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Short communication

Traumatic childbirth during COVID-19 triggers maternal psychological growth and in turn better mother-infant bonding

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ABSTRACT

Background: Although posttraumatic psychological growth (PTG) occurs following stressful events, knowledge of maternal psychological growth as a result of giving birth during the novel coronavirus (COVID-19) pandemic is lacking.
Methods: We assessed PTG associated with recent childbirth (Posttraumatic Growth Inventory) in a sample of 2205 women who gave birth during the pandemic and 540 who gave birth before. They also provided information about birth-related traumatic stress (Peritraumatic Distress Inventory; PTSD Checklist), mother-infant bonding (Maternal Attachment Inventory), and breastfeeding.
Results: Close to two thirds (60.45 %) of participants reported childbirth-related PTG with greater appreciation of life endorsed most frequently. No group differences in PTG prevalence were noted between deliveries during or before COVID-19 ($\chi^2 = 0.35$, $p = 0.84$). A multigroup mediation model revealed that in deliveries during the pandemic, childbirth-related acute stress was linked with elevated PTG ($\beta = 0.07$, $p < 0.01$); in turn, PTG was associated with lower posttraumatic stress symptoms ($\beta = -0.06$, $p < 0.05$) and better mother-infant bonding ($\beta = 0.22$, $p < 0.001$). These indirect paths via PTG were not significant in deliveries before the pandemic.
Limitations: Reliance on a convenient sample, self-reports, and cross-sectional design may introduce bias.
Conclusions: Perceived positive maternal psychological changes as a result of childbirth are endorsed by a significant portion of women during the pandemic and can ensue in response to traumatic childbirth. Maternal growth is further implicated in successful postpartum adjustment and positive mother-infant interactions during an important period. Hence, directing clinical attention to opportunities of maternal psychological growth may have benefits especially for women at risk for the adverse outcomes of exposure to traumatic experiences of childbirth.

1. Introduction

Your husband was restricted entry to the hospital at the door because he had been sick 7 days prior, even though he had been healthy since then, and you are being treated as an assumed COVID-19 positive patient. Since delivery, you have been isolated away from your baby. You are so sad and desperate to see your baby that most of your "recovery" has been spent alone, crying. This paraphrased vignette depicts the childbirth experience of a primiparous person during the novel (coronavirus) COVID-19.

A significant portion of women all over the world gave birth during the midst of this global health crisis. They were subject to disruptions in perinatal care and were one of the very few non-urgent populations that continued to be treated in hospitals operating under new policies to counter the pandemic (Mayopoulos et al., 2021b).

In accord with the salutogenic perspective of health (Antonovsky, 1979), individuals may thrive in response to adverse experiences. Although reports of psychological growth during COVID-19 have been documented in adult individuals (Vazquez et al., 2021), the impact of COVID-19 on postpartum individuals has been largely described by negative outcomes (Basu et al., 2021). The COVID-19 pandemic offers a unique opportunity to study possibilities for maternal psychological

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growth during conditions of global uncertainty and traumatic experiences of childbirth (Mayopoulos et al., 2021a). This is unknown.

The positive outlook of highly stressful events has been commonly termed "posttraumatic growth (PTG)". It signifies subjective psychological transformation in which individuals grow in new ways beyond their pre-event functioning level (Tedeschi and Calhoun, 2004). PTG has been repeatedly documented in individuals exposed to various forms of traumatic events (Dekel et al., 2012) and more recently based on pre-pandemic samples in a significant portion of women as a result of childbirth (Berman et al., 2021). Nevertheless, it remains unclear whether PTG has an adaptive value in promoting positive postpartum adjustment.

Rather than mere exposure to traumatic events, it has been conceptualized that the emotional struggle in the face of trauma can trigger PTG (Tedeschi and Calhoun, 2004). Traumatic childbirth has been heightened during the pandemic (Mayopoulos et al., 2021b). This suggests that acute stress in response to childbirth, indicative of a traumatic experience, may also promote opportunities for PTG. The development of positive perceptions of self, which are disturbed in traumatic childbirth (Rodriguez-Almagro et al., 2019), and a stronger sense of one's purpose in life, may further facilitate positive outcomes with respect to maternal mental health and the mother-infant bond, which is often impaired in postpartum psychopathology (Chan et al., 2020).

Because the effects of the pandemic on postpartum women could be enduring and in preparation for future crisis (LoGiudice et al., 2020), we set to study childbirth-related PTG in a large sample of women during COVID-19 and among them a sub-group who delivered during the outbreak of the pandemic in the US. We examined whether acute stress in childbirth is associated with PTG, whether PTG in turn is associated with better mother-infant bonding (and breastfeeding) and lower post-traumatic stress symptoms, and whether this process is heightened when delivering during COVID-19.

2. Methods

We launched an anonymous survey on April 2nd, 2020 to understand the impact of COVID-19 on maternal wellness with data collected through December 2020 (see Mayopoulos et al., 2021a; Mayopoulos et al., 2021b for details). The study was granted exemption by Mass General Brigham Human Research Committee.

A total of 2205 participants gave birth since the outbreak of the pandemic and 544 before the pandemic among those who met inclusion and exclusion criteria (i.e., ≥18 years, live baby, and gave birth in the last 6 months) and provided information on acute stress in response to recent childbirth (out of 3282). In the total sample, participants were on average 31.98 years of age ($SD = 4.54$) and 2.23 months postpartum ($SD = 1.53$). The majority had a vaginal delivery (71%), gave birth at-term to a healthy infant (93.3 %), and half (55.3 %) were primiparas. The majority were married (91.3 %), attained at least a bachelor's degree (78.1 %), and were Non-Hispanic White (86 %). Women delivering during the pandemic and before had similar background except that the former were younger in age ($t(\mathrm{df} = 2747) = 3.86$, $p = 0.001$), less educated ($\chi^2 = 15.54(\mathrm{df} = 1)$, $p = 0.001$), less likely to be Non-Hispanic White ($\chi^2 = 5.74(\mathrm{df} = 1)$, $p = 0.016$), and delivered more recently ($t(\mathrm{df} = 2747) = 24.65$, $p = 0.001$).

2.1. Measures

Psychological growth was assessed using the commonly used Post-traumatic Growth Inventory-Expanded (PTGI-X) (Tedeschi et al., 2017). It has 25 items that measure-positive changes in relating to others, new possibilities, personal strength, spiritual and existential being, and appreciation of life that occurred as a result of a specified stressful event (here, recent childbirth) on a scale from 0 (I did not experience this change) to 5 (I experienced this change to a very great degree) (α = 0.96).

Acute stress in response to childbirth was assessed using the well-validated 13-item Peritraumatic Distress Inventory (PDI) (Brunet et al., 2001). It measures emotional (e.g., "I thought I might die") and physiological experiences during and shortly after a traumatic event (here, childbirth).

Posttraumatic stress disorder symptoms in relation to childbirth (CB-PTSD) were assessed using the PTSD Checklist for DSM-5 (PCL-5) (Weathers et al., 2013). The PCL-5 is the standard self-report of 20 DSM-5 PTSD symptoms (including the 4 PTSD symptom clusters) and their severity over the past month regarding a specified trauma (α = 0.91). The PCL-5 strongly correspondence with diagnostic tools.

Maternal-infant bonding was measured with the Maternal Attachment Inventory (MAI) (Müller, 1994), a 25-item self-report measure assessing maternal perception and feelings towards the infant in the first postpartum year. It is a robust tool to measure problems in mother-infant relationship (Perrelli et al., 2014) on a 4 (almost always) to 1 (almost never) scale (α = 0.94), with the scale reversed such that higher scores were indicative of better bonding.

Demographics (i.e., maternal age, education, income, ethnicity), childbirth factors (e.g., primiparity, gestational weeks, mode of delivery), and breastfeeding status (recoded as current breastfeeding versus other) were assessed using single items.

2.2. Data analysis

To examine the hypothesis that childbirth-related acute stress may result in PTG, and that PTG may be linked with better mother-infant bonding, higher likelihood of breastfeeding, and lower CB-PTSD, we conducted a mediation model using MPlus 8.4 (Muthén and Muthén, 2019) Structural Equation Modeling (SEM) software. We also tested whether this process is heightened if delivering during COVID-19. Acute stress served as the predictor, a latent factor on which the five PTG clusters were loaded served as the mediator; the outcome variables were mother-infant bonding, breastfeeding (1 = yes, 0 = no), and the DSM-5 PTSD clusters (intrusion [B], avoidance [C], negative alterations in cognitions and mood [D], and alterations in arousal and reactivity [E]) latent factor. Additionally, we added covariates between the outcome measures, set the paths to breastfeeding to be based on logistic regression (i.e., assessing the likelihood for breastfeeding), and used bias-corrected bootstrap analysis with 5000 resampling cycles to estimate the direct and indirect paths' significance. Estimation of coefficients was conducted using robust weighted least squares (WLSMV) estimator, with delta parameterization, and probit link. Model fit was appraised using Comparative Fit Index (CFI), Tucker Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR). Values above 0.95 in CFI and TLI, below 0.05 in RMSEA, and below 0.08 in SRMR are indicative of good fit. To examine whether the suggested processes were heightened in COVID-19 deliveries, "time" (before or during COVID-19) served as a grouping variable. Using deviance tests, we compared differences between model's paths. Specifically, we compared a model in which all paths were freely estimated with a series of models in which a specific path was constrained to be equal across groups. A significant chi-square test (with one degree of freedom) would indicate a difference in the processes before and during COVID-19. Missing data were allowed on mediator and/or outcome measures (with an average of 20.30 % of the data missing). Little's Missing Completely At Random (MCAR; Little, 1988) test indicated that the data were not MCAR, $\chi^2_{(421)} = 497.91$, $p = 0.006$. Accordingly, missing data were handled with Full-Information Maximum Likelihood (FIM). Group Differences in PTGI scores were examined by Welch's independent samples *t*-test (for continuous measure) and chi-square test for independence of measures (for cut-off scores).

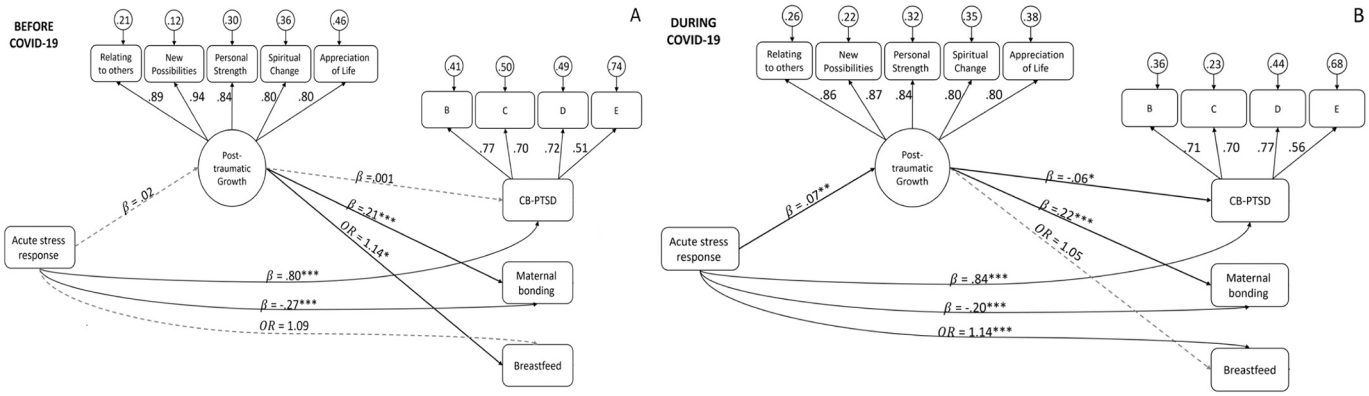

Fig. 1. Multigroup mediation model linking acute stress in response to childbirth with posttraumatic stress disorder symptoms, maternal bonding, and breastfeeding via an increase in posttraumatic growth in women giving birth before (A) and during COVID-19 (B) pandemic. β = standardized regression coefficient, OR = odds ratio for the likelihood of breastfeeding. Solid black paths are statistically significant; dashed gray paths are non-significant. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Table 1
Deviance tests for comparing model's paths between participants delivered before and during the COVID-19 pandemic.

	Deviance test	
	$\chi^2_{(1)}$	*p*-Value
Acute stress response > PTG	23.72	**0.0001**
Acute stress response > PTSD	2.45	0.117
Acute stress response > Maternal bonding	0.88	0.348
Acute stress response > Breastfeeding	2.14	0.144
PTG > PTSD	66.56	**0.0001**
PTG > Maternal bonding	15.82	**0.0001**
PTG > Breastfeeding	16.86	**0.0001**
PTSD <> Maternal bonding	70.73	**0.0001**
PTSD <> Breastfeeding	6.08	**0.013**
Maternal bonding <> Breastfeeding	1.92	0.166

Note. Acute stress response = immediate negative emotional/physiological response to childbirth; PTG = posttraumatic growth, childbirth-related; CB-PTSD = childbirth related posttraumatic stress disorder symptoms; Maternal bonding refers to mother to infant bonding; Breastfeeding refers to currently breastfeeding versus no breastfeeding offered.
> refer to model paths, <> refer to covariates.
$p < 0.05$.

3. Results

Around one third of the sample reported (34.1 %) some degree of growth ($25 \leq$ PTGI ≤ 50) as a result of childbirth and 26.35 % indicated more substantial growth (PTGI>50). Appreciation for life was commonly endorsed (63.8 %; $M_{Item} = 2.31$, $SD = 1.40$), followed by personal strength (54.1 %; $M_{Item} = 1.79$, $SD = 1.36$), relating to others (48.1 %; $M_{Item} = 1.56$, $SD = 1.23$), new possibilities (36.5 %; $M_{Item} = 1.12$, $SD = 1.13$), and spiritual and existential change (24.2 %; $M_{Item} = 0.78$, $SD = 1.04$).

The multigroup mediation model had good fit to the observed data, $\chi^2_{(104)} = 341.12$, $p < 0.01$, $CFI = 0.97$, $TLI = 0.96$, $RMSEA = 0.041$ (90 % confidence interval [CI] 0.036, 0.046; 99.9 % likelihood for RMSEA to be below 0.05), $SRMR = 0.033$ (Fig. 1). The model revealed significant differences in delivering before and during COVID-19 in the processes linking postpartum acute stress response to CB-PTSD, mother-infant bonding, and breastfeeding via an increase in PTG (Table 1). Specifically, only if giving birth during COVID-19 but not before, childbirth-related acute stress was linked with elevated PTG. In turn, only if delivering during COVID-19, PTG was associated with dampened severity of CB-PTSD symptoms. In both cases, PTG was also related to better mother-infant bonding. Thus, the model indicated that only during the pandemic were the indirect paths from childbirth-related acute stress to CB-PTSD and mother-infant bonding via PTG statistically significant (99 % bias-corrected CI -0.029, −0.002 for CB-PTSD, and 0.006, 0.028 for mother-infant bonding).

Independent samples t-test and chi-square test revealed no significant differences in overall PTGI score, $t = 0.58$, $df = 641.43$, $p = 0.562$, *Hedges's g* = 0.03, 95 % CI -0.07, 0.14 ($M_{before} = 35.97$, $SD = 27.17$; $M_{during} = 35.12$, $SD = 26.33$) and $\chi^2_{(2)} = 0.35$, $p = 0.84$, and no differences in PTGI factors (appreciation for life, $p = 0.61$; personal strength, $p = 0.39$; relating to others, $p = 0.48$, new possibilities, $p = 0.50$, spiritual change, $p = 0.18$).

4. Discussion

The phenomenon of PTG adds a new perspective to the study of childbirth outcomes and broadens the conceptualization of maternal postpartum psychological adjustment. Here, we show that during the COVID-19 pandemic–a time of reduced social support and access to healthcare (Townsend et al., 2021) – a significant portion of postpartum women nevertheless reported psychological growth in response to their recent childbirth, which was most notable in greater appreciation of life and personal strength; these changes were in turn associated with the formation of mother-infant bonding during a critical period.

An important issue that we aimed to address is the potential adaptive significance of PTG during COVID-19 in facilitating maternal coping following traumatic childbirth. Although acute stress to childbirth is a robust marker of maternal psychiatric morbidity (Mayopoulos et al., 2021a) the emergence of PTG may support positive postpartum adjustment. We demonstrate the ensuing of maternal PTG in response to traumatic childbirth in women delivering during the pandemic. Experiencing a traumatic event can result in the shattering of one's core cognitive schemas and at the same time may offer opportunities for reconstruction of more positive cognitions manifested in psychological growth. We also find that for women delivering during COVID-19 the development of perceptions of growth following traumatic childbirth associates with less maternal posttraumatic stress disturbance and more positive mother-infant bonding that is instrumental for the infant's socioemotional development (Joas and Moehler, 2021).

Shortcomings of the study include a cross-sectional design, an internet-based sample, and the use of self-reports which allowed us to swiftly collect information in the peak of the pandemic. Although we did not include clinician assessment of maternal health and bonding, we used well-validated questionnaires that accord with diagnostic and observational assessments, and measured growth with the most commonly employed assessment in trauma research. Self-reports, however, cannot rule out the proposed illusionary aspect of PTG, and mediational analysis in cross-sectional design, although common, cannot fully confirm the role of PTG in maternal mental health and nature of the directional relationship and this warrants longitudinal

investigation.

In summary, our findings show that maternal perceptions of positive psychological changes as a result of childbirth associate with healthy postpartum outcomes. The development of maternal growth may have important benefits for women experiencing traumatic childbirth. Interventions targeting maternal psychological growth in the wake of traumatic childbirth are recommended.

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CRediT authorship contribution statement

Mrithula Suresh Babu: Contributed to the writing of the manuscript and data analysis.
Sabrina Chan: Contributed to the writing of the manuscript and built the web survey.
Tsachi Ein-Dor: Conceptualized the statistical design, conducted the statistical analyses, and contributed to the writing the manuscript.
Sharon Dekel: Is the principal investigator of the COVID-19 maternal wellness project. She supervised the data collection, conceptualized the study and its design, and wrote the manuscript.

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated sufficiently in the work to take public responsibility for the content, including participation in the concept, design, analysis, writing, or revision of the manuscript.

Conflict of interest

Mrithula Suresh Babu, Sabrina Chan, Tsachi Ein-Dor and Sharon Dekel declare that they have no conflict of interest.

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