were based on identifying mental health rates with 2% precision and 95% confidence intervals in the population of women who give birth to a live baby each year in Turkey. There were 1,279,864 live births in 2012 (Turkish Statistical Institute, 2012). On this basis, the sample size needed to identify 5% PTSD is 457, and to identify 10% anxiety/depression is 865.

## **Running head: PERINATAL MENTAL HEALTH**

A sample of 950 pregnant women were recruited from three hospitals. All pregnant Turkish-speaking women waiting for their routine antenatal appointment in gestational week 26-35 were approached and invited to participate in this study. Inclusion criteria are that women were aged 18 or over and provided informed consent to participate. Women who had late fetal loss, stillbirth or neonatal death were excluded.

### **Measures**

Measures were chosen that have been widely used in perinatal research, and translated and validated in Turkish samples.

#### *Demographic and Obstetric Information*

Baseline information was taken for socio-demographic characteristics, basic medical history, psychiatric history, and obstetric history (previous births, losses or abortions, type of delivery, or pregnancy and birth related complications).

#### *Depression*

The Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987) is a 10-item screening tool for identification of postpartum depression. The EPDS has also been validated to screen women in pregnancy for antenatal depression (Murray and Cox, 1990). The EPDS has been validated in Turkish population and validity and reliability were found to be adequate (Aydin et al., 2004). For postpartum women, the validated cut-off score of  $\geq 13$  was used to detect probable depression (Matthey, 2008) and  $\geq 10$  to indicate possible depression. In pregnancy, more stringent cut-off scores of  $\geq 14$  and  $\geq 12$  were used to identify cases of probable and possible depression, respectively (Murray and Cox, 1990).

#### *Anxiety*

The Hospital Anxiety and Depression Scale (HADS; Zigmond and Snaith, 1983) was used to assess anxiety in pregnancy and postpartum. It is 14-item instrument, consisting of separate



## **Running head: PERINATAL MENTAL HEALTH**

subscales of depression and anxiety with possible range of scores 0 to 21. The HADS focuses on affective symptoms and excludes somatic symptoms (Makara-Studzińska et al., 2013), which might be easily confounded with pregnancy symptoms. The depression subscale was used to increase the strength and validity of the study by double-assessing depression with EPDS. The validated Turkish version of HADS (Aydemir, 1997) was employed in this study. However, since it is not validated in perinatal women, international cut-off scores were used where a score of 8-10 was used as indicative of 'possible cases' and of  $\geq 11$  was indicative of 'probable cases' (Snaith, 2003).

### *PTSD*

PTSD diagnosis and symptom severity during the perinatal period were measured using the Posttraumatic Diagnostic Scale (PDS; Foa et al., 1997). The PDS is extensively used in different trauma populations because it assesses DSM-IV criteria for PTSD and is therefore a diagnostic measure (Foa et al., 1997). In pregnancy, PTSD was assessed in relation to any traumatic event. After birth, the PDS was specifically adapted to the event of birth and PTSD only in relation to the birth was examined. The PDS was translated into Turkish and good psychometric properties were noted (Isikli, 2006). The PTSD diagnosis was based on DSM-IV criteria: a woman must have met A1 and A2 criteria; developed at least one re-experiencing symptom (B), at least three avoidance symptoms (C), and at least two hyperarousal symptoms (D); experienced the disturbance for at least one month (E) and reported impairment in significant areas of functioning (F).

### **Procedure**

Pregnant women were approached at maternity hospital antenatal clinics by the researcher while they were waiting for their scheduled antenatal appointment between 26 and 35 weeks. The sampling was consecutive in that all women attending their prenatal visit were approached. Eligible women were given information about the study and asked to participate.

## **Running head: PERINATAL MENTAL HEALTH**

Those who agreed and signed the consent form were provided with a booklet of questionnaires, including the demographic and obstetric questionnaire, anxiety, depression and PTSD measures. All women recruited in pregnancy were contacted by telephone at 4-6 weeks after birth and at 6-month after birth for completion of the repeated questionnaires.

The study was approved by the Research Ethics Committee of City University in the UK, and by Kocaeli University in Turkey.

### **Analyses**

Means and standard deviations were calculated for each variable. Recommended cut-offs were used to examine the rates of depression and anxiety. Diagnostic criteria were used to calculate rates of PTSD. Each prevalence estimate was accompanied by 95% confidence interval (95% CI). New-onset rates were calculated based on the sample size for 4-6 weeks and 6 month postpartum. Postpartum prevalence rates were adjusted for pre-existing psychological disorder in pregnancy to calculate incidence of new onset of the relevant disorder. The differences between responders and non-responders were calculated with Mann Whitney U and Chi-square test. To assess differences in repeated measures between three time-points, generalized estimating equations (GEE) were used. Data analyses were carried out using IBM SPSS Statistics, version 22. Confidence intervals were calculated using the MedCalc statistical software, version 15. A two-tailed p-value of less than .05 was deemed significant.

### **Findings**

#### *Sample Attrition analyses*

Response rates were good: 950 of 1004 women (94.6%) were recruited in pregnancy, 858 (90.3%) completed 4-6 week assessment and 829 (87.2%) completed the 6 month assessment. Attrition analysis was performed between participants who completed

questionnaires at all three assessment time points ( $n = 829$ ) and the group of participants who dropped out ( $n = 121$ ). Women who dropped out were not significantly different to responders in terms of basic socio-demographics. There were also no significant differences between the participants and drop-outs on the severity of PTSD, anxiety and depression symptoms and psychological diagnoses (all  $p > .05$ ).

*Characteristics of women*

Women were aged approximately 28 years, ranging from 18 to 44 years old ( $M = 27.6$ ,  $SD = 5.3$ ), with 88.7% ( $n = 843$ ) were younger women (aged  $< 35$  years). Other sample characteristics are shown in Table 1. The majority were married. Most of the participants had planned pregnancy and about half of women were experiencing their first pregnancy. About a third of women had a high school degree and most participants were unemployed.

Please insert Table 1 here

*Mean changes in symptom severity from pregnancy to 4-6 weeks and 6 months postpartum*

The women's mean ratings on measures of depression, anxiety and PTSD at each assessment are presented in Table 2. Although GEE is quite robust against the choice of the working correlation structure (Twisk, 2003), an exchangeable correlation structure was chosen given the correlation between the three time-points and better goodness of fit statistics relative to other structures. Selecting pregnancy as a reference category, statistically significant differences in mean scores were observed between different time points on all outcomes.

Different measures of depression, EPDS and HADS-D, demonstrated a significant increase from pregnancy to 4-6 weeks postpartum and then a small but significant drop around 6 months postpartum. Contrary to the pattern of depression symptomatology, anxiety was highest in pregnancy and then decreased significantly and steadily after birth. In terms of the PTSD scores, there was a significant increase from pregnancy to 4-6 weeks and a decrease

## **Running head: PERINATAL MENTAL HEALTH**

from 4-6 weeks to 6 months postpartum; but this decrease was hardly significant ( $p = 0.04$ ). Notably, depression, anxiety and PTSD scores were still elevated at final assessment.

Please insert Table 2 here

### *Prevalence of depression in pregnancy and after birth*

The two measures of depression demonstrated different rates for antenatal and postnatal depression in different severity groups (Table 3). It is evident that women were most affected by depression immediately after childbirth. The onset was highest at 4-6 weeks postpartum and declined thereafter. The rates for the first and second onset depression at 4-6 weeks and 6 months postpartum were 24.6% (95% CI, 21.8-27.6) and 4.7% (95% CI, 3.5-6.4) by EPDS and 14.1% (95% CI, 11.7-16.9) and 6.8% (95% CI, 5.1-8.8) by HADS-D, respectively. Remissions occurred in 60% (EPDS; 95% CI, 54.5-65.9) to 69% (HADS-D; 95% CI, 55.4-85.9) of women between 4-6 weeks and 6 months postpartum.

Totals of 465 (56.1%) to 628 (75.8%) women (EPDS and HADS-D, respectively) remained depression free at all three assessments.

Please insert Table 3 here

### *Prevalence of anxiety in pregnancy and after birth*

Anxiety has been shown to be relatively persistent during the perinatal period. Table 3 shows the rates of anxiety from pregnancy to 6 months after birth. Of the women with probable anxiety in pregnancy ( $n = 281$ ), nearly half of them experienced possible or probable anxiety at 4-6 weeks postpartum (19.2% and 33.1%, respectively) and a total of 29 women (3.5%) had probable anxiety across all three assessment time points. The rate for probable anxiety with new postpartum onset was 13.7% (95% CI, 11.4-16.5) at 4-6 weeks and 5.9% (95% CI, 4.4-7.8) at 6 months. Importantly, 91 women (9.6%; 95% CI, 7.7-11.8) had significant anxiety in pregnancy and no longer had anxiety after birth. Only 14 out of 950 women (1.5%;

## **Running head: PERINATAL MENTAL HEALTH**

95% CI, 0.8-2.5) reported no symptoms of anxiety in pregnancy, suggesting that some anxiety is normal in pregnancy.

The rate of women with possible anxiety appeared to be stable during perinatal months with a prevalence range from 20.3% to 22.6% across the three assessment time points.

### *Prevalence of PTSD in pregnancy and after birth*

The prevalence of PTSD was 5.8% in pregnancy (Table 3). A total of 244 women (25.7%; 95% CI, 22.6-29.1) reported PTSD symptoms in relation to a range of traumatic events experienced before or during pregnancy; and 38 of these women met full DSM-IV diagnostic criteria for PTSD following traumatic events that were not birth-related (4%; 95% CI, 2.8-5.5). The events reported were accidents, natural disasters, death of a significant other, life-threatening disease, physical abuse, and previous births. An additional 17 women reported their previous birth experiences as traumatic and met diagnostic criteria for PTSD before birth (1.8%; 95% CI, 1.0-2.8). Birth events included stillbirth, miscarriage and difficult or complicated births.

At 4-6 weeks postpartum PTSD was measured in relation to women's birth experiences and the prevalence of PTSD was 11.9%. Among the 102 women who had birth-related PTSD 4-6 weeks after birth, 25 (24.5%; 95% CI, 15.87-36.2) had already had PTSD in their pregnancy (Fig.1). Thus, 77 women (8.9% of the total sample; 95% CI, 7.1-11.2) experienced a new onset of birth-related PTSD. A total of 745 mothers (86.8%; 95% CI, 80.7-93.3) scored below the threshold on PDS (<15) and 120 women (14%; 95% CI, 11.6-16.7) did not report any PTSD symptoms at 4-6 weeks postpartum ( $n = 858$ ).

Six months after birth 76 women had birth-related PTSD, yielding a prevalence rate of 9.2%. Of the women with PTSD in pregnancy, 18 (23.7%; 95 CI, 14.0-37.4) had birth-related PTSD at 6 months postpartum. Of women with birth-related PTSD at 4-6 weeks postpartum, 31

## **Running head: PERINATAL MENTAL HEALTH**

women (40.8%; 95 CI, 27.7-57.9) met criteria for PTSD at 6 months postpartum. In contrast, 27 women (3.2%; 95% CI, 2.1-4.7) had birth-related PTSD with delayed onset 6 months after birth ( $n = 829$ ) (Fig. 1).

Please insert Figure 1 here

### *Adjusted prevalence of depression, anxiety and PTSD at 4-6 weeks and 6 months postpartum*

The onset-rates of each psychological disorder after removing women with the same disorder in pregnancy are provided in Table 4. The rates of each disorder were generally lower than those originally reported in Table 3. The difference between adjusted and unadjusted prevalence rates was greater for depression at 4-6 weeks postpartum and the difference was less pronounced at 6 month postpartum for all.

Please insert Table 4 here

### *Pure vs Comorbid depression, anxiety and PTSD in pregnancy and after birth*

The number of women with pure and comorbid depression, anxiety and PTSD in pregnancy, 4-6 weeks and 6 months postpartum was computed and is provided in Table 5. Among the “pure” disorders, the most common category was women with anxiety only in pregnancy followed by those with depression only at 4-6 weeks and 6 months postpartum. Pure PTSD was rarely reported at each time point.

Comorbidity rates varied across disorders and assessment points and was most notable 4-6 weeks after childbirth. Comorbid anxiety and depression was most common. PTSD demonstrated the most comorbidity with depression at 4-6 weeks and with anxiety at 6 months postpartum.

Please insert Table 5 here

## **Discussion**

## **Running head: PERINATAL MENTAL HEALTH**

The main objective of this study was to provide rates of prevalence and comorbidity of the most common perinatal affective disorders among women in pregnancy, early and late postpartum in Turkey. The present study indicated that during the perinatal period the prevalence of depression, anxiety and PTSD was high and generally exceeded those found in Western countries. Although this may be likely due to the use of different measures with different cut-off points, it may also be related to different population characteristics. This study also showed that anxiety was common in pregnancy and persisted 4-6 weeks and 6 month postpartum. There were some indications of persistency of symptoms over perinatal period, although the highest levels of psychopathology were observed 4-6 weeks after birth. The course of depression and PTSD showed an inverse-U pattern, whereas anxiety followed a gradually declining linear-pattern from pregnancy to 6 months postpartum.

### *Depression*

The findings of the current study corroborate earlier reports that a significant proportion of women suffer from depression in pregnancy and after birth. Prevalence rates varied between the two measures of depression, which highlights the importance of measurement in establishing prevalence. As the EPDS is specifically designed to measure depression in postpartum and pregnancy and has been validated among Turkish perinatal women, the results of the EPDS will be discussed.

Depressive symptomatology was higher in early postpartum than that in pregnancy and late postpartum. The rates of antenatal depression (14.6%) were consistent with previous studies (Chatillon and Even, 2010; Evans et al., 2001; Moraes et al., 2016). However, 14.6% is considerably lower than other studies in Turkey which reported rates of 27.5% and 21.6% (Golbasi et al., 2010; Gulseren et al., 2006). This may be due to differences in sampling or measurement. For example, we used a conservative EPDS cut-off score ( $\geq 14$ ) and recruited from different provinces in Turkey.

## **Running head: PERINATAL MENTAL HEALTH**

A large number of women manifested significant depression 4-6 weeks after birth with a rate of 32.6%, which is similar to that reported in a review of postpartum depression in developing countries (31.3%) (Villegas et al., 2011). This is also consistent with previous studies in Turkey (Bugdayci et al., 2004; Poçan et al., 2013) and other Middle-Eastern countries, including Iran (31.4%) (Bahrami et al., 2010) and Iraq (28.4%) (Ahmed et al., 2012). However, it is substantially higher than prevalence rates found in studies conducted in developed countries, such as 14.4% in the UK (Bell et al., 2015) and 9.6% in USA (Banti et al., 2011). This is likely to be due to cultural and socioeconomic differences between Western and Middle Eastern countries and different study methodologies with different assessment time points, sample sizes, and diagnostic criteria. The high prevalence of postpartum depression might also depend on the fact that a significant number of women with antenatal depression continued to be depressed by 4-6 weeks postpartum. Alternatively, the immediate increase of postpartum depression might reflect difficulties in adjusting to physiological and psychological changes that occur after birth.

A lower but still relatively high rate of depression at 18.5% six months after birth is also consistent with other national and international studies (Gulseren et al., 2006; Stuart et al., 1998; Yelland et al., 2010), which suggests that although depressive symptomatology decreases over time, depression may linger for 6 months or longer for certain women (Evans et al., 2001; Heron et al., 2004). Of mothers who were depressed in pregnancy, 28% were also elevated at 6 month postpartum, which also suggests the persistency of depression from pregnancy to the first postpartum year. Overall, this research has confirmed that depression is highly prevalent among women during perinatal period– particularly postpartum.

### *Anxiety*

Previous literature suggests anxiety is more common in pregnancy compared to the postpartum period (Andersson et al., 2006; Figueiredo and Costa, 2009), affecting more than



## **Running head: PERINATAL MENTAL HEALTH**

25% of pregnant women (Britton, 2005; Ross and McLean, 2006). This research provides partial support for this with 29.6% of pregnant women and 24.6% of postpartum were found to have significant anxiety. Given the fact that more women suffer from partial anxiety, it is possible to claim that perinatal anxiety is as important as perinatal depression. The results cannot be compared with Turkish studies due to an absence of research on postpartum anxiety in Turkey. However, the rate of antenatal anxiety (29.6%) was consistent with studies of Arslan et al. (2011) and Tunc et al. (2012) which reported 28.8% and 32%, respectively.

In accordance with George et al. (2013), postpartum anxiety was also found as prevalent at 6 months postpartum (16.2%). Importantly, among women with concerning levels of anxiety 6 months after birth, 22% had probable anxiety at all three occasions, confirming the persistence of antenatal and postnatal anxiety from pregnancy to late postpartum period (Heron et al., 2004) and highlighting the significance of routine screening of perinatal anxiety in Turkey. High anxiety in pregnancy might be associated with biological and hormonal changes, fear of childbirth, concerns about the infant (Huizink et al., 2004) as well as labour pain and birth-related interventions (Eriksson et al., 2006) whilst after birth it might be ascribed to concerns about the woman's own health, the well-being of her infant and parenting role (Britton, 2005). However, these need to be further explored in Turkish perinatal women.

### *PTSD*

There is a growing body of literature showing that PTSD occurs in pregnancy and after birth. In a recent review, the estimated prevalence for pre- and postpartum PTSD were 3.3% and 4%, respectively (Yildiz et al., 2017). A higher prevalence of PTSD was observed in our study with a rate of 5.8% in pregnancy and of 11.9% in early postpartum. This is consistent with a few other studies conducted among community samples in Australia, USA, and Netherlands (Gamble and Creed, 2005; Kim et al., 2014; Quispel et al., 2015). Postpartum

## **Running head: PERINATAL MENTAL HEALTH**

PTSD rates were higher than in pregnancy, which might be related to difficult childbirth experiences triggering new onset of PTSD or exacerbating pre-existing PTSD symptoms. Alternatively, a difficult birth might re-trigger PTSD experienced in early life. The observation that PTSD prevalence remained high at 9.2% 6 months postpartum, suggesting that PTSD after birth might be more chronic than previously assumed. This also indicates that some women with negative birth experiences maintained their negative perception of birth and their symptoms until 6 months postpartum.

Besides, it is reasonable to speculate that higher prevalence rates of PTSD might result from sample differences as well as poor conditions of state hospitals and differing health care practices in Turkey, specifically the high rate of obstetric interventions (Gokce Isbir et al., 2016) and the authoritarian attitudes of midwives or health professionals towards women during birth (Sercekus and Okumus, 2009). However, there is no epidemiologic study of risk factors for perinatal PTSD in Turkey. Future research, therefore, should clarify whether high rates of postpartum PTSD reflect the true differences in the population studied or differences in health care services. Furthermore, although there was a decrease in depression and anxiety symptoms from 4-6 weeks to 6 months postpartum, this decrease was not as evident in PTSD symptoms, indicating that spontaneous resolution of PTSD did not occur in most women. This finding suggests women with PTSD might have more difficulty in coping with birth-related PTSD compared to depression and anxiety or been less likely to access treatment. These results lend further support to the literature suggesting that PTSD in pregnancy and after birth may have possibly higher rates in low- and middle-income countries.

### *Comorbidity of perinatal depression, anxiety and PTSD*

Comorbidity of depression and anxiety was frequently observed and is consistent with previous literature (Falah-Hassani et al., 2016; Tavares et al., 2012). The coexistence of PTSD with depression; and PTSD with anxiety was equally common after birth, suggesting

## **Running head: PERINATAL MENTAL HEALTH**

that women with depression or anxiety are more prone to experience PTSD postpartum or vice versa. This is important because women with comorbid psychological disorders are more likely to have impaired functioning and higher levels of distress than those with a single condition (Robert and Hirschfield, 2001). The rates of triple comorbidity after birth were relatively low at 6.6% at 4-6 weeks and 3.4% at 6 months postpartum but consistent with a recent review (Agius et al., 2016). The presence of comorbidities suggest that when there is a suspected case of depression or PTSD, screening for other affective symptoms is important for treatment purposes. It might also be more relevant to regard them as part of the same continuum of stress and use the term “postnatal mood disorders” proposed by Matthey et al. (2003) with an inclusion of birth-related PTSD.

### *Limitations and strengths of the study*

This study has several limitations. First, self-report questionnaires rather than clinical interviews were used to assess anxiety, depression and PTSD which might inflate prevalence rates. The classification of anxiety and depression as probable, possible and normal cases was achieved based on cut-off scores. This is potentially problematic compared to clinical diagnosis and may limit comparison with studies using different criteria. Second, since the HADS scale was not validated in Turkish perinatal women, originally recommended cut-off points were used instead of culturally-derived scores. This may have contributed to the notable differences in depression rates between EPDS and HADS-D. Third, the three study settings were selected on the basis of birth rates and are all in Western Turkey which limits the generalizability of the findings to the Eastern part of the country. Participants were recruited from the state hospitals that are attended by both low and high-risk women. Finally, postpartum data were collected by telephone which, although commonly used, might have biased the results.

## **Running head: PERINATAL MENTAL HEALTH**

Notwithstanding these limitations, this was the first study to longitudinally assess depression, anxiety and PTSD in a large sample of women from pregnancy to 6 months postpartum in Turkey. The heterogeneous sample including women from rural and urban areas of Turkey, the large sample size, multi-center design, and low attrition rates are also strengths of the study.

### *Clinical implications for practice*

Although it is not always easy to conclude whether the differences were clinically meaningful, the sample size may be considered large enough to find statistically and clinically significant differences, which allow to provide some implications for practice.

High rates of affective disorders in pregnancy and after birth highlight three main points. First, it is important to have effective perinatal screening to identify women with psychological needs. Early detection may help to prevent exacerbation of, and support reduction of, the likelihood of antenatal and postnatal psychological disorders. Second, providing early treatment to women experiencing severe psychological problems is essential to ensure psychological well-being of those women and to prevent chronicity. Third, psychosocial screening and interventions should be offered until at least 6 months after birth to catch new-onset cases.

### **Conclusion**

Overall, this research demonstrated that a substantial number of women experience significant depression, anxiety or PTSD or both, during the perinatal period in Turkey. This study is also consistent with previous literature showing that women in middle-income countries are at a greater risk of perinatal affective disorders than their high-income counterparts (Fisher et al., 2012); yet psychological wellbeing is not usually addressed in maternity care in Turkey. Health providers and policy-makers should be aware of the

substantial burden of psychological morbidity among Turkish women across the perinatal period and the potential long term impact of this on women and children. Implementing effective screening and intervention programs may help to promote perinatal mental health and eventually improve the quality of pre- and postpartum care in Turkey.

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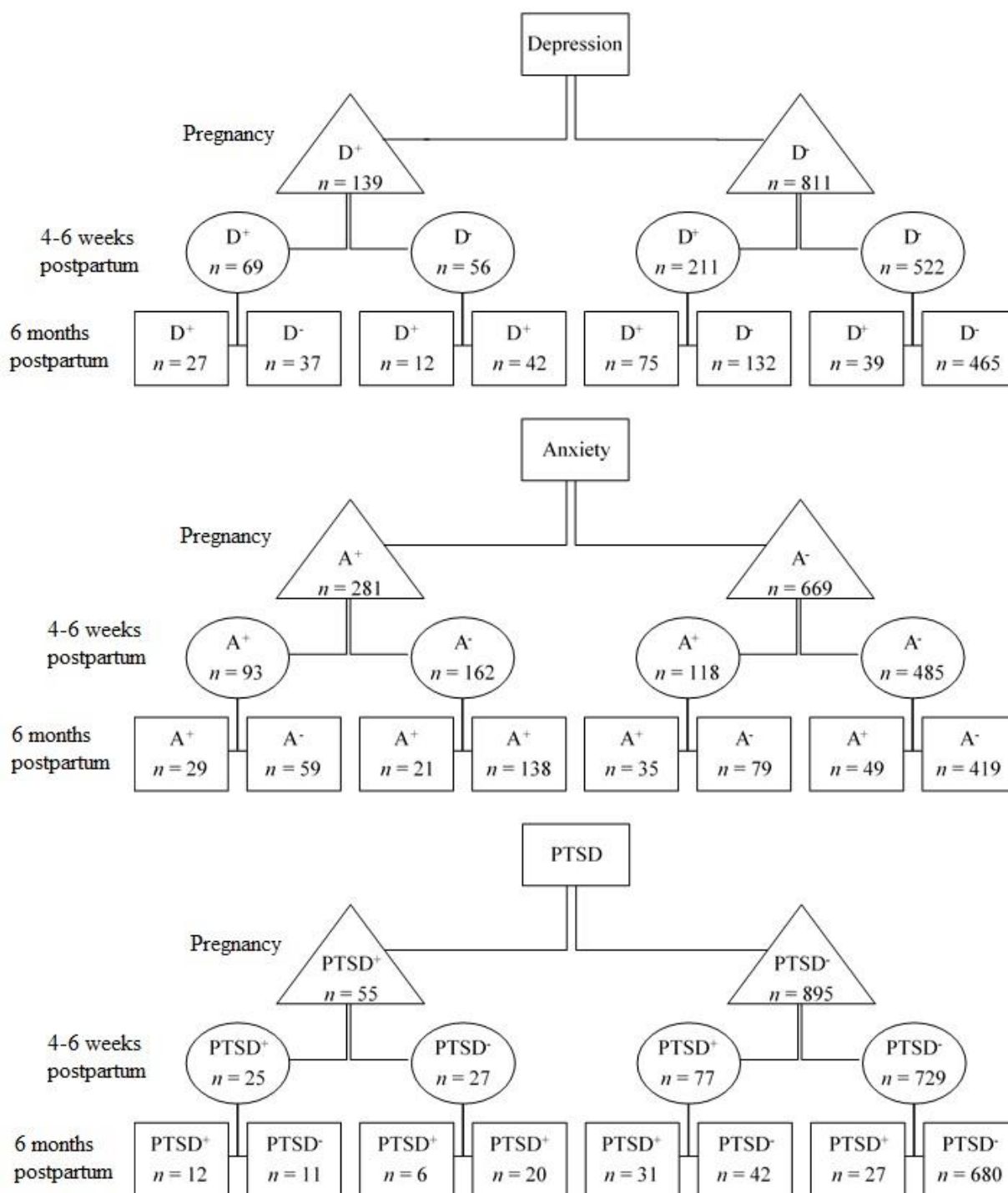
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## Running head: PERINATAL MENTAL HEALTH

Figure 1.



**Fig.1.** Flow chart of women with/out probable depression (measured by EPDS), anxiety and PTSD at all assessment points. Women screened as positive are represented as squared (+) and those screened as negative are represented as squared (-). Triangles, circles and squares represent the number of women who scored above and below the cut-off for the relevant disorder in pregnancy, 4-6 weeks and 6 months postpartum, respectively. The number of probable cases at the lower level do not add up to the total number of probable cases at the higher level due to attrition.

**Table 1**  
Socio-demographic characteristics of participants

<b>Variables</b>	<b>n (%)</b>
Parity	
First pregnancy	408 (42.9%)
1	344 (36.2%)
2	162 (17.1%)
3 or more	36 (3.8%)
Marital status	
Married	945 (99.5%)
Separated	2 (0.2%)
Divorced	3 (0.3%)
Education level	
Illiterate	26 (2.7%)
Literate	13 (1.4%)
Primary	255 (26.8%)
Secondary	204 (21.5%)
High-school	303 (31.9%)
University or higher degree	149 (15.7%)
Employment	
Yes	165 (17.4%)
No	785 (82.6%)
Family income (TL/per month)	
<1000	158 (16.6%)
1000-1500	308 (32.4%)
1500-2000	246 (25.9%)
2000-2500	108 (11.4%)
2500-3000	34 (3.6%)
>3000	96 (10.1%)
Planned pregnancy	
Yes	779 (82.0%)
No	171 (18.0%)

Note: *SD* = standard deviation

**Table 2**

Longitudinal changes in mean scores of Depression, Anxiety and PTSD from baseline to 6 months postpartum

	<i>M</i>	<i>SD</i>	$\beta$	<i>95% CI</i>	<i>Wald X<sup>2</sup></i>	<i>p</i>
<b>Depressive symptoms<sup>a</sup></b>						
Pregnancy	8.6	4.8				
4-6 weeks postpartum	10.0	6.4	1.4	0.9 to 1.8	37.1	p < 0.001
6 months postpartum	7.9	5.1	-0.8	-1.1 to -0.4	13.6	p < 0.001
<b>Depressive symptoms<sup>b</sup></b>						
Pregnancy	3.6	3.1				
4-6 weeks postpartum	5.7	4.6	2.1	1.8 to 2.4	184.2	p < 0.001
6 months postpartum	4.8	4.3	1.2	0.9 to 1.5	62.0	p < 0.001
<b>Anxiety symptoms<sup>c</sup></b>						
Pregnancy	8.2	4.3				
4-6 weeks postpartum	7.7	4.3	-0.5	-0.9 to -0.2	8.5	p < 0.01
6 months postpartum	7.2	3.8	-1.1	-1.4 to -0.8	39.4	p < 0.001
<b>PTSD symptoms<sup>d</sup></b>						
Pregnancy	2.2	5.9				
4-6 weeks postpartum	7.1	7.6	4.9	4.3 to 5.4	319.3	p < 0.001
6 months postpartum	6.6	7.0	4.3	3.8 to 4.9	274.3	p < 0.001

Note: Pregnancy is the reference category. The sample size is 950 for pregnancy, 858 for 4-6 weeks postpartum and 829 for 6 months postpartum. Beta values indicate the rate of change as a function of time. <sup>a</sup> Depression measured by EPDS with a range of 0 to 30. <sup>b</sup> Depression measured by HADS-D with a range of 0 to 21. <sup>c</sup> The scores for anxiety ranges from 0 to 21. <sup>d</sup> The scores for PTSD ranges from 0 to 51.

**Table 3**

Prevalence of PTSD, Anxiety and Depression in pregnancy and after birth

	Pregnancy <sup>a,b</sup>		4-6 weeks postpartum <sup>c,d</sup>		6 months postpartum <sup>d,e</sup>	
	n (%)	95% CI	n (%)	95% CI	n (%)	95% CI
Probable cases						
PTSD	55 (5.8%)	4.3 to 7.5	102 (11.9%)	9.7 to 14.4	76 (9.2%)	7.2 to 11.5
Anxiety	281 (29.6%)	26.2 to 33.3	211 (24.6%)	21.4 to 28.1	134 (16.2%)	13.5 to 19.1
Depression <sup>f</sup>	139 (14.6%)	12.5 to 17.0	280 (32.6%)	29.6 to 35.8	153 (18.5%)	15.9 to 21.2
Depression <sup>g</sup>	31 (3.3%)	2.2 to 4.6	133 (15.5%)	12.9 to 18.4	102 (12.3%)	10.0 to 14.9
Possible cases <sup>h</sup>						
Anxiety	215 (22.6%)	19.7 to 25.9	174 (20.3%)	17.4 to 23.5	180 (21.7%)	18.7 to 25.1
Depression <sup>f</sup>	123 (12.9%)	10.9 to 15.2	109 (12.7%)	10.6 to 15.1	91 (11.0%)	9.0 to 13.3
Depression <sup>g</sup>	86 (9.1%)	7.2 to 11.2	131 (15.3%)	12.8 to 18.1	75 (9.0%)	7.1 to 11.3

Note: <sup>a</sup>  $n = 950$ . <sup>b</sup> PTSD was measured in relation to any event. <sup>c</sup>  $n = 858$ . <sup>d</sup> PTSD was measured only in relation to birth. <sup>e</sup>  $n = 829$ . <sup>f</sup> Depression measured by EPDS. <sup>g</sup> Depression measured by HADS-D. <sup>h</sup> No data available for PTSD diagnosis.

**Table 4**

Adjusted prevalence rates of PTSD, Anxiety and Depression after removing women with the disorder in pregnancy

	<b>4-6 weeks postpartum<sup>a</sup> <i>n</i> (%)</b>	<b>6 months postpartum<sup>b</sup> <i>n</i> (%)</b>
Probable cases		
PTSD	77 (9.6%)	58 (7.4%)
Anxiety	118 (19.6%)	84 (14.4%)
Depression <sup>c</sup>	211 (24.6%)	114 (13.7%)
Depression <sup>d</sup>	121 (14.6%)	89 (11.1%)
Possible cases		
Anxiety	120 (19.9%)	111 (19.1%)
Depression <sup>c</sup>	94 (10.9%)	78 (9.4%)
Depression <sup>d</sup>	123 (14.9%)	72 (9%)

Note: <sup>a</sup> *n* = 858. <sup>b</sup> *n* = 829. <sup>c</sup> Depression measured by EPDS.

<sup>d</sup> Depression measured by HADS-D.

**Table 5**

The prevalence of perinatal mental health disorders with rates of comorbid diagnoses in a community sample

	<b>PTSD only n (%)</b>	<b>Depression only n (%)</b>	<b>Anxiety only n (%)</b>	<b>PTSD and Depressio n (%)</b>	<b>PTSD and Anxiety n (%)</b>	<b>Anxiety and Depression n (%)</b>	<b>Triple comorbidity n (%)</b>	<b>No diagnosis n (%)</b>
Pregnancy <sup>a</sup>	21 (2.2%)	32 (3.4%)	166 (17.4%)	23 (2.4%)	31 (3.3%)	104 (11.0%)	20 (2.1%)	613 (64.5%)
4-6 weeks postpartum <sup>b</sup>	10 (1.2%)	89 (10.4%)	45 (5.2%)	87 (10.1%)	62 (7.2%)	161 (18.8%)	57 (6.6%)	518 (60.4%)
6 months postpartum <sup>c</sup>	23 (2.8%)	71 (8.6%)	48 (5.8%)	41 (4.9%)	45 (5.4%)	74 (8.9%)	33 (3.4%)	593 (71.5%)

Note: Rates of depression were based on EPDS. <sup>a</sup> *n* = 950. <sup>b</sup> *n* = 858. <sup>c</sup> *n* = 829.