Postpartum mood among universally screened high and low socioeconomic status patients during COVID-19 social restrictions in New York City.

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Research Article

Abstract

Introduction: The mental health effects of the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) and the Coronavirus disease 2019 (COVID-19) pandemic on postpartum women is of increasing concern among mental health practitioners. To date only a handful of studies have explored the impact of the pandemic during pregnancy and none have attempted explore the impact of pandemic related social restrictions on postpartum mood.

Methods: Postpartum patients appearing to the Mount Sinai Health System for their postpartum appointment between January 2, 2020 and June 30, 2020, corresponding to before and during pandemic imposed social restrictions, were screened for mood symptomatology using the Edinburgh Postnatal Depression Scale (EPDS). Each patient's socioeconomic status (SES; high/low) was determined by their location of clinical service.

Results: 516 postpartum patients were screened. While no differences in EPDS scores were observed by SES prior to social restrictions (t(262)=0.23, p=.82), a significant change in mood symptomatology was observed following COVID-19 restrictions (t(288)=2.32, p≤.02), with patients living in lower SES reporting significantly less depression symptomatology (t(321)=4.07, p≤.01). There was no change in symptomatology among patients of higher SES (t(191)=0.59, p=0.56).

Discussion: Postpartum depression, the most common complication of childbearing, is a prevalent, cross-cultural disorder with significant morbidity. The observed differences in postpartum mood between patients of different SES in the context of temporarily imposed COVID-19 related social restrictions present a unique opportunity to better understand the specific health and social support needs of postpartum patients living in urban poverty. Given that maternal mental illness has negative long-term developmental implications for the offspring, and that poor mental health reinforces the poverty cycle, future policy specifically directed towards supporting urban postpartum women living in low-SES by ameliorating some of the early maternal mental health burdens associated with balancing employment-family-childcare demands may assist in interrupting this cycle while simultaneously improving the long-term outcomes of their offspring.

Introduction

Symptoms associated with depression are extremely common following childbirth (1), with a considerable number of postpartum patients being diagnosed with clinically significant depression (2). Because early postpartum depression can result in negative personal, family, and child developmental outcomes (3), it is a serious public health concern. Given that postpartum patients and their offspring represent uniquely vulnerable populations (4) and in light of the worldwide impact of the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) and the Coronavirus disease 2019 (COVID-19) pandemic, the health of those who have recently given birth has been a focus of considerable and

increasing concern among obstetricians, pediatricians, mental health clinicians, Centers for Disease Control, and policy makers (5,6).

The relationship between socioeconomic status (SES) and health, the income gradient—the relative increase in mortality with lower income—accounts for a greater loss of health than any risk factor other than normal human aging (7). While questions remain concerning the causal direction of mental health and poverty (8,9), that is, whether poverty increases the risk of mental health problems or whether poverty is a consequence of ill mental health, observations have repeatedly suggested that minorities living in low SES are among the most vulnerable for postpartum period mood disruption (10,11). Indeed, differences in mental health care following delivery, including sub-optimal treatment (12), distrust of providers (13), racism (14), religious factors (15), perceived negative caregiver traits (16) and poor health literacy (17) are likely partially responsible for these observations. Similarly, social and economic factors such as unavailable or inadequate childcare (18), limited partner and social support (19,20), and reduced flexibility of available time secondary to financial obligations including both formal and informal employment (21,22) likely also play a role in contributing to poorer postpartum mental health outcomes of those living in lower SES.

The COVID-19 pandemic has resulted in far-reaching consequences, beyond the alarming global spread of the disease itself. Interestingly, while the vast majority of impacts appear to be negative, including for those uninfected (23), the pandemic also appears to have had some unexpected positive, albeit temporary, effects. Reduced pollution levels, a decline in the rates of automobile accidents, and a lower incidence of non-COVID infectious disease (24) all appear secondary to imposed social, educational and employment restrictions. Unsurprisingly, early explorations into the impact of the COVID-19 pandemic on maternal populations have reported increases in anxiety and depression (25-28). While these findings represent valuable contributions to the literature, the majority of these studies have suffered from important methodological limitations, including relying solely on self-selection recruitment methods, such as social media advertisements (25,26) and e-mailed online surveys (27) that are prone to biased sampling, may directly influence outcome measures, and are well understood threats to the generalizability of the findings.

Therefore, how the consequences of the COVID-19 pandemic lockdown may differentially impact postpartum mood among those living across the socioeconomic spectrum, both in high and low SES, who are also universally screened as part of their regular clinical care remains unknown. The aims of this exploration was two-fold; The first aim was to determine if there were any changes in postpartum mood symptomatology among all patients who had given birth before and during the COVID-19 pandemic. The second aim of the study was to explore if there were any differences in reported postpartum mood symptomatology between those living in high and low SES during this same time period. The results of this study will help to understand better how the COVID-19 pandemic may be impacting individuals in the postpartum period, identify any differences in postpartum mood related to SES, and determine if the COVID-19 pandemic restrictions may reveal any areas for maternal health policy development (29).

Methods

Sample Population

The study cohort (n=516) consisted of the entire population of patients who appeared either in person or virtually for their postpartum appointment at one of the Mount Sinai Health System sites (Mount Sinai Hospital Obstetrics and Gynecology Associates, Mount Sinai West, Mount Sinai Queens or a Mount Sinai Hospital Faculty Practice) between January 2, 2020, and June 30, 2020. The Mount Sinai Hospital Obstetrics and Gynecology Ambulatory Practice, Mount Sinai West practice and Mount Sinai Queens practice are New York State public health law designated community practices. They are certified as participants of the New York State Medicaid Program and primarily serve a population that self- identifies as minority (94%). Hispanic and African-American women who reside in the inner city comprise the vast majority of the population served (90%). The remaining 10% of women self-identify as Asian, Caucasian, Native American, Indian, Filipino, Islander, and "unknown." Approximately 70% of the women report being single at their first prenatal appointment. Nearly all women are enrolled or "pending enrollment" in a U.S. government funded health care plan when they first come for treatment. The Mount Sinai Faculty Practices consists of a group of independent physicians servicing a population of higher SES individuals, 59% of whom identify as a minority. The vast majority of these patients has commercial insurance, independently subscribes to a private insurance plan, or chooses to self-pay (93%).

Postpartum Assessment of Mood

Beginning in 2010, the Mount Sinai Health System implemented a computerized decision support "hard stop" module, programmed into the postpartum electronic health record, that requires clinicians to enter a standardized PPD mood assessment score before a chart could be closed and the patient released (30). During normal operation, the Edinburgh Postnatal Depression Scale (EPDS;31) is provided to all postpartum patients in the examination room prior to meeting with a medical provider as a first step in screening for depressive symptomatology, The EPDS is a ten-item self-report instrument designed to assess symptoms associated with depression and anxiety using a scale of 0–30. It is an effective screening tool for the mood changes associated with PPD (32) and has been validated in over 36 languages with considerable stability (33). When used as a first step in screening for mood changes associated with pregnancy or when the score is used in a retrospective study for the purpose of statistical analysis, the recommended cutoff score of ≥9 maintains a minimal false-positive rate, a sensitivity of 89%, and a specificity of 51–93 % for mood disturbance, while a cutoff score of ≥12 maintains a sensitivity of 62–96% and specificity of 70–98 % (31, 34). Whenever possible, assessments are provided in the patient's primary language. During the early days of COVID-19 pandemic non-emergent postpartum appointments were conducted virtually or over the telephone with a clinical social worker. In these instances, the clinician was responsible for administering the EPDS verbally and recording the patient's responses. Tabulated scores were then entered into the EHR in their regular manner.

Data Acquisition and Analysis

Data acquisition and analysis were performed in compliance with the Mount Sinai School of Medicine Program for the Protection of Human Subjects and in accordance with the Health Insurance Portability and Accountability Act (HIPAA) security rule guidelines enacted in 2003. Patient health information including date of service and EPDS score was downloaded directly from the Mount Sinai Hospital's network and imported into SAS for analysis.

To accomplish the first aim, all postpartum patients who were administered the EPDS were separated into two groups based on New York's March 12, 2020 ban on large gatherings. Differences in reported symptomatology were assessed using independent sample t-tests. To accomplish the second aim, postpartum patients were divided into high and low SES groups based on their location of service and analyses were run first to explore any differences in symptomatology during the months of January and February, representing a pre-COVID baseline. Then additional analysis were run to further explore any changes in symptomatology between those assessed prior to the March 12, 2020 social restrictions and those assessed thereafter.

Results

Difference in mood before and during community restrictions

516 patients appeared for their postpartum appointment between January 2, 2020 and June 30, 2020, with, 418 (81.0%) reporting some change of mood "over the past two-weeks" (EPDS ≥1), 70 women (13.6%) had a score ≥9 suggesting *possible* depression, and 35 women (6.8%) had a score ≥12 suggesting *probable* depression (mean = 4.1, median = 3.0, range = 0–25, SD = 4.3). After dividing all postpartum patients into those who were assessed on or before March 11, 2020 and those after, corresponding to before and during community restrictions, a significant difference was observed in mean EPDS scores, $t(514)=2.06$, $p=.0039$. (Table 1)

Differences in mood between high and low economic status patients

Of the 516 patients in the sample, 323 women were classified among the low-SES group, whereas 193 were among the high-SES group (Table 2). No difference in depressive symptomatology as measured by the EPDS was observed between the two SES groups prior to the March 11, 2020 implementation of social restrictions ($t(262)=0.23$, $p=.82$), a significant change in mood symptomatology was observed following COVID-19 restrictions ($t(288)=2.32$, $p<.02$), with those living in lower SES reporting significantly less depression symptomatology ($t(321)=4.07$, $p\leq.01$) (Table 3a). Notably, patients among the high SES group demonstrated no difference in symptomatology following community restrictions $t(191)=0.59$, $p=0.56$. (Table 3b)

Discussion

Even in the best of environments, the period following childbirth represents a time of heightened stress and vulnerability for most, if not all, new parents. The added effects of the COVID-19 pandemic on

postpartum individuals have raised considerable concern among clinicians who treat pregnant and postpartum patients. Surprisingly, our findings demonstrated a differentiated postpartum response for those living in New York City during the COVID-19 pandemic based on socioeconomic status. Specifically, while those of higher SES demonstrated no change in postpartum mood in light of the implementation of social restrictions in New York, those living in lower socioeconomic status expressed improved mood over the same time period. Notably, because those living in lower SES have been found to be the most vulnerable for postpartum mood dysregulation (35), these findings appear to have some important implications for public policy directed towards pregnant and postpartum patients living in lower SES.

This is the first study to show a differential response during the COVID-19 pandemic in postpartum mood among those living in urban poverty. Although numerous studies, natural and randomized-control, have sought to determine the mechanism(s) underlying the relationship between poverty and mental health, the causal direction remains indeterminate. Theories generally suppose one of two potential, albeit conflicting, routes; *social selection* and *social causation* (36). The social selection hypothesis posits that individuals with psychopathology will have reduced occupational skills, lower income, and therefore a lower SES. The literature supporting this "social drift" hypothesis however is problematic, in part, because subject samples tend to be young and unable to account for a familial income effect - with the exception of specific incidences such as when the child's health issues reduces the parents' ability to maintain their income. The alternative hypothesis, social causation proposes that people living in low SES develop psychiatric disorders as a result of adversity, including volatile income, limited support and material hardship. While the vast majority of research appears to support this hypothesis (37,38), it is equally probable that the nature of this relationship is cyclic, and that while living in poverty cultivates mental illness, the consequences of mental illness likely reinforce poverty. This is mirrored by the observation that increased rates of depression among new mothers in lower-SES are associated with the absence of spousal financial and social support, material deprivation and subjective standing (39) leading to their offspring being at greater risk for cognitive (40) and emotional challenges (41-43). If accurate, programs designed to mitigate the social determinants of postpartum mood dysregulation in those living in lower-SES could presumably offer an approach towards breaking the poverty cycle.

On March 12, 2020, the World Health Organization declared the outbreak of COVID-19 a global pandemic, and community-wide restrictions resulting in the closing of schools and non-essential business were mandated across New York State. While the vast majority of attention has been focused on the negative consequences of these actions (social and economic), recent observations have noted that the imposed social restrictions may have also had unanticipated positive effects on health and wellbeing (24). Indeed, the well understood social and economic factors which disproportionately impact mothers living in low SES such as unavailable childcare, limited partner and family support, and reduced time flexibility secondary to formal and informal employment obligations, which undoubtedly play a role in contributing to poorer maternal mental health (44), have in many cases, been ameliorated in light of these imposed restrictions. This contrasts to those women of higher SES where factors associated with perceived quality of daily life may have been disrupted in different ways (45).

Since the time of Aristotle, philosophers have discussed *quality of life* factors associated with human well-being that underlie self-perceptions of happiness (46). These differ from *standards of living* which are considered necessities for a healthy life (housing, food, education etc). Although constituting subjective and objective measures respectively, both have been targets of health policy designed to ameliorate the adverse effects of poverty on family mental health, often in the hopes of breaking the poverty cycle (47). To this point, an increasing body of research has consistently found that stressors of parenting which can be buffered by institutional support, such as parental leave, results in decreased stress, increased happiness and facilitates strengthening of the parent-child bond (48), particularly for those living in lower-SES (49). Given that maternal mental health is directly related to the long-term mental health of the offspring, and that the temporary implementation of social restrictions related to the COVID19 pandemic improved the postpartum mental health outcomes of a population at increased risk, further emphasizes the need to develop meaningful social policies to address the parental burdens of those living in urban poverty and towards the greater effort of interrupting the poverty cycle.

While these findings are important, we recognize some possible limitations. First, the population explored is a treatment-seeking clinical sample from care-based centers in New York City, and as convenience samples our findings may not represent the general population of socioeconomic diversity in New York City or the United States. This is a well-understood problem universal to all health registry-based studies where the outcome variables may only represent those agreeing to treatment, as opposed to the treatment capture of all postpartum patients. In this respect, despite the benefits of universal screening, we can only assess those patients who chose to travel, recognize the benefits, or had the means to virtually attend appointments – factors well understood to effect postpartum care utilization among those living in low-SES (50).

Importantly, the distinction between our method of universally screening all postpartum patients and previous studies exploring maternal mood during the COVID-19 pandemic (25-28) likely explains, at least in part, the differences in our findings compared to theirs. That is, they not only did not differentiate between SES, but in addition likely suffered from well understood methodological limitations associated with sampling bias in choosing only to study individuals who independently responded to social media announcements (25,26), anonymously e-mailed online survey requests (27) or other voluntary participation requests (28). Second, we were unable to analyze the data for demographic differences beyond SES. It is possible that there is a subgroup of postpartum patients (e.g. race, parity, delivery route) that may be disproportionally experiencing postpartum mood change, either increased or decreased, but the sample size would have been insufficiently powered to meaningfully identify any differences had these factors been used as covariates. This will therefore need to be further explored as the days of the pandemic continue, and our sample size increases thereby allowing for appropriate statistical power. Thirdly, it is possible that our observation was unrelated to pandemic restrictions and merely a cyclical mood artifact in response to the change in seasons that disproportionally impacts those postpartum individuals living in lower-SES. To assess for this possibility, we randomly generated a year of data corresponding to the dates observed (1/2/2015-6/30/2015) and ran similar analyses exploring for such a

trend – no difference in mood was observed (Supplement 1), further supporting the pandemic restrictions as the modifier of the postpartum mood improvement in low SES patients.

The socio-economic implications of the COVID-19 pandemic remain largely unknown as do the longer-term consequences of the imposed social restrictions. As we presumably remain in the early stages of the crisis, it is also possible that as the pandemic continues to extend and the impacts from unemployment, housing and childcare concerns become more acute, anxiety and depression among this population may increase. Indeed, while we currently see postpartum mood improvement among those living in lower-SES during restrictions, this may change with the eventual lifting of restrictions, the discontinuance of policies expanding access to maternal care, housing protections during the COVID-19 pandemic, government stipends and unemployment benefits. Further, with the potential permanent loss of employment and income secondary to the projected closing of many businesses following the lifting of restrictions (51), postpartum minority groups of lower-SES could ultimately suffer more acutely following the pandemic than those living in higher-SES, who generally have a greater ability to afford the high cost of childcare (52) and are more likely to be able to resume many of those aspects of their lives tied to improved health outcome.

Declarations

Author Contributions:

<u>General:</u> M.S. and H.L. had full access to all of the data and take responsibility for the integrity of the data and the accuracy of the data analysis.

<u>Study concept and design:</u> All authors

<u>Drafting of the manuscript</u>: M.S., H.L., A.K.

<u>Acquisition, analysis, or interpretation of data</u>: All authors

<u>Critical revision of the manuscript for important intellectual content:</u> All authors

<u>Statistical analysis:</u> M.S.

<u>Administrative, technical, or material support</u>: M.S., H.L., L.B.

<u>Study supervision:</u> M.S.

Ethics Approval: The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

Consent for publication: All Authors

Availability of data and materials: The datasets generated during and analyzed during the current study are not publicly available due patient protections and institutional policy.

Competing Interests: None

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Institutional Approvals:

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. Data acquisition and analysis were performed in compliance with the Mount Sinai School of Medicine Program for the Protection of Human Subjects and in accordance with the Health Insurance Portability and Accountability Act (HIPAA) security rule guidelines enacted in 2003.

Informed Consent:

Under the Federal Policy for the Protection of Human Subjects (45 CFR 46.116; a.k.a. the "Common Rule"), informed consent was waived by determination of the Mount Sinai School of Medicine Program for the Protection of Human Subjects.

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Tables

Table 1: EPDS scores before and after implementation of pandemic restrictions (all subjects)

Appointment Date	N	Mean	Median	Range	SDev	EPDS ≥ 1	EPDS ≥ 9	EPDS ≥ 12
1/2/20 - 3/11/2020	260	4.54	3.00	0-25	4.56	213 (81.9%)	39 (15.0%)	19 (7.3%)
3/12/2020 – 6/30/2020	256	3.75	3.00	0-24	4.07	205 (80.1%)	31 (12.1%)	16 (6.3%)

Table 2 EPDS scores presented by SES group (low/high)

	N	Mean	Median	Range	SDev	EPDS ≥1	EPDS ≥9	EPDS ≥12
Low SES 1/2/20-6/30/20	323	3.83	3.00	0-25	4.37	250 (77.4%)	43 (13.3%)	24 (7.4%)
High SES 1/2/20-6/30/20	193	4.68	4.00	0-24	4.24	168 (87.0%)	27 (14.0%)	11 (5.7%)

Table 3a EPDS scores for patients living in low-SES before and after implementation of pandemic restrictions

	N	Mean	Median	Range	SDev	EPDS ≥1	EPDS ≥9	EPDS ≥12
Low SES 1/2/20-3/11/20	146	4.47	3.00	0-25	4.87	114 (78.1%)	21 (14.4%)	13 (8.9%)
Low SES 3/12/20-6/30/20	177	3.31	2.00	0-16	3.84	136 (76.8%)	22 (12.4%)	11 (6.2%)

Table 3b EPDS scores for patients living in high-SES before and after implementation of pandemic restrictions

	N	Mean	Median	Range	SDev	EPDS ≥1	EPDS ≥9	EPDS ≥12
High SES 1/2/20-3/11/20	114	4.62	3.50	0-23	4.14	99 (86.8%)	18 (15.8%)	6 (5.3%)
High SES 3/12/20-6/30/20	79	4.76	4.00	0-24	4.40	69 (87.3%)	9 (11.4%)	5 (6.3%)

Supplement: EPDS scores for patients living in low-SES, January 2 – June 30, 2015

Appointment Date	N	Mean	Median	Range	SDev	EPDS ≥ 1	EPDS ≥ 9	EPDS ≥ 12
1/2/15 - 3/11/2015	121	3.48	3.00	0-17	3.67	85 (70.0%)	13 (10.7%)	5 (4.1%)
3/12/15-6/30/15	174	4.06	3.00	0-21	4.50	129 (74.1%)	23 (13.2%)	16 (9.2%)