**Running head: Trajectories of birth-related PTSD**

# Longitudinal trajectories of post-traumatic stress disorder (PTSD) after birth and associated risk factors

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## Abstract

**Background:** Although longitudinal trajectories of post-traumatic stress disorder (PTSD) are well-established in general trauma populations, to date, no study has systematically examined trajectories of birth-related PTSD. This study aimed to identify trajectories of birth-related PTSD; determine factors associated with each trajectory; and identify women more likely to develop birth-related PTSD.

**Method:** 226 women who had traumatic childbirth according to DSM-IV criterion A were drawn from a community sample of 950 women. Measures were taken of PTSD, affective symptoms, fear of childbirth and social support in pregnancy, 4-6 weeks and 6-months postpartum. Information on some obstetric and psychosocial factors were also prospectively obtained.

**Results:** Four trajectories were identified: resilience, recovery, chronic-PTSD and delayed-PTSD. Resilience was consistently distinguished from other PTSD trajectories by less affective symptoms at 4-6 weeks postpartum. Poor satisfaction with health professionals was associated with chronic-PTSD and delayed-PTSD group. When affective symptoms at 4-6 weeks postpartum were removed from the model, less social support and higher fear of childbirth 4-6 weeks after birth predicted chronic and recovery trajectories; whereas experience of further trauma and low levels of satisfaction with health professionals were predictive of chronic-PTSD and delayed-PTSD, compared to resilience. Additional variables associated with different trajectories included antenatal affective symptoms, caesarean section, preterm birth and receiving professional help.

**Limitations:** Use of self-report measures, use of DSM-IV criteria for PTSD diagnosis, and no follow up beyond six months are main limitations of this study.

**Conclusion:** Identified factors may inform preventive and treatment interventions for women with traumatic birth experiences.

**Keywords:** Post-traumatic stress disorder; trajectories; childbirth; risk factors; resilience, recovery.

## Introduction

There is a growing literature suggesting that birth can produce clinical levels of psychological distress, with 19.7 to 45.5% of women perceiving their childbirth as traumatic (Alcorn et al., 2010; Ayers et al., 2009). Research has shown that although medical interventions and complications including instrumental deliveries, emergency caesarean-sections, or preeclampsia increase the risk of traumatic birth experience (Andersen et al., 2012), a seemingly normal birth may also be perceived as traumatic as a result of loss of control, perceived threat or physical harm to self or baby, or negative attitudes of healthcare professionals involved in the birth (Ford and Ayers, 2011; Halperin et al., 2015).

Post-Traumatic Stress Disorder (PTSD) can affect women who have traumatic birth experiences, with around 4% of women meeting the diagnostic criteria for PTSD after a traumatic birth (Yildiz et al., 2017). The rates of both traumatic birth experience and PTSD may be more staggering in low and middle-income countries (Fisher et al., 2012). In Turkey, where this study was conducted, obstetric interventions are common (Gokce Isbir et al., 2016) and the conditions of maternity wards are poor (Sercekus and Okumus, 2009). Consequently, the prevalence estimates of traumatic birth and PTSD may be higher than reported elsewhere. Nevertheless, as in the general trauma literature, the majority of women are resilient and do not develop diagnostic PTSD following traumatic birth, although some may report some symptoms which is to be expected in the aftermath of a negative event.

PTSD after birth is associated with adverse outcomes in women such as greater risk of depression (Shahar et al., 2015), problems with the parent-infant relationship (Davies et al., 2008), and marital difficulties (Ayers et al., 2006), which are likely to prolong or impede recovery. A meta-analysis of 50 studies of risk factors for PTSD after birth found that antenatal depression, fear of childbirth, prior PTSD, negative birth experience, lack of support and postpartum depression contribute to susceptibility to birth-related PTSD (Ayers et al., 2016).

Although the aetiology of PTSD after birth has been extensively investigated, research regarding the course of birth-related PTSD is less well-represented. Among the few studies that have been conducted, some report a decline in the prevalence of PTSD over time providing evidence that some women recover during the first months after birth (Haagen et al., 2015). Other research reports the persistence or exacerbation of PTSD symptoms across time and specify chronic PTSD (Alcorn et al., 2010; Zaers et al., 2008). New-onset PTSD cases following a complicated birth have also been observed (Alcorn et al., 2010). There are also women who perceive their birth as traumatic but are only mildly symptomatic, suggests that some are resilient to birth trauma.

These studies indicate a substantial variation in PTSD outcomes among women who experience a traumatic birth. Despite the different trajectories that PTSD can follow after birth, there has been no research that has systematically investigated these patterns and their underlying determinants in postpartum women. There is evidence on the correlates of chronic post-traumatic stress symptoms (PSS) following birth where insomnia, antenatal depression and perinatal somatoform dissociation were found to predict PSS chronicity (Garthus-Niegel et al., 2015; Haagen et al., 2015). However, these studies use community samples and include all women irrespective of their PTSD status, and therefore do not distinguish the different trajectories or examine factors associated with these different trajectories.

The majority of research on birth-related PTSD focus on trauma psychopathology rather than resilience, adaptation or recovery. The only exceptions are a few studies of posttraumatic growth- a positive change that occurs as a result of one's struggle with highly challenging life circumstances- which demonstrates that some women report low to moderate levels of growth after birth regardless of their birth experience (Sawyer et al., 2012).

Thus, women vary substantially in their responses and response patterns after a traumatic birth. These patterns are consistent with common trajectories of PTSD identified in

other trauma populations: resilience (minimal/mild disruption or absence of elevated symptoms), recovery (initial significant disruption and elevated PTSD symptoms which resolves after some time), chronic dysfunction (elevated PTSD symptoms that are maintained over time) and delayed-PTSD (worsening of symptoms over time) (Bonanno, 2008; Norris et al., 2009). Although these trajectories have not been studied in relation to birth-related PTSD, a systematic examination of these trajectories in postpartum women is worthy of investigation for several reasons. First, the exploration of different trajectories enables a focus on both positive and negative outcomes after a traumatic birth and provide a more comprehensive understanding. Second, birth is different from other potentially traumatic events in that it is predictable and generally entered into voluntarily (Ayers et al., 2008). Therefore, a longitudinal study on birth-related PTSD can identify pre-trauma characteristics that may affect different trajectories and thus inform trauma research more generally. Third, postpartum women are at greater risk of other psychological disorders such as depression or anxiety which may influence the women's responses or response patterns. Finally, PTSD as a construct is very heterogeneous (Galatzer-Levy et al., 2013). Identifying subgroups of women after traumatic birth and predictors of such trajectory groups may enhance understanding of the development, course and outcomes of birth-related PTSD and facilitate differentiation between low and high-risk women for postpartum PTSD, which could inform appropriate preventive and treatment strategies for postpartum women.

The aim of the present study was therefore to examine the nature and predictors of trajectories of birth-related PTSD among postpartum women, with a focus on ante-, intra- and postpartum factors associated with each trajectory, and to determine differences between women who develop PTSD and those do not after traumatic birth.

1. Method

1.1.Participants

The sample was drawn from the third wave of a prospective research project, Pregnancy and Childbirth in Turkey (PACT), designed to assess perinatal mental health among Turkish women. Participants were recruited in pregnancy (*n* = 950) and followed up at 4-6 weeks (*n* = 858) and 6-months (*n* = 829) after birth. The inclusion criteria were aged 18 years or older and gestational age 26-35 weeks. Women reporting fetal loss, stillbirth and neonatal death were excluded.

With reference to DSM-IV criteria, birth can be qualified as traumatic when women met both the criteria of A1 (stressor) and A2 (emotional response). Participants who had traumatic birth according to DSM-IV criteria at 4-6 weeks postpartum were considered as the target population for the present study. Women were included in analyses if they completed follow-up assessments at 6-months postpartum. A total of 287 fulfilled criterion A of DSM-IV and 77 met diagnostic criteria for PTSD at 4-6 weeks postpartum. The total number of participants included into analyses was 226 (Fig. 1).

Using the DSM-IV criteria for PTSD, four trajectory groups were identified as follows (Fig. 1):

*Resilient* (*n* = 140, 61.9%): Women who did not meet criteria for birth-related PTSD at both 4-6 weeks and 6-months postpartum, and who had scoresd below the cut-off 11on at least one subscale of HADS (depression and anxiety).

*Recovered* (*n* = 42, 13.7%): Women who fulfilled criteria for birth-related PTSD at 4-6 weeks postpartum but did not meet criteria at 6-months postpartum.

*Delayed-PTSD* (*n* = 13, 5.8%): Women who did not satisfy birth-related PTSD criteria at 4-6 weeks postpartum, but met the criteria at 6-months postpartum.

*Chronic-PTSD* (*n* = 31, 16.4%): Women who met criteria for birth-related PTSD at both time points.

### 1.2.Procedure

Recruitment took place at three maternity hospitals in Istanbul, Ankara and Izmir in Turkey. Eligible participants were invited to participate while they were waiting for a routine antenatal appointment between 26-35 weeks of gestation. Those providing consent were asked to complete self-report measures of affective symptoms (depression and anxiety), fear of childbirth, PTSD and social support. The same set of measures were repeated through telephone interview at 4-6 weeks and 6-months postpartum. The follow-up phone interviews were 30-45 minutes long and arranged according to participants' convenience.

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

### 1.3.Measures

Women reported on five measures of ante- and postpartum psychological mood. Post-traumatic Diagnostic Scale (PDS; Foa et al., 1997) is a 49-item self-report diagnostic instrument including yes/no responses to assess the nature and impact of the traumatic event and scaled responses to rate severity of the traumatic event. The PDS is based on DSM-IV criteria and was used to assess Criterion A and PTSD in women following birth. The Criterion A stressor and PTSD was assessed only in relation to childbirth experience. To have PTSD, the women had to fulfil all DSM-IV criteria A through to F in relation to a traumatic birth. The reliability and validity of the Turkish version of the PDS has been confirmed in postpartum population (Dikmen-Yildiz et al., 2017). Reliability values for PDS were high at 4-6 weeks and 6-months postpartum ($\alpha$ = .92 and $\alpha$ =. 94, respectively).

Affective symptoms (depression and anxiety) were assessed through the Turkish version of the Hospital Anxiety and Depression Scale (HADS; Aydemir, 1997;

Zigmond and Snaith, 1983), which had been proven to be valid and reliable among Turkish non-obstetric populations (Aydemir, 1997). The HADS consists of 2 subscales — anxiety, 7 items; and depression, 7 items; rated on a 4-point scale, where higher scores represent more severe symptoms. A cut-off ≥11 on each subscale indicates probable cases of anxiety or depression. The total HADS score was the primary variable of interest for the current study, as a measure of affective symptoms. The HADS had satisfactory internal reliability at both assessments ($\alpha$ = .88 and $\alpha$ =.82, correspondingly).

The Wijma Delivery Expectancy/Experience Questionnaire (WDEQ) assesses fear of childbirth in pregnancy (WDEQ-A) and after birth (WDEQ-B) (Wijma et al., 1997). Turkish versions of both WDEQ-A and WDEQ-B have shown good reliability and validity (Korukcu et al., 2016; Korukcu et al., 2012). Although WDEQ is a 33-item scale, a shortened version with 10-items was employed to reduce the burden on participants and increase response rates. Internal reliability for these items from the WDEQ-A and WDEQ-B in this sample was .89 and .90, accordingly.

Perceived social support was assessed via Turkish version of Multidimensional Scale of Perceived Social Support (MSPSS; Eker and Arkar, 1995; Zimet et al., 1988), which is a 12-item instrument, rated on a 7-point scale with higher scores showing greater support. Psychometric properties of the Turkish version of MSPSS have been found satisfactory (Eker and Arkar, 1995). Internal consistency for the MSPPS was .93 at 4-6 weeks and .94 at 6-months postpartum.

Socio-demographic and obstetric information on age, primiparity, planned pregnancy, history of stillbirth and miscarriage, history of psychological problem, antepartum complications and prior traumatic event were obtained in pregnancy. Data on intra-partum complications, infant complications, gestational age and delivery mode were collected at 4-6 weeks postpartum. Postpartum complications, insomnia, occurrence of traumatic event after

birth and whether psychological help was received, were assessed at 6-months postpartum. Women were also required to rate their satisfaction level with health professionals who cared for them during birth on a single 5-point scale 4-6 weeks after birth.

### 1.4.Data Analyses

All statistical analyses were performed with SPSS statistics (version 22). The prevalence rate for each trajectory was reported using the DSM-IV criteria for PTSD on the PDS. The few outliers identified in the data were kept since they did not alter the results when excluded. Where the assumption of normality was violated, non-parametric tests were considered but, as they yielded similar results, parametric tests were preferred. Changes in PTSD symptoms from 4-6 weeks to 6-months postpartum were examined with a repeated-measure analysis of variance (ANOVA). Group differences with regard to selected socio-demographic and psychosocial variables were examined using one-way ANOVA for continuous measures and Chi-square for categorical variables. Fisher's exact test was used in case of a low frequency of the relevant variable. One-way Welch ANOVA was reported when the assumption of homogeneity of variance was violated. Two-model logistic regression analysis was conducted to determine main and secondary factors that differentiated PTSD trajectories. In the first model, variables significantly associated with trajectory membership in the univariate analysis were subjected to multivariate logistic regression procedure with the entry method, except concurrent variables assessed at 6-months postpartum. In the second model, the variable - affective symptoms (depression and anxiety) at 4-6 weeks postpartum- was removed to determine other factors associated with PTSD trajectories. The resilient group served as the reference category and $\beta$ values and odds ratios (OR) with 95% CIs were reported. All assumptions including multi-collinearity were met. Finally, a "non-resilient" group was formed by combining groups of women with PTSD at any time after birth (recovery, chronic-PTSD, and delayed-PTSD) and compared to the resilient group to determine the factors associated

with development of birth-related PTSD. Variables found to be statistically significant in Chi-square and independent t-test analyses as appropriate were then included into binary logistic regression. P-values < .05 were considered statistically significant and all tests were two-sided.

## 2. Results

### 2.1. PTSD symptom severity at 4-6 weeks and 6-months postpartum as a function of different trajectories

Figure 2 shows mean PTSD symptoms scores in the different groups. There was a significant main effect of group, $F(3, 222) = 299.95$, $p < .001$, partial $\eta^2 = .80$, and a significant interaction between time and group, $F(3, 222) = 58.08$, $p < .001$, partial $\eta^2 = .44$. Post hoc pairwise comparisons with a Bonferroni adjustment revealed that PTSD scores was statistically significantly decreased from 4-6 weeks to 6-months postpartum in the *resilient and recovered* groups, whereas the *delayed-PTSD* group reported a significant increase in PTSD scores. The *chronic-PTSD* group did not show a significant change in PTSD symptoms between the two time points.

### 2.2. Differences between trajectories

The descriptive statistics for selected socio-demographic, obstetric and psychosocial variables are summarized in Table 1. It can be seen that resilient women were significantly more likely to be satisfied with health professionals during birth; less likely to receive psychological help; and had the greatest level of social support at all-time points. Women in the recovered group were more likely to report higher affective symptoms in pregnancy compared to other groups. Those with chronic PTSD were more likely to have postpartum complications and had an increased severity of affective symptoms, PTSD symptoms, and fear of childbirth at 4-6 weeks and 6-months postpartum compared to women in other trajectories. Finally, women with delayed-PTSD had higher rates of caesarean-section delivery, preterm birth, and further traumatic events after birth than women in other groups.

### 2.3.Determinants of PTSD trajectories

Table 2 reports the factors associated with different trajectory group membership. Affective symptoms at 4-6 weeks postpartum significantly differentiated trajectories of recovery, chronic-PTSD and delayed-PTSD from resilience. Affective symptoms in pregnancy was associated with an increased probability of being in the recovered group. Women in the recovered group were additionally less likely to have social support 4-6 weeks after birth, compared to the resilient group. Those reporting low levels of satisfaction with health professionals were more likely to be in the chronic and delayed-PTSD group compared to the resilient group.

Table 3 shows the factors associated with group membership after excluding the variable –affective symptoms at 4-6 weeks postpartum. One of the well-established findings in birth-related psychological symptoms is high comorbidity of PTSD with depression and PTSD with anxiety or multi-morbidity of PTSD, depression and anxiety (Agius et al., 2016; Alcorn et al., 2010; Parfitt and Ayers, 2009). Given that HADS examines symptoms of depression and anxiety, the variable of affective symptoms might be so associated with different trajectories of birth-related PTSD that may remove the effect of other variables. Therefore, in order to examine the role of variables other than the concurrent psychological distress in predicting the different trajectories of birth-related PTSD, an additional regression was conducted. Results demonstrated that, when affective symptoms at 4-6 weeks postpartum were excluded, women in the recovered and chronic trajectories were more likely to have fear of childbirth and poor social support at 4-6 weeks postpartum compared to the resilient group. Those reporting low levels of satisfaction with health professionals during birth, or experiencing a further traumatic event after birth, were also more likely to fall in the chronic and delayed-PSTD group compared to the resilient group. Women with delayed-PTSD were also more likely than resilient group to have caesarean section and preterm birth. Women in the recovered group were additionally

more likely to report antenatal affective symptoms and receive psychological help relative to resilient group.

### 2.4.Risk factors for developing PTSD after a traumatic birth

The analyses comparing the resilient group with non-resilient groups (including all women with recovery, chronic-PTSD, and delayed-PTSD trajectories) are shown in Table 4. It can be seen that there were significant differences between resilient and non-resilient women in delivery mode, gestational age, infant complications, intra- and postpartum complications, experience of further traumatic event and receiving psychological help. The independent sample t-test revealed that those with PTSD at any time point (i.e. non-resilient) reported more affective symptoms in pregnancy, 4-6 weeks and 6-months postpartum, had more severe PTSD symptoms at 4-6 weeks and 6-months postpartum and experienced higher levels of fear of birth 4-6 weeks after birth. Women in the non-resilient group also reported less perceived social support at 4-6 weeks and 6-months postpartum and less satisfaction with health professionals during birth. The first logistic regression model showed that, compared with resilient women, those with PTSD at any time after birth were significantly more likely to report greater affective symptoms at 4-6 weeks postpartum and have lower satisfaction with health professionals. In the second model, affective symptoms at 4-6 weeks postpartum were removed and results showed that women with PTSD were more likely to have fear of childbirth 4-6 weeks after birth and receive psychological help during the six months preceding the birth. Non-resilient women were also more likely to have low levels of satisfaction with health professionals and of perceived social support 4-6 weeks after birth.

## 3. Discussion

This is the first study to systematically examine the nature of trajectories of birth-related PTSD and their associated factors. This research extends our knowledge about factors involved in the development of birth-related PTSD after a traumatic birth experience. The results of this study

are consistent with previous literature with regard to the important role of affective symptoms (depression and anxiety), fear of childbirth and lack of social support in PTSD diagnostic status.

An examination of trajectory analysis revealed that women's response to traumatic birth is not homogeneous and likely to follow four different paths: resilience (61.9%), recovery (18.5%), chronic-PTSD (13.7%) and delayed-PTSD (5.8%). These trajectory groups are largely consistent with trajectory patterns reported in other trauma populations (Bonanno, 2005; deRoon-Cassini et al., 2010). The proportions of trajectories are also comparable with those in previous studies (Fan et al., 2015; Pietrzak et al., 2013). Trajectory analysis suggest that traumatic birth does not necessarily result in PTSD and if it does develop, a substantial proportion of women can recover. However, the high rate of chronicity and relatively significant rate of delayed-PTSD highlight the need for continued screening and treatment to promote recovery or prevent the worsening of PTSD symptoms after birth.

With regard to consistent risk factors (identified in both bivariate and multivariate analyses), the results suggest both commonalities and differences between the four trajectory groups. Affective symptoms (depression and anxiety combined) at 4-6 weeks postpartum emerged as robust predictor of birth-related PTSD trajectories. Affective symptoms 4-6 weeks after birth differentiated recovery, chronic-PTSD and delayed-PTSD trajectories from the resilient trajectory, confirming earlier findings that depression and anxiety are large component of PTSD and are highly comorbid with PTSD after birth (Ayers et al., 2016; Shahar et al., 2015). The finding that comorbid affective symptoms contribute to persistence of birth-related PTSD is consistent with studies in other trauma populations (King et al., 2009), suggesting that chronicity of PTSD may be maintained by psychological comorbidity. However, in this study, the recovered group was also predicted by affective symptoms at 4-6 weeks postpartum. Initial

severity of the symptoms or covariation with other protective or risk factors may account for this inconsistency.

Antenatal affective symptoms (depression and anxiety) were also associated with recovery trajectory, yet, this was not consistently predictive of chronic-PTSD or delayed-PTSD relative to resilient group. Whether this reflects a difference in severity of antenatal affective symptoms or a cultural difference is unclear and remains an important direction for further research.

Lack of social support appeared to be a risk factor for birth-related PTSD, increasing the likelihood of membership in the recovery or chronic trajectory when compared to resilient trajectory. This finding is consistent with previous studies of birth and other trauma populations (Bonanno, 2008; Soderquist et al., 2009) and underscores the role of social support in enhancing and facilitating women's resistance to PTSD after traumatic birth. However, the level of perceived support failed to differentiate delayed-PTSD group from resilient women, suggesting that social support buffers against PTSD to a point in the postpartum period, but may not actually be protective against delayed-PTSD. Turkish women are customarily accompanied by their relatives for 40 days following birth and receive more support in postpartum than in the antepartum or non-reproductive period (Ozbasaran et al., 2011). Women receiving less support than they expected, particularly after a traumatic birth may be more vulnerable to develop birth-related PTSD. Therefore, health care providers should consider the role of social support in the prevention and management of PTSD postpartum.

Satisfaction with health professionals predicted chronic-PTSD and delayed-PTSD trajectories, suggesting that women with PTSD experience their relationship with the staff during birth more negatively than resilient women. In other studies where similar findings were reported, the differences were explained by selective processing of threat-related cues or

making external attributions for negative birth experience (Menage, 1993; Wijma et al., 1997). Alternatively, some women may experience interpersonal trauma stemming from negative attitudes of health care professionals during birth, which may result in PTSD. There is evidence that Turkish women are very concerned about being left alone or scolded for doing something wrong during birth (Sercekus and Okumus, 2009). Given the reciprocal relationship between satisfaction with health professionals and health outcomes, the degree of satisfaction with staff may reflect a woman's physiological and psychological fulfilment during and after birth rather than an objective judgement of the staff. In the present study, women with chronic PTSD reported lowest satisfaction levels, followed by those with delayed-PTSD. Therefore, very low satisfaction ratings for health professionals may be suggestive of a difficult birth experience, which may culminate in PTSD particularly if combined with other risk factors.

For all women, regardless of the trajectory group, fear increased after birth, suggesting that moderate to severe fear of childbirth may occur as a reaction to traumatic birth experience, and is highly likely to result in secondary tokophobia. High levels of childbirth fear was associated with an increased risk when a woman was in the recovered and chronic-PTSD group, but not in the delayed-PTSD group. This may result from a higher level of incongruence women in the recovered and chronic-PTSD group experienced between their expectations and actual experiences of childbirth (see online material Table S1). If the fear is mild to moderate in pregnancy and the experience of childbirth is more fearful than expected, a woman may feel traumatized and develop PTSD symptoms, which is consistent with a previous study reporting that when expectations about birth are not met women are more susceptible to PTSD (Wijma et al., 1997). For women in the delayed-PTSD trajectory, however, either fear of birth is not a good predictor of delayed-PTSD or greater congruence in their expectations of fear of childbirth decreased the association. If the latter is the case, primary care providers should assess women's fear of birth in relation to their expectations and experiences of childbirth.

Women who experienced an additional trauma since birth were at greater risk of developing chronic or delayed-PTSD compared to the resilient group. Although the association between post-trauma negative life events and chronic and delayed-PSTD has been well documented in different trauma populations (Galea et al., 2008; Kessler et al., 2012), the impact of an additional traumatic event on the course of birth-related PTSD has not been investigated before. Double trauma may potentially interfere or impede recovery from PTSD in the chronic group or may exacerbate existing PTSD symptoms in the delayed-PTSD group. However, the number of women experiencing additional traumatic event after birth are small and the resulting confidence intervals are very wide in the present study, making it difficult to draw conclusions regarding the relative impact of further trauma on birth-related PTSD. Nevertheless, this variable may have some relevance for the deterioration of PTSD symptoms given the well-established evidence between post-disaster traumatic events and chronic or delayed-PTSD (Galea et al., 2008; Kessler et al., 2012).

Delayed-PTSD was additionally associated with preterm birth and caesarean-section. However, 13 women had delayed-PTSD, which accounts for the very wide confidence intervals around those with delayed-PTSD. Therefore, caution is necessary regarding the interpretation of the findings. Preterm birth is associated with greater rates of depression, anxiety and PTSD (Brandon et al., 2011). The finding that preterm birth is a risk factor for delayed-PTSD is novel and could be due to a number of factors, such as the mother's focus on the baby's survival or that whilst the baby is very sick, the mother may still experience trauma which at that time, cannot be processed and worked through, and may be suspended or delayed until the baby is fully recovered. However, this may also be a random effect and so in need of further investigation. In the present study, all women having preterm birth in the delayed-PTSD group gave birth by caesarean-section which may contribute to the association between caesarean-section and delayed-PTSD. The occurrence of PTSD after caesarean-section may also depend

on the mode of caesarean-section and why it was necessary. Unfortunately, data on the type of caesarean-section and its determinants were not collected, making the interpretation difficult. More research is therefore needed to clarify the link between caesarean-section and delayed-PTSD.

Receiving professional help differentiated recovered from resilient group but had no effect on other trajectories, highlighting the importance of providing psychological help services to women with PTSD after birth. However, the limited number of women receiving professional help raises the question about the accuracy of this estimate.

It is noteworthy that although obstetric and infant complications are reported risk factors for birth-related PTSD (Ayers et al., 2016) and were associated with trajectory membership in bivariate analyses in the present study, multivariate analyses failed to support those relationships.

Finally, the determinants of birth-related PTSD were examined in relation to resilient and non-resilient women (including all other trajectories). Affective symptoms (depression and anxiety) at 4-6 weeks postpartum predicted development of PTSD after birth, re-consolidating the evidence of multi-morbidity of PTSD, depression and anxiety (Agius et al., 2016). When affective symptoms were excluded, non-resilient women were predictable by receiving professional help, experiencing severe fear of childbirth and reporting lower levels of satisfaction with health professionals and of social support 4-6 weeks after birth.

### 3.1.Limitations

This study has some limitations that should be addressed in future research, including use of DSM-IV criteria for PTSD rather than DSM-V, use of self-report measures which is inherently less precise than clinical interviews (Boals and Hathaway, 2010), and the lack of information on the type of caesarean-section and no follow up beyond six months to assess

whether recovery is stable. The confidence intervals were fairly wide for some variables, limiting our understanding of the role played by those factors in different trajectories of birth-related PTSD. Women meeting the diagnostic criteria for PTSD in pregnancy were excluded to ensure that the stressor is birth; yet, a total of 22 women with PTSD after birth had some antenatal PTSD symptoms. Although this may confound and complicate the course of birth-related PTSD, given that antenatal PTSD symptoms were very mild (maximum score reported was 6 out of 51), the possible confounding impact is unlikely. Further, the sample predominantly comprised Turkish women with birth-related PTSD, which limits the generalizability of results to other cultures and to other trauma populations. Other relevant factors which may have affected recovery and resilience like personality characteristics or coping skills, were not assessed. Finally, although use of DSM-IV criteria for PTSD diagnosis enabled us to study the transition from clinical to non-clinical state or vice versa, this approach disregards the differences in symptom presentation (Le Brocque et al., 2010).

### 3.2.Strengths

It is the first study to systematically investigate trajectories of birth-related PTSD and the factors associated with each trajectory. This study examined different aspects of mental health problems in relation to heterogeneous trajectories of birth-related PTSD, and assessed both ante-, intra- and postpartum risk factors as predictors.

## 4. Conclusion

A negative birth experience can have a substantial impact on the well-being of new-mothers but more than half of women were resilient enough to deal with the adverse effect of traumatic birth without developing PTSD. In women who were affected, trajectories of recovery, chronic or delayed patterns of PTSD were observed. Early identification and treatment of women with PTSD are crucial because PTSD may comorbid with other

postpartum mental health problems and linger for months. Given that each trajectory was predicted by unique or shared factors, interventions targeting women with PTSD should incorporate a thorough appreciation of these factors and adopt a multifaceted approach to increase the likelihood of a positive birth experience and improve psychological health.

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**Table 1.**
Socio-demographic, obstetric and psychosocial characteristics among four groups of PTSD trajectories

| Variables | Resilient ( *n* = 140) *M* (*SD*) or *n* (%)[a] | Recovered ( *n* = 42) *M* (*SD*) or *n* (%)[a] | Chronic PTSD ( *n* = 31) *M* (*SD*) or *n* (%)[a] | Delayed-PTSD ( *n* = 13) *M* (*SD*) or *n* (%)[a] | *F* or $X^2$ |
|---|---|---|---|---|---|
| Age[b] | 27.05 (5.20) | 26.73 (5.61) | 27.96 (5.14) | 28.15 (4.39) | .51 |
| Primiparity[c] | 82 (58.6%) | 19 (45.2%) | 20 (64.5%) | 6 (46.2%) | 3.77 |
| Planned pregnancy (yes)[c,d] | 122 (87.1%) | 34 (81%) | 26 (84%) | 12 (92.3%) | 1.57 |
| Previous pregnancy/delivery problem (yes)[c,d] | 11 (7.9%) | 3 (7.1%) | 3 (9.7%) | 1 (7.7%) | .17 |
| History of stillbirth (yes)[c,d] | 6 (4.3%) | 3 (7.1%) | 2 (6.5%) | 2 (15.4%) | 2.96 |
| History of miscarriage (yes)[c,d] | 27 (19.3%) | 9 (21.4%) | 3 (9.7%) | 3 (23.1%) | 2.07 |
| History of psychological problem (yes)[c,d] | 10 (7.1%) | 8 (19%) | 3 (9.7%) | 2 (15.4%) | 5.42 |
| Number of prior traumatic events[b,e] | .16 (.39) | .26 (.49) | .26 (.44) | .38 (.51) | 1.60 |
| Having prior PTSD symptoms (yes)[c,d] | 21 (15%) | 10 (23.8%) | 7 (22.6%) | 5 (38.5) | 5.53 |
| Antepartum complications (yes)[c,d] | 44 (31.4%) | 12 (28.6%) | 14 (45.2%) | 4 (30.8%) | 2.64 |
| Intra-partum complications (yes)[c,d] | 25 (17.9%) | 20 (47.6%) | 21 (67.7%) | 9 (69.2%) | 42.43*** |
| Delivery mode (c-section)[c,d] | 35 (25.0%) | 17 (40.5%) | 10 (32.3%) | 10 (76.9%) | 15.54** |
| Infant complications (yes)[c] | 1 (0.7%) | 2 (4.8%) | 2 (6.5%) | 1 (7.7%) | 7.14* |
| Gestational age (preterm)[c,d] | 3 (2.1%) | 4 (9.5%) | 3 (9.7%) | 5 (38.5%) | 19.0*** |
| Postpartum complications (yes)[c,d] | 36 (25.7%) | 19 (45.2%) | 20 (64.5%) | 7 (53.8%) | 20.36*** |
| Insomnia (yes)[c,d] | 105 (75.0%) | 32 (76.2%) | 26 (83.9%) | 11 (84.6%) | 1.33 |
| Traumatic event after birth (yes)[c,d] | 1 (0.7%) | 2 (4.8%) | 8 (25.8%) | 4 (30.8%) | 21.13*** |
| Psychological help received (yes)[c,d] | 4 (2.9%) | 10 (23.8%) | 9 (29.0%) | 2 (15.4%) | 26.79*** |
| Satisfaction with health professionals[b,e] | 4.18 (1.16) | 3.64 (1.46) | 1.96 (1.66) | 2.76 (1.42) | 19.27*** |
| Affective symptoms in pregnancy[b,f] | 11.31 (5.79) | 15.97 (6.10) | 13.12 (6.75) | 12.0 (6.01) | 6.66*** |
| PTSD symptoms in pregnancy[b,f,g] | .75 (2.24) | 1.14 (2.62) | 1.38 (2.75) | 1.69 (2.81) | 1.14 |
| Fear of birth symptoms in pregnancy[b,h] | 24.51 (9.06) | 25.33 (9.45) | 24.64 (10.02) | 28.3 (7.61) | .72 |
| Social support in pregnancy[b,i] | 62.48 (12.53) | 57.85 (13.8) | 61.51 (11.77) | 62.26 (14.9) | 1.45 |
| Affective symptoms at 4-6 weeks postpartum[b,e,f] | 9.81 (4.51) | 21.60 (6.9) | 25.64 (7.35) | 21.46 (8.5) | 76.17*** |
| PTSD symptoms at 4-6 weeks postpartum[b,e,g] | 5.37 (3.63) | 18.36 (5.76) | 25.61 (8.2) | 10.92 (4.7) | 114.47*** |
| Fear of birth symptoms at 4-6 weeks postpartum[b,e,h] | 27.0 (7.72) | 30.86 (10.4) | 36.87 (8.06) | 31.53 (8.16) | 13.38*** |
| Social support at 4-6 weeks postpartum[b,i] | 63.66 (10.58) | 50.38 (11.2) | 52.61 (11.04) | 60.76 (13.54) | 20.61*** |

| | | | | | |
|---|---|---|---|---|---|
| Affective symptoms at 6-months postpartum[b,e,f] | 10.26 (5.56) | 14.26 (6.61) | 20.12 (8.83) | 18.0 (6.64) | 41.61*** |
| PTSD symptoms at 6-months postpartum[b,e,g] | 4.42 (2.93) | 6.97 (2.92) | 26.54 (8.34) | 20.84 (8.19) | 87.75*** |
| Social support at 6-months postpartum[b,i] | 62.04 (11.44) | 52.8 (13.46) | 51.03 (12.24) | 58.76 (14.12) | 11.03*** |

[a] Mean and standard deviation were provided for continuous variables. Number and percentages were provided for categorical variables. [b] One-way ANOVA was used for continuous variables. [c] Chi-square was used for categorical variables. [d] Fisher's Exact test was used where the number of expected counts were below 5. [e] Welch ANOVA statistic was used where the assumption of the assumption of homogeneity of variance was not met . [f] Affective symptoms range from 0 to 42.[g] PTSD scores range from 0 to 51. [h] The scores for fear of childbirth ranges from 0 to 50. [i] The scores for social support ranges from 0 to 84. *$p < .05$; **$p < .01$; ***$p < .001$.

**Table 2.**
Predictors of trajectories of birth-related PTSD

| Variables | Recovered vs. Resilient | | Chronic vs. Resilient | | Delayed-PTSD vs. Resilient | |
|---|---|---|---|---|---|---|
| | *b (SE)* | *OR (95% CI)* | *b (SE)* | *OR (95% CI)* | *b (SE)* | *OR (95% CI)* |
| Intra-partum complications (yes) | .59 (.73) | 1.79 (.43-7.56) | -.76 (.94) | .47 (.08-2.93) | -.01 (1.06) | .99 (.13-7.97) |
| Delivery mode (c-section) | .08 (.58) | 1.07 (.34-3.39) | -.73 (.79) | .48 (.10-2.28) | 1.67(.90) | 5.3 (.91-30.78) |
| Infant complications (yes) | .95 (1.97) | 2.61 (0.6-123.9) | .95 (2.16) | 2.59 (.04-180.61) | -.45 (2.32) | .64 (.00-60.38) |
| Gestational age (preterm) | -.15 (1.51) | .86 (.05-16.40) | .83 (1.62) | 2.28 (.09-54.92) | 2.21 (1.52) | 9.06 (.46-178.13) |
| Postpartum complications (yes) | .95 (.59) | 1.10 (.34-3.54) | .46 (.77) | 1.59 (.35-7.21) | -.58 (.84) | .56 (.09-3.54) |
| Traumatic event after birth (yes) | -.68 (1.66) | .51 (.02-13.12) | 2.49 (1.5) | 12.0 (.63-54.92) | 2.9 (1.66) | 18.1 (.69-472.93) |
| Psychological help received (yes) | -.12 (1.07) | .88 (.11-7.24) | -.79 (1.2) | .46 (.04-4.69) | -1.09 (1.4) | .33 (.02-5.87) |
| Affective symptoms in pregnancy | .06 (.05) | 1.06 (.97-1.17) | -.05 (.06) | .95 (.84-1.08) | -.08 (.08) | .92 (.79-1.07) |
| Satisfaction with health professionals | -.14 (.23) | .87 (.56-1.35) | **-.89 (.27)** | **.41 (.24-.70)**** | -.65 (.30) | **.52 (.29-.94)*** |
| Affective symptoms at 4-6 weeks postpartum | .30 (.06) | **1.36 (1.2-1.53)***** | .39 (.07) | **1.47 (1.28-1.7)***** | .30 (.08) | **1.35 (1.15-1.74)***** |
| Fear of birth symptoms at 4-6 weeks postpartum | .06 (.04) | 1.06 (.99-1.14) | .09 (.05) | 1.09 (.99-1.19) | .05 (.05) | 1.05 (.95-1.17) |
| Social support at 4-6 weeks postpartum | -.05 (.03) | **.95 (.90-.99)*** | -.06 (.03) | .94 (.88-1.01) | .16 (.04) | 1.02 (.94-1.01) |

Note: $R^2$ = .66 (Cox & Snell), .75 (Nagelkerke). Model $\chi^2$ (36) = 243.70, $p$ < .001. Bolded OR (95% CI) indicate a significant association with relevant trajectory group. *$p$ < .05; **$p$ < 0.01; ***$p$ < .001.

**Table 3.**
Predictors of trajectories of birth-related PTSD after exclusion of anxiety and depression at 4-6 weeks postpartum as covariates

| Variables | Recovered vs. Resilient | | Chronic vs. Resilient | | Delayed-PTSD vs. Resilient | |
|---|---|---|---|---|---|---|
| | *b (SE)* | *OR (95% CI)* | *b (SE)* | *OR (95% CI)* | *b (SE)* | *OR (95% CI)* |
| Intra-partum complications (yes) | .74 (.61) | 2.09 (.64-6.86) | -.12 (.73) | .89 (.21-3.72) | .12 (.97) | 1.13 (.17-7.50) |
| Delivery mode (c-section) | -.07 (.51) | .93 (.35-2.50) | -.49 (.67) | .62 (.16-2.31) | 1.73 (.83) | **5.65 (1.11-28.69)*** |
| Infant complications (yes) | 2.35 (1.43) | 10.46 (.64-171.27) | 2.55 (1.58) | 12.86 (.59-283.12) | 1.02 (1.78) | 2.77 (.08-91.26) |
| Gestational age (preterm) | .37 (1.09) | 1.45 (.17-12.27) | 1.14 (1.21) | 3.12 (.29-33.27) | 2.44 (1.22) | **11.49 (1.05-125.44)*** |
| Postpartum complications (yes) | .51 (.49) | 1.67 (.64-4.36) | .86 (.63) | 2.36 (.69-8.14) | -.14 (.86) | .87 (.16-4.71) |
| Traumatic event after birth (yes) | -.15 (1.49) | .86 (.05-15.79) | 3.07 (1.39) | **21.53 (1.41-329.21)*** | 3.45 (1.54) | **31.52 (1.51-648.14)*** |
| Psychological help received (yes) | 1.74 (.77) | **5.7 (1.27-25.58)*** | 1.31(.92) | 3.70 (.61-22.53) | .59 (1.29) | 1.82 (.14-23.03) |
| Affective symptoms in pregnancy | .10 (.04) | **1.11 (1.03-1.2)*** | -.00 (.05) | .99 (.90-1.10) | -.05 (.07) | .95 (.83-1.09) |
| Satisfaction with health professionals | -.09 (.19) | .91 (.62-1.33) | -.78 (.22) | **.46 (.30-70.0)***** | -.67 (.27) | **.51 (.30-.88)*** |
| Fear of birth symptoms at 4-6 weeks postpartum | .06 (.03) | **1.06 (1.01-1.13)*** | .12 (.04) | **1.13 (1.04-1.22)**** | .05 (.05) | 1.05 (.96-1.15) |
| Social support at 4-6 weeks postpartum | -.10 (.02) | **.90 (.86-.94)***** | -.11 (.03) | **.89 (.85-94.0)***** | -.03 (.04) | .97 (.91-1.04) |

Note: $R^2$ = .56 (Cox & Snell), .64 (Nagelkerke). Model $\chi^2$ (33) = 184.44, p < .001. Bolded OR (95% CI) indicate a significant association with relevant trajectory group. *$p$ < .05; **$p$ < 0.01; ***$p$ < .001.

**Table 4.**
Socio-demographic, obstetric and psychosocial characteristics of women resilient and non-resilient women with predictors of birth-related PTSD

| Variables | Resilient (*n* = 140) *M* (*SD*) or *n* (%)[a] | Non-resilient (*n* = 86) *M* (*SD*) or *n* (%)[a] | *t* or $X^2$ | *b (SE)* | *OR (95% CI)* | *b (SE)* | *OR (95% CI)* |
|---|---|---|---|---|---|---|---|
| Age[b] | 27.05 (5.19) | 27.39 (5.26) | -.47 | | | | |
| Primiparity[c] | 82 (58.6%) | 45 (52.3%) | .84 | | | | |
| Planned pregnancy (yes)[c] | 122 (87.1%) | 72 (83.7%) | .51 | | | | |
| Previous delivery problem (yes)[c] | 11 (7.9%) | 7 (8.1%) | .01 | | | | |
| History of stillbirth (yes)[c,d] | 6 (4.3%) | 7 (8.1%) | 1.46 | | | | |
| History of miscarriage (yes)[c] | 27 (19.3%) | 15 (17.4%) | .12 | | | | |
| History of psychological problem (yes)[c] | 10 (7.1%) | 13 (15.1%) | 3.71 | | | | |
| Number of prior traumatic events[b] | .16 (.39) | .28 (.48) | -1.88 | | | | |
| Having prior PTSD symptoms (yes)[c] | 21 (15%) | 22 (25.6%) | 3.87 | | | | |
| Antepartum complications (yes)[c] | 44 (31.4%) | 30 (34.9%) | .29 | | | | |
| Intra-partum complications (yes)[c] | 25 (17.9%) | 50 (58.1%) | 38.98*** | .22 (.66) | 1.25 (.34-4.57) | .39 (.52) | 1.48 (.54-4.08) |
| Delivery mode (c-section)[c] | 35 (25.0%) | 37 (43.0%) | 7.97** | .26 (.54) | 1.30 (.45-3.74) | .17 (.43) | 1.18 (.51-2.77) |
| Infant complications (yes)[c,d] | 1 (0.7%) | 5 (5.8%) | 5.36* | .52 (1.88) | 1.69 (.42-67.78) | 1.97 (1.3) | 7.19 (.55-94.29) |
| Gestational age (preterm)[c] | 3 (2.1%) | 12 (14%) | 11.99** | 1.3 (1.35) | 3.8 (.27-53.16) | 1.47 (.94) | 4.45 (.69-27.48) |
| Postpartum complications (yes)[c] | 36 (25.7%) | 46 (53.5%) | 17.78*** | .98 (.56) | 1.10 (.37-3.29) | .59 (.43) | 1.8 (.77-4.19) |
| Insomnia (yes)[c] | 105 (75.0%) | 69 (80.2%) | .82 | | | | |
| Traumatic event after birth (yes)[c] | 1 (0.7%) | 14 (16.3%) | 20.83*** | .99 (1.34) | 2.69 (.20-36.98) | 1.75 (1.2) | 5.74 (.58-56.77) |
| Psychological help received (yes)[c] | 4 (2.9%) | 21 (24.4%) | 25.17*** | -.27 (.99) | .76 (.11-5.24) | 1.65 (.74) | **5.21 (1.2-22.2)*** |
| Satisfaction with health professionals[b,j] | 4.18 (1.16) | 2.9 (1.7) | 6.16*** | -.41 (.19) | **.66 (.45-.97)*** | -.41 (.15) | **.66 (.49-.90)**** |
| Affective symptoms in pregnancy[b,e,j] | 11.31 (5.79) | 14.34 (6.47) | -3.65*** | .02 (.04) | 1.02 (.94-1.08) | .05 (.03) | 1.06 (.98-1.13) |
| PTSD symptoms in pregnancy[b,f] | .75 (2.24) | 1.31 (2.67) | -1.63 | | | | |
| Fear of birth symptoms in pregnancy[b,g] | 24.51 (9.06) | 25.53 (9.39) | -.81 | | | | |
| Social support in pregnancy[b,h] | 62.48 (12.53) | 59.92 (13.29) | 1.46 | | | | |
| Affective symptoms at 4-6 weeks postpartum[b,e,j] | 9.81 (4.51) | 23.03 (7.48) | -14.8*** | .32 (.06) | **1.4 (1.23-1.6)***** | | |
| PTSD symptoms at 4-6 weeks postpartum[b,f,j] | 5.37 (3.63) | 19.84 (8.26) | -15.3*** | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Fear of birth symptoms at 4-6 weeks postpartum[b,g,j] | 27.0 (7.72) | 33.12 (9.62) | -4.99*** | .06 (.03) | 1.06 (.99-1.13) | .07 (.03) | **1.07 (1.0-1.1)**** |
| Social support at 4-6 weeks postpartum[b,h,j] | 63.66 (10.58) | 52.75 (11.9) | 7.16*** | -.04 (.02) | .96 (.92-1.01) | -.09 (.02) | **.92 (.88-.95)***** |
| Affective symptoms at 6-months postpartum[b,e,i,j] | 10.26 (5.56) | 16.94 (7.51) | -7.14*** | | | | |
| PTSD symptoms at 6-months postpartum[b,f,i,j] | 4.42 (2.93) | 16.12 (11.07) | -9.6*** | | | | |
| Social support at 6-months postpartum[b,h,i,j] | 62.04 (11.44) | 53.07 (13.22) | 5.39*** | | | | |

Note: Non-resilient group was formed by combining groups of women with PTSD at any time after birth (recovered, chronic, and delayed-PTSD).[a]Mean and standard deviation were provided for continuous variables. Number and percentages were provided for categorical variables. [b] Continuous variable; Independent t-test was used. [c] Dummy variable; Chi-square was used. [d] Fisher's Exact test was used where the number of expected counts were below 5. [e] Affective symptoms range from 0 to 42. [f] PTSD scores range from 0 to 51. [g] The scores for fear of childbirth range from 0 to 50. [h] The scores for social support range from 0 to 84. [i] Concurrent variables were not included into the binary logistic regression. [j] The assumption of normality was violated for these variables and therefore Mann-Whitney U test was run to examine statistical significance between the resilient an non-resilient groups. However, since the analyses yielded similar results, the results of parametric test were reported. Significant *p* values indicate differences in proportion or mean scores between groups for the indicated characteristics. *$p < .05$; **$p < .01$; ***$p < .001$.

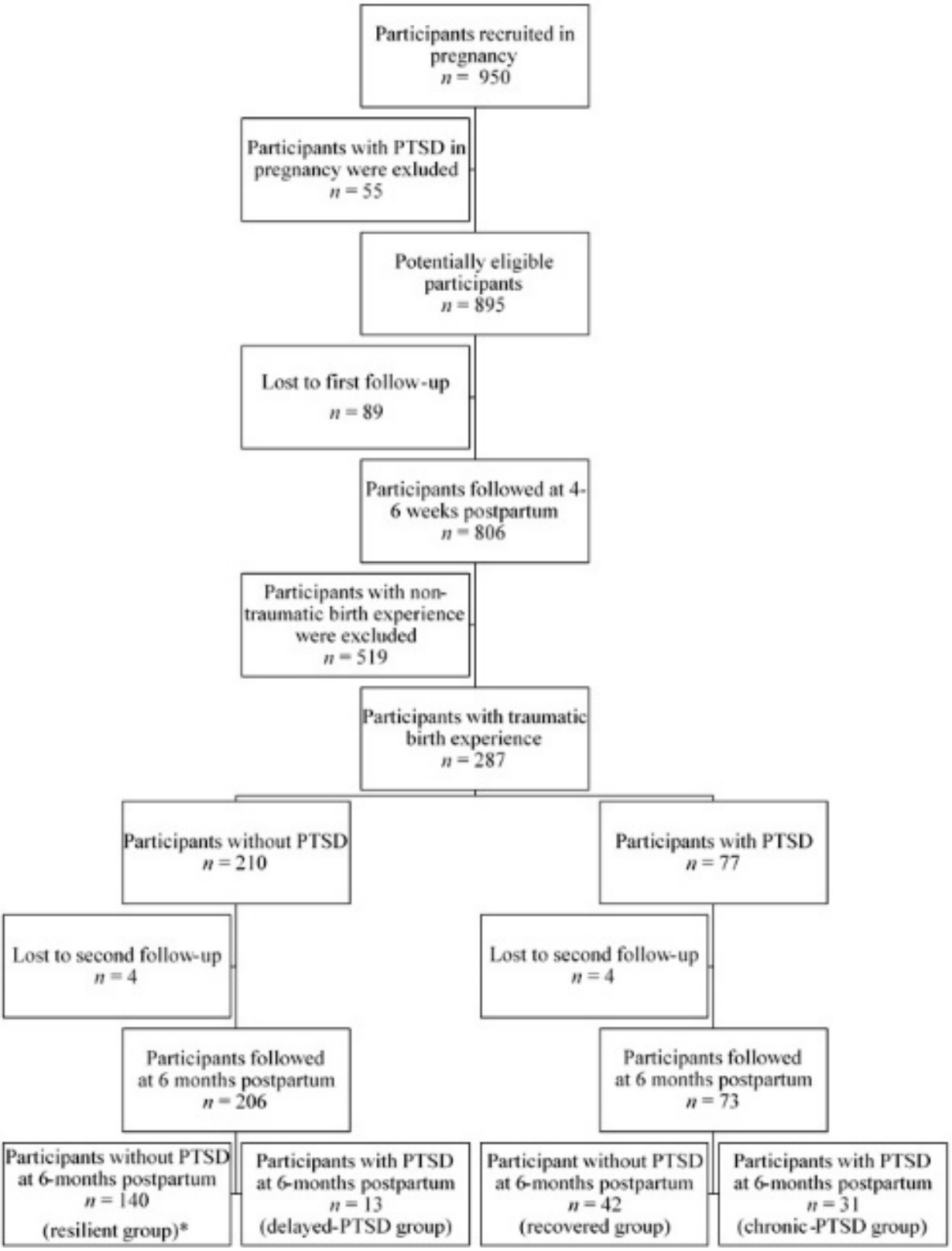


Fig.1. Flow chart of participants and study design. * In accordance with "resilient" terminology, women with scores above the cut-off on at least one subscale of HADS (depression or anxiety) were excluded ($n = 53$).

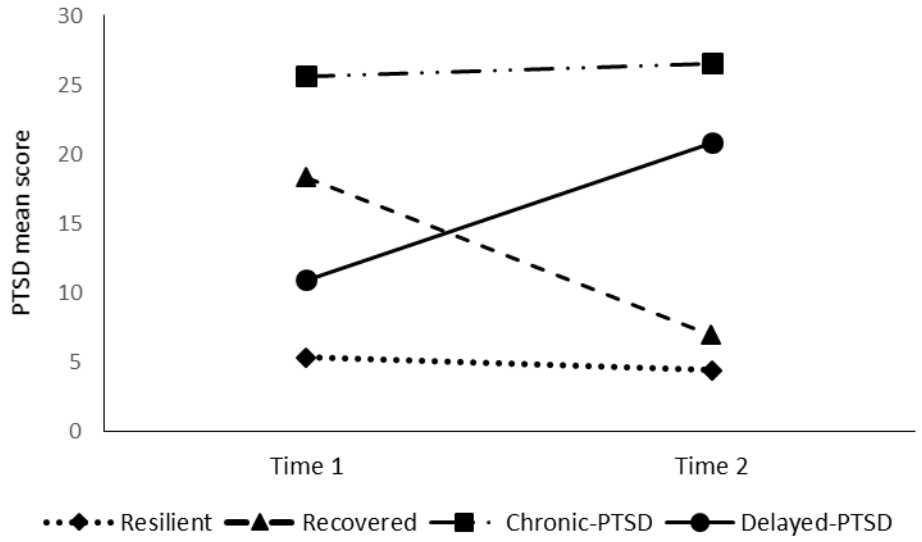


**Fig.2**. Birth-related PTSD scores at 4-6 weeks and 6-months postpartum.