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ORIGINAL PAPER

Examining the connection between perceived stress and post-traumatic stress in women who experienced a traumatic childbirth

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Abstract

Aim: This study aimed to: (1) explore post-traumatic stress disorder symptoms in relation to sociodemographic, obstetric, and childbirth trauma factors; (2) assess the association between perceived stress levels and post-traumatic stress disorder symptoms; and (3) analyze how the duration of perceived stress affects post-traumatic stress disorder. *Design:* A cross-sectional study. *Methods:* Data were collected via an online survey, including demographic and obstetric information, traumatic childbirth events, post-traumatic stress disorder symptoms, and perceived stress levels and duration in the postpartum period. The study was conducted with 202 women who self-identified as having experienced a traumatic childbirth. *Results:* Post-traumatic stress disorder scores did not differ significantly by most sociodemographic or obstetric factors, but cesarean delivery was linked to higher post-traumatic stress disorder scores compared to vaginal delivery with forceps or vacuum extraction, mediated by increased perceived stress. Perceived stress levels showed a significant positive association with all post-traumatic stress disorder dimensions. Stress duration significantly was related to total post-traumatic stress disorder scores, with longer stress being associated with greater severity of symptoms. *Conclusion:* Cesarean delivery and prolonged, elevated stress during childbirth are key risk factors for post-traumatic stress disorder symptoms, highlighting the need for targeted postpartum mental health interventions.

Keywords: childbirth trauma, perceived stress, post-traumatic stress disorder, woman.

Introduction

Childbirth is an impactful and transformative experience in a woman's life (Schmidt et al., 2023). However, for some, this event can be marked by significant stress or trauma. Experiencing childbirth as traumatic can result in psychological issues such as intense fear, anxiety, depression, and the development of post-traumatic stress disorder (PTSD) (Ertan et al., 2021; Kjerulff et al., 2021; Türkmen et al., 2020).

PTSD is an anxiety disorder that may arise following exposure to or witnessing a traumatic event. People with PTSD may experience different symptoms such as flashbacks, nightmares, avoidance of triggers,

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increased anxiety or fear, and a sense of detachment from others (Kleber, 2019; Yehuda, 2004). PTSD can have significant negative implications for the affected women, their babies, and their families, emphasizing the need for a comprehensive understanding of its underlying factors and consequences (Ertan et al., 2021).

Numerous studies in recent years have highlighted the prevalence of postpartum PTSD and its effects on maternal health and infant development. Research indicates that over 40% of women have experienced a traumatic childbirth (Ertan et al., 2021; Patterson et al., 2019; Türkmen et al., 2020), up to 4–7.5% of women meet the clinical threshold for PTSD diagnosis, and up to 20% report subthreshold post-traumatic stress (PTS) symptoms at a sub-diagnostic level (Ayers et al., 2016; Ertan et al., 2021; Grekin et al., 2021; Kjerulff et al., 2021; Liu et al., 2021; Patterson et al., 2019; Slade et al., 2022).

Additionally, the COVID-19 pandemic was associated with higher rates of PTSD during the perinatal period (Mayopoulos et al., 2021; Motrico et al., 2023). Women who delivered during the pandemic were found to have a higher risk of experiencing a traumatic birth compared to those who gave birth prior to the pandemic (Mayopoulos et al., 2021), with studies revealing that more than 40% of women experienced postpartum PTS symptoms during this period (Mayopoulos et al., 2021; Ostacoli et al., 2020; Shuman et al., 2022).

Recently, researchers have started investigating the link between perceived stress and the onset of postpartum PTSD. The interaction between psychological and environmental factors forms a stress response component termed perceived stress, defined as the extent to which life circumstances are perceived as challenging or demanding (Cohen et al., 1983). Thus, perceived stress refers to an individual's subjective appraisal of stressors in their life and their perceived ability to cope with them. It involves the cognitive and emotional assessment of the demands imposed on an individual and the resources available to cope with those demands (Cohen et al., 1983). Obstetric emergencies, complications with the baby's health, and poor support during childbirth have been the most frequently identified risk factors for increased stress during childbirth (Ertan et al., 2021). Recent evidence indicates that elevated levels of perceived stress are positively linked to the occurrence and severity of postpartum PTS symptoms (Lee et al., 1998; O'Donovan et al., 2014). Recognizing the role of perceived stress in relation to PTSD is essential for identifying women at risk and formulating effective intervention strategies.

When considering the associations between a traumatic birth, perceived stress, and PTS symptoms, it is also important to consider the role of individual and clinical factors. Understanding the relationship between various sociodemographic factors is essential for understanding the broader context in which traumatic childbirth experiences occur. Younger age, lower educational attainment, lower income, and insufficient social support have been identified as possible risk factors for developing PTS symptoms (Dikmen-Yildiz et al., 2018). Moreover, investigating the impact of obstetric factors on the development of PTS symptoms after childbirth is vital for understanding how certain birth experiences may lead to trauma. Obstetric factors such as mode of delivery, length of labor, and birth complications have been linked to the onset of PTS symptoms. Emergency cesarean sections, difficult vaginal deliveries, and prolonged labor have been associated with a higher risk of PTSD (Creedy et al., 2000; Grekin et al., 2021; Olza et al., 2018).

Aim

The purpose of this study was to: (1) explore PTS symptoms in relation to sociodemographic, obstetric, and childbirth trauma factors; (2) assess the association between perceived stress levels and PTS symptoms; and (3) analyze how the duration of perceived stress affects PTS symptoms.

Methods

Design

A cross-sectional study.

Sample

To reach the participants, that is, persons who identified themselves as women who had experienced a traumatic event during childbirth, through an e-survey, a questionnaire was distributed via email through several contacts and via various social networks.

The study involved women who had experienced a traumatic childbirth and had an infant who was at least one month old. However, those whose newborn had died or whose clinical condition advised against participation in the survey were excluded.

The research commenced by providing the women with an information sheet detailing the aims of the study, highlighting the confidentiality

of participants, and allowing them to withdraw if they wished. Informed consent was then obtained from those willing to participate.

The questionnaire started by asking participants if they had experienced at least one distressing or traumatic childbirth event.

A traumatic childbirth event was defined based on the American Psychiatric Association criteria outlined in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders of "actual or threatened death, serious injury" (American Psychiatric Association, 2013, p. 210). Therefore, in this study, traumatic childbirth appraisal was determined if participants answered "yes" to one or both of the following questions related to their childbirth experience: (1) Did you believe that your life was in danger or that you were at risk of serious injury?; (2) Did you believe that your baby's life was in danger or that your baby was at risk of serious injury? This operationalization of traumatic childbirth is consistent with previous studies on postpartum PTSD (Ayers, 2004).

Data collection

The survey was conducted in the northern region of Portugal between April 2020 and December 2021. Data collection took place during the COVID-19 pandemic, a period when Portugal, similar to a number of other countries, implemented stringent contact restrictions. Ensuring the integrity of survey data necessitated meticulous planning and careful attention to nuances. In our study, these steps encompassed: (a) measuring the reliability and validity of the collected data through a validation study that included pre-testing of survey questions to identify potential issues related to question wording or interpretation prior to the official survey launch; (b) engaging professionals well versed in the distinctive characteristics of the study population, a measure that facilitated improving the survey inquiries; and (c) maintaining participant anonymity, a paramount consideration to avert potential reservations or hesitations on the part of participants wary of disclosing personal details; this particular information was clearly explained at the beginning of the survey. This research adhered to the stringent reporting criteria specified in the STROBE guideline for cohort studies, as described by von Elm et al. (2014). It is one of the studies conducted as part of a larger project undertaken under the umbrella of an EU COST Action.

Measures

Sociodemographic characteristics were evaluated through a questionnaire that covered age, education, marital status, and employment status.

Obstetric characteristics included parity, type of delivery, and pregnancy planning.

Childbirth trauma was assessed using a questionnaire that categorized trauma into those related to the child's condition, delivery complications, and the experience of losing control during labor.

Perceived stress was assessed through a question about the level of stress felt at the moment of childbirth: "What level of stress did you feel at that moment?"; the level of stress was rated on a Likert scale ranging from 1 to 5. A score of 1 indicated a "very low level of stress", while a score of 5 indicated a "very high level of stress". With regard to duration, the following question was asked: "Regarding the duration of the stress you felt during the birth, how long did it persist?"; Participants' responses were classified into three distinct categories: less than one month, one to three months, and exceeding three months.

The Posttraumatic Stress Disorder Checklist for Civilians (PCL-C) (Weathers et al., 1993) was used to assess the level of PTS symptoms. The PCL-C is a self-report measure consisting of 17 questions corresponding to the 17 PTSD symptoms described in DSM-5 criteria B (re-experiencing), C (avoidance / numbing), and D (hyperarousal).

Responses are given on a 5-point Likert scale, where 1 is "not at all" and 5 is "extremely". Scores of 3 or more indicate the presence of PTS symptoms. The original scale has good psychometric quality, with a Cronbach alpha of 0.97 for the total PCL-C score, and 0.94, 0.95, and 0.92 for criteria B, C, and D, respectively. The translation of the scale into Portuguese was based on the back-translation method, with authorization from the author of the original scale. The scale showed good psychometric properties (Marcelino & Gonçalves, 2012), with a Cronbach alpha of 0.94 for the total PCL-C score, and 0.86, 0.87, and 0.88 for criteria B, C, and D, respectively.

Data analysis

Data were analyzed using IBM SPSS Statistics (version 28). Initially, descriptive statistics were computed to summarize the study variables. Subsequently, Spearman's rho was examined to determine the strength and direction of associations between the variables.

Multivariate analysis of variance (MANOVA) was used to examine the relationships between the PCL-C and the study variables, namely sociodemographic, obstetric and childbirth trauma-related variables, and perceived stress levels.

Differences in PTSD based on sociodemographic and obstetric characteristics and childbirth trauma events were calculated using analysis of variance (ANOVA). Furthermore, an analysis was performed to examine the mediating role of perceived stress level in the relationship between type of childbirth (cesarean vs. vaginal delivery) and PTS scores. This analysis utilized Model 4 of the PROCESS macro (version 4.1), developed by Hayes for SPSS (Hayes et al., 2017). Although the level of perceived stress was assessed using an ordinal rather than a continuous variable, this assessment was considered continuous, following the indication that ordinal variables can be treated as continuous in various situations (Robitzsch, 2020).

By employing this model, we were able to estimate the direct effects of the type of birth on PTS symptoms, as well as the indirect effects of type of birth (caesarean vs. vaginal delivery) on PTS scores through perceived stress levels. To determine the significance of indirect effects, bootstrap 95% confidence intervals (CIs) were calculated. Indirect effects were considered statistically significant at the 0.05 level if the lower and upper limits of the CI did not include zero (0). In addition, the statistical significance of direct effects was assessed using unstandardized regression coefficients and p-values.

Results

Sample characteristics

A total of 202 women completed the questionnaire, ranging in age from 18 to 46 years, with a mean age of 33.68 (SD = 4.70). The majority were from Portugal (95%; n = 192), were married or cohabiting (93%; n = 188), had higher education (76.8%; n = 155), and were employed (84.2%; n = 170). Most participants were first-time mothers (66.3%; n = 134) and had planned their pregnancies (76.7%; n = 155). All had attended regular prenatal check-ups, with at least six medical appointments during their pregnancy. Regarding the type of delivery, 31.2% (n = 63) had a vaginal birth, another 31.2% (n = 63) had a vaginal delivery assisted by forceps or vacuum extraction, and 37.6% (n = 76) underwent a cesarean section.

As for traumatic childbirth events, 13.9% (n = 28) reported childbirth trauma associated with the child's condition, 63.9% (n = 131) experiences childbirth trauma linked to delivery complications, and 20.3% (n = 43) reported childbirth trauma associated with a sense of loss of control during labor.

Table 1 shows the sociodemographic and obstetric profiles and trauma-related events within the sample.

Differences in PTS by sociodemographic and obstetric characteristics and childbirth trauma events

The results of the MANOVA showed no significant differences in PCL-C scores related to education ($F[4.197] = 1.66$, $p = 0.106$, $\eta p2 = 0.03$), employment status ($F[4.197] = 0.75$, $p = 0.558$, $\eta p2 = 0.02$), marital status ($F[4.197] = 0.17$, $p = 0.951$, $\eta p2 = 0.00$), or parity ($F[4.197] = 1.18$, $p = 0.322$, $\eta p2 = 0.02$). Significant differences were found for pregnancy planning ($F[4.197] = 3.25$, $p < 0.05$, $\eta p2 = 0.06$).

No significant differences were found in relation to childbirth type ($F[4.197] = 1.75$, $p = 0.085$, $\eta p2 = 0.03$). However, significant differences were observed for childbirth type, when comparing only cesarean sections with vaginal delivery with forceps or vacuum extraction, excluding vaginal deliveries ($F[4.174] = 3.02$, $p < 0.05$, $\eta p2 = 0.07$). This difference was found across all the dimensions of the PCL-C, including re-experiencing symptoms ($F[4.174] = 5.18$, $p < 0.05$, $\eta p2 = 0.03$), avoidance / numbing symptoms ($F[4.174] = 7.12$, $p < 0.01$, $\eta p2 = 0.04$), hyperarousal symptoms ($F[4.174] = 4.60$, $p < 0.05$, $\eta p2 = 0.03$), and for the total score ($F[4.174] = 6.53$, $p < 0.05$, $\eta p2 = 0.04$).

Relationship between the type of childbirth and PTS: the mediating role of perceived stress level

The model tested accounted for 44% of the variance in the PCL-C scores ($F[2.199] = 77.07$, $p < 0.001$). The direct effect of the type of childbirth on the PCL-C was not significant ($B = -0.00$; $SE = 0.15$, $p = 0.992$). The total effect model was significant ($B = -0.42$; $SE = 0.19$, $p < 0.05$). The indirect effect of perceived stress levels was also significant (effect = -0.41; 95% CI -0.580, -0.238), suggesting that having a cesarean section was related to higher levels of perceived stress, which contributed to more PTS.

Association between perceived stress levels and PTS

The correlation analysis revealed a significant strong positive relationship (0.675, $p < 0.001$) between the perceived stress level and all dimensions of PCL-C in women after a traumatic childbirth event (Table 2).

Table 1 Sociodemographic and obstetric characteristics and trauma-related events (n = 202)

Characteristics	Min–max	n (%)	M (SD)
Sociodemographic			
age	18–46		33.68 (SD = 4.70)
marital status	single	10 (5%)	
	married / non-marital partnership	188 (93%)	
	divorced	4 (2%)	
education	completed basic school	7 (3.5%)	
	completed secondary school	33 (16.3%)	
	bachelor's degree or more	162 (80.2%)	
current employment situation	employed	170 (84.2%)	
	unemployed	32 (15.8%)	
Obstetric			
parity	primiparous	134 (66.3%)	
	multiparous	68 (33.7%)	
pregnancy planning	planned	155 (76.7%)	
	not planned	47 (23.3%)	
childbirth type	vaginal	63 (31.2%)	
	vaginal with forceps or vacuum	63 (31.2%)	
	caesarean	76 (37.6%)	
Childbirth trauma events			
related to the child's condition	health problems (including prematurity)	28 (13.9%)	
related to delivery problems	perineal trauma	56 (27.7%)	
related to delivery experience	change in type of delivery	46 (22.8%)	
	use of forceps	27 (13.4%)	
	lack of pain control during labor	23 (11.4%)	
	prohibiting partners from being in the delivery room	18 (8.8%)	
	unexpected maternal health problem	4 (2%)	
Perceived stress level	very low level	13 (6.4%)	
	low level	13 (6.4%)	
	moderate level	6 (3%)	
	high level	29 (14.4%)	
	very high level	141 (69.8%)	

Table 2 Means, standard deviations, and Spearman's rho correlations among study variables

		Perceived stress (M = 4.35; SD = 1.21)
PCL-C – re-experiencing	M = 3.01 (SD = 1.30)	0.676*
PCL-C – avoidance / numbing	M = 3.20 (SD = 1.35)	0.660*
PCL-C – hyperarousal	M = 3.21 (SD = 1.15)	0.607*
PCL-C – total score	M = 3.15 (SD = 1.22)	0.675*

*$p < 0.001$

Association between the duration of perceived stress and PTS

The results revealed significant differences in the total PCL-C ($F[2.199] = 40.584$, $p < 0.001$, $\eta p2 = 0.290$) based on the duration of perceived stress. These differences were also observed across all PCL-C subscales, including: re-experiencing ($F[2.199] = 41.463$, $p < 0.001$, $\eta p2 = 0.294$); avoidance / numbing ($F[2.199] = 34.511$, $p < 0.001$, $\eta p2 = 0.258$); and hyperarousal ($F[2.199] = 31.492$, $p < 0.001$, $\eta p2 = 0.240$). There were also significant differences in the number of women who experienced stress for less than one month compared to those who experienced stress for 1–3 months (mean difference = -0.97; SD = 0.22; $p < 0.001$). Additionally, significant differences were found between the group experiencing stress for less than one month and the group experiencing stress for more than three months (mean difference = -1.56; SD = 0.17; $p < 0.001$) (Table 3).

Table 3 Perceived stress duration and PCL-C

	Less than 1 month / 1 to 3 months	Less than 1 month / More than 3 months
	Mean difference (SD)	**Mean difference (SD)**
PCL-C – re-experiencing	-0.70 (± 0.24)*	-1.67 (± 0.18)*
PCL-C – avoidance / numbing	-1.02 (± 0.25)*	-1.63 (± 0.20)*
PCL-C – hyperarousal	-0.99 (± 0.22)*	-1.34 (± 0.17)*
PCL-C – total score	-0.97 (± 0.22)*	-1.56 (± 0.17)*

**p < 0.001*

Discussion

The study aimed to investigate the connection between the intensity and duration of perceived stress during a traumatic childbirth and the development of PTS symptoms. The results indicated that cesarean delivery was linked to significantly higher PTS scores, with this association being mediated by elevated levels of perceived stress. Both the intensity and duration of perceived stress were found to have a significant positive correlation with all aspects of PTS following a traumatic childbirth. These findings are consistent with earlier research demonstrating a positive link between perceived stress and PTSD (Ertan et al., 2021; Kjerulff et al., 2021; Razurel et al., 2013). These results also support the findings of a recent systematic review and meta-analysis, which indicated that women who perceived their childbirth experience as traumatic had a higher risk of developing symptoms associated with PTSD (Heyne et al., 2022).

This study provides important insights into the associations between PTS and different sociodemographic, obstetric, and childbirth trauma factors. The findings indicate that sociodemographic factors such as education, employment status, marital status, and parity were not significantly linked to PTS symptoms in women who experienced a traumatic childbirth. Thus, it may be hypothesized that the development of PTS following a traumatic birth is not strongly influenced by these particular sociodemographic factors (Brandao et al., 2020). As most of the women were older, well-educated, married and employed, our sample is not representative of all childbearing women. However, there were significant differences based on pregnancy planning, indicating that women who plan their pregnancies may be more likely to experience PTS, consistent with other studies (İsbİr et al., 2016; Rodríguez-Almagro et al., 2019). Although post hoc analyses did not reveal significant differences between the groups, further research is needed to understand how this variable behaved in previous studies carried out in this area.

Although there were no significant differences regarding the type of birth, when comparing cesarean delivery with vaginal delivery with forceps or vacuum extraction, significant differences were observed in all dimensions of PTS symptoms, similar to previous studies (Andersen et al., 2012; Modarres et al., 2012). Women who underwent caesarean section reported elevated levels of re-experiencing, avoidance / numbing, and hyperarousal symptoms, along with higher overall PTS scores. Additionally, the study found that having a cesarean section mediated the link between perceived stress levels and the severity of PTS symptoms. Women with cesarean deliveries experienced greater perceived stress, which subsequently resulted in higher PTS levels. This indicates that perceived stress is a key factor in the development of PTS in women who have had a cesarean section (Sawyer et al., 2012). These data reinforce the potential psychological impact of a cesarean section and the need for adequate support and interventions for women who have undergone this type of delivery (Brandao et al., 2020; Heyne et al., 2022; Sawyer et al., 2012).

Healthcare providers must recognize the possible psychological effects of cesarean sections and offer appropriate support and interventions to address the needs of women who have undergone this procedure. Additionally, initiatives to reduce perceived stress during the perinatal period could assist in preventing or reducing the risk of PTSD in this group.

The findings demonstrated a positive correlation between perceived stress and all dimensions of PTS in women following a traumatic childbirth. Elevated levels of perceived stress were associated with more severe PTS symptoms, including re-experiencing, avoidance / numbing, and hyperarousal. This is consistent with previous research suggesting that stress can lead to central nervous system disorders such as depression, anxiety, and PTSD. Given that brain regulation during stressful events creates associations that attune the brain to danger cues, life-threatening situations can activate this system, contributing to PTSD-related symptoms

(Daviu et al., 2019; Schmidt et al., 2023; Welcome & Mastorakis, 2020).

The stress encountered during childbirth can have enduring effects on a woman's mental health, potentially influencing the emergence of PTS symptoms well beyond the immediate aftermath of the event (Sharp et al., 2021). These findings are in line with previous research highlighting the potential psychological impact of traumatic childbirth experiences.

The results of this study provide valuable insight into how the duration of perceived stress relates to the severity of PTS symptoms. The significant differences in total PTS scores and specific subscales indicate that the duration of stress exposure greatly affects the onset and severity of PTSD. This has important implications for understanding the development of PTSD and the long-term health outcomes for both mothers and their children. Previous studies have shown that stress and anxiety during pregnancy and the postpartum period can negatively impact maternal and child well-being (Racine et al., 2019). Since social support has been proven to reduce maternal stress and anxiety, it is essential to implement early intervention programs to lower stress levels in women who have gone through traumatic childbirth experiences (Shorey et al., 2023). Addressing stress through early intervention can improve both short- and long-term health outcomes for mothers and their children.

Nevertheless, the context of this study, conducted during the COVID-19 pandemic, presents unique considerations that may have influenced the results. The pandemic caused unprecedented stress due to various factors, including social isolation, restricted access to healthcare, and concerns regarding health and safety. Recent studies have shown that perinatal mental health was particularly affected during the pandemic, with elevated stress levels and increased reports of anxiety and PTS symptoms among postpartum women (Mayopoulos et al., 2021; Shuman et al., 2022). These external stressors could have amplified the perceived stress levels reported by participants in our study, potentially affecting both the intensity and duration of PTS symptoms.

It is therefore important to interpret the results of the study within this unique context. The influence of the pandemic might have acted as an exacerbating factor for perceived stress, contributing to the development and severity of PTS symptoms following a traumatic childbirth. Acknowledging this factor provides a more nuanced understanding of the findings and aligns with existing literature that underscores the significant impact of the pandemic on maternal mental health (Motrico et al., 2023; Ostacoli et al., 2020).

Despite the measures taken to ensure data reliability, this study has limitations that must be acknowledged. Firstly, the data were collected through an electronic survey, which may cause sampling bias by excluding women who lack digital access, and thus the results should be interpreted with caution. Also, as the data were collected during the COVID-19 pandemic, sometimes during periods of lockdown, this may have contributed to women's perceived stress, so the data should be interpreted in this context. As our findings are regional, the study population is not representative. Finally, the study was cross-sectional, so the associations found are important but do not establish a causal relationship. Therefore, it is important that further prospective research be conducted that examines the impact of trauma and PTS symptoms over time.

Conclusion

This study examined the experiences of a cohort comprising women who had undergone traumatic childbirth. Importantly, most of the women were older, well-educated, married, and employed, making this sample unrepresentative of all childbearing women. While sociodemographic factors yielded no significant differences in PTS, pregnancy planning was an exception. Remarkably, differences in childbirth type showed significant correlations with dimensions of PCL-C, especially cesarean sections versus vaginal deliveries with forceps or vacuum extraction. The model examined accounted for the importance of variance in PCL-C scores, underscoring the interrelated nature of childbirth type and PTS. Thus, perceived stress levels emerged as a mediating factor, with cesarean sections being linked to increased perceived stress, thereby contributing to elevated PTS. Notably, perceived stress levels bore a robust positive association with all PCL-C dimensions. Further, the temporal aspect of perceived stress also proved consequential, as varying durations exhibited significant differences across PCL-C dimensions. In essence, these findings provide a nuanced perspective on the intricate interplay between childbirth experiences, perceived stress, and PTS symptoms, thereby enriching our understanding of this multifaceted domain.

Ethical aspects and conflict of interest

The Research Ethics Committee of the Nursing School of Porto (ESEP) approved the study (reference number 2019-530, December 17, 2019).

The authors report no conflict of interest.

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Author contributions

Conception and design (SB, RS, WA, TB, APP, OR, GJF, EGM, GGİ, Fİ, BKA, KU, TG, GT), data analysis and interpretation (SB, RS, WA, TB, APP), manuscript draft (SB, RS, WA, TB, APP, OR, GJF, EGM, GGİ, Fİ, BKA, KU, TG, GT), critical revision of the manuscript (SB, RS, WA, TB, APP, OR, GJF, EGM, GGİ, Fİ, BKA, KU, TG, GT), final approval of the manuscript (SB, RS, WA, TB, APP, OR, GJF, EGM, GGİ, Fİ, BKA, KU, TG, GT).

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