ASSISTED REPRODUCTION TECHNOLOGIES

Surrogates' experience during the COVID-19 pandemic: mental health, social support, and relationship with intended parents

Samantha Yee[1] · Jacob L. Fine[1,2] · Emma A. Lindsay[1,3] · Tali L. Laszlo[1,4] · Clifford L. Librach[1,5,6,7,8]

Abstract

Purpose To examine surrogates' mental health, social support, and relationship with intended parents (IPs) during the COVID-19 pandemic from March 2020 to February 2022.

Methods Data were collected between April 29, 2022 and July 31, 2022, at an academic IVF center in Canada using an 85-item online anonymous cross-sectional survey that included three standardized scales measuring mental health (PHQ-4), loneliness, and social support. Eligible surrogates actively involved in surrogacy during the study period received email invitations.

Results The response rate was 50.3% (338/672); 320 submitted surveys were analyzed. Two-thirds (65%) of respondents experienced mental health concerns during the pandemic and were significantly less comfortable about seeking mental health support than those without concerns. Nonetheless, 64% were highly satisfied with their surrogacy experience; 80% received a high level of support from their IPs, and 90% reported a good relationship with them. The final hierarchical regression model identified five significant predictors, explaining 39.4% of the variance in PHQ-4 scores: a prior mental health history, COVID-19 impact on personal life, surrogacy satisfaction, loneliness, and social support.

Conclusions COVID-19 created an unprecedented challenge to surrogacy care, increasing surrogates' risk of experiencing mental health symptoms. Our data show that IP support and the surrogate-IP relationship were fundamentals to surrogacy satisfaction. The findings are relevant to fertility and mental health practitioners in identifying surrogates who are more susceptible to mental health challenges. Fertility clinics should ensure adequate psychological screening of surrogate candidates and proactively offer mental health support services.

Keywords Surrogates · Gestational carriers · Surrogacy · COVID-19 · Mental health · Pandemic

✉ Samantha Yee
samantha@createivf.com

1 CReATe Fertility Centre, 790 Bay Street, Suite 1100, Toronto, ON M5G 1N8, Canada

2 Department of Molecular Genetics, University of Toronto, Toronto, ON, Canada

3 Department of Biomedical Sciences, Ontario, University of Guelph, Guelph, ON, Canada

4 Department of Health Sciences, Ontario, Wilfrid Laurier University, Waterloo, ON, Canada

5 Faculty of Medicine, University of Toronto, Toronto, ON, Canada

6 Department of Obstetrics and Gynecology, University of Toronto, Toronto, ON, Canada

7 Department of Obstetrics and Reproductive Endocrinology, Sunnybrook Health Sciences Centre, Toronto, ON, Canada

8 Department of Gynecology, Women's College Hospital, Toronto, ON, Canada

Abbreviation

IP Intended parent

Introduction

Gestational surrogacy involving assisted reproductive treatments (ART) has become more frequently used by intended parents (IPs) who are unable to carry a pregnancy for medical (e.g., infertile heterosexual couples and cancer survivors) or biological reasons (e.g., same-sex male couples and single men) [1]. Pregnancy is a potentially vulnerable time for many women, partly due to the mental health challenges accompanying the physiological changes during gestation. A systematic review of 31 articles concluded that mental health problems affect approximately 1 in 5 pregnant women throughout the prenatal and postpartum periods [2]. Another umbrella review found that 15–65% of pregnant women

experience symptoms consistent with antenatal depression [3]. As surrogates take on the potential risks of gestating a baby for the benefit of IPs, the safety threshold for surrogates should be high to protect their short-term and long-term wellbeing [4]. The American Society for Reproductive Medicine's (ASRM) practice guidelines recommend that screening, evaluation, and counseling should "address the complex medical and psychological issues that confront the gestational carrier and intended parents, as well as the resultant children" [5, p. 65]. Reducing the risk of negative mental health outcomes among women participating in surrogacy through identifying potential protective and risk factors is therefore crucial [6].

Studies examining the impact of COVID-19 found that women were more susceptible to mental health symptoms than men, likely due to their family roles and caregiving responsibilities, with additional pressure from employment disruptions, income loss, and home-based remote learning for their young children [7–9]. Since pregnant women are already vulnerable to many mental health challenges throughout the antenatal and postpartum periods [2, 3], experiencing social restrictions and isolation due to the prolonged public health measures during the pandemic can further put them at risk for developing severe mental health complications. Despite empirical knowledge on the psychological well-being of pregnant and postpartum women during the pandemic [3, 10], surrogates are under-represented in COVID-19 studies, so their experience is unexplored.

Gestational surrogates' experiences differ from typical pregnancies, in part due to the amount of collaborative third-party reproductive work involved in every step of the process from screening to embryo transfer and pregnancy, the IPs' involvement in treatment and decision-making, and the intent of pregnancy with baby relinquishment upon birth, as well as the surrogate-IP relationship dynamics that are critical to surrogacy satisfaction [11–13]. Surrogate-specific experiences, combined with the added burden of pregnancy during a global public health crisis, could put surrogates at greater risk for developing antenatal and postpartum mental health complications, although no data exist yet to confirm this supposition. ASRM practice guidelines recommend the consideration of surrogates' circumstances and family context for evaluation and preparation [5]. It is paramount that surrogates' short-term and long-term psychological well-being is at the forefront of considerations to mitigate risks, eliminate potential harm, and minimize premature withdrawal [4, 14]. To our knowledge, no research data exist concerning the mental health of surrogates during a global public health emergency. The dearth of empirical knowledge to guide clinical practice poses challenges for fertility clinics, ART practitioners, and mental health professionals to evaluate, counsel, and prepare surrogate candidates adequately and appropriately.

Research investigating the impact of COVID-19 found that pregnant women receiving higher social support had lower odds of experiencing mental health challenges [15–17], thereby confirming the protective function of social support in lowering the risks of mood disorders among antepartum and postpartum women [16, 18]. However, the protective roles of social support on surrogates' mental health during COVID-19 remain unstudied since surrogates were not included in these studies. Given the different pregnancy intents among surrogates and societal attitudes toward surrogacy [13], research is necessary to examine changes in surrogates' social support systems when human contacts were restricted by safety control measures and investigate how these restrictions impacted the buffering effects of social support in mental health protection.

This study evaluated gestational surrogates' retrospective experiences during the pandemic through (i) examining the overall impact of COVID-19 on surrogates' personal lives, mental health, and social support; (ii) investigating surrogates' satisfaction and their relationship with IPs; and (iii) identifying predictive factors influencing surrogates' mental health. Our findings help fill some of the research gaps in evaluating the protective roles of social support on surrogates' mental health, understanding how surrogates experience the IP relationship differently when there is a loss of physical contact and in-person support due to social distancing restrictions, and examining how surrogates appraise their satisfaction of surrogacy participation when the social environment was negatively impacted by COVID-19. Fertility clinics, ART practitioners, and mental health professionals can use the findings to improve surrogacy care, mitigate risks, and improve surrogacy satisfaction in preparing for future epidemics and pandemics.

Methods

Study design

This is a descriptive and exploratory study that collected data anonymously using a self-administered, cross-sectional online survey created by SurveyMonkey™, without chart review. Institutional research ethics approval was obtained prior to recruiting survey respondents at a Canadian academic IVF center located in Toronto (CReATe Fertility Centre). The study sampling frame included a cohort of gestational surrogates who had embryo transfer cycle(s) between March 1, 2019, and February 28, 2022. The start date—1 year before the onset of COVID-19—was chosen so that our sampling frame would include surrogates who were at an advanced stage of pregnancy or gave birth during the first phase of COVID-19 in 2020. To be included in the study, surrogates needed to have (i) been actively involved in a surrogacy

process during the study timeframe; (ii) resided in Canada during the study period; (iii) been a gestational surrogate with no genetic contribution to the fetus; and (iv) a valid email address. The cover page of the online survey was used as the study's consent form, describing the risks and benefits of survey participation with a mandatory check box to confirm eligibility for and consent to participation before starting the survey. This consent procedure excluded inactive surrogates who withdrew, discontinued, or finished their surrogacy journey before the onset of COVID-19 in March 2020. As the survey was anonymous, no personally identifiable information was sought or collected, and survey participation would not affect respondents' clinical care at the center.

Survey construction

An 85-item study-specific, self-constructed survey (Supplementary Table 1) was constructed to examine surrogates' socio-demographics, the impact of COVID-19 on personal and family life, and COVID-19 risk tolerance levels, surrogacy characteristics and experience, social support system, and mental health based on the research team's clinical experience and a comprehensive review of relevant surrogacy and COVID-19 research literature. The survey was reviewed by a team of professionals specializing in surrogacy care for content and face validity and was subsequently pilot-tested by five surrogates before administration. Most survey questions were optional in accordance with research ethics, allowing respondents to skip questions if they chose. The impact of COVID-19 on personal life was assessed by seven items in the domains of family relationships, family income, employment, mental health, physical health, eating habits, and lifestyle choices on a 5-point scale (1, "very low," to 5, "very high"); the COVID-19 impact score was calculated by summing the total scores of these seven items. Mental health status (Yes/No) before and during the pandemic was assessed by a checklist of panic attacks, mild to severe anxiety, mild to severe depression, postpartum blues, and postpartum depression. The survey included the following three validated scales with established psychometric properties to assess three key constructs: loneliness, mental health (i.e., depression and anxiety), and social support:

(i) UCLA-3 Loneliness Scale (UCLA-3) [19] is a 3-item 3-point Likert scale (1, "hardly ever," to 3, "often") that measures three different dimensions of loneliness. A total score of 3–5 represents "not lonely," and 6–9 represents "lonely." Cronbach's alpha was 0.87.

(ii) Patient Health Questionnaire (PHQ-4) [20] is a 4-item 4-Likert scale (0, "not at all," to 3, "nearly every day") that measures the prevalence of depression and anxiety disorder symptoms. A total score of ≤ 6 indicates possible symptoms, and ≥ 6 indicates elevated symptoms. Cronbach's alpha was 0.88.

(iii) Multidimensional Scale of Perceived Social Support (MSPSS-12) [21] is a 12-item 7-point Likert scale (1, "very strongly disagree," to 7, "very strongly agree") that measures perceived social support in the domains of family, friends, and significant other. A total score of 12–48 represents low support, 49–68 represents medium support, and 69–84 represents high support. Cronbach's alpha was 0.94.

Data collection

An electronic medical record and workflow database system (e-IVF) was used to generate a list of surrogates (i.e., names and email addresses) who had embryo transfer(s) during the study period. An initial study invitation email was sent to 690 potential respondents who had a valid email address on April 29 and 30, 2022, with a "no contact" option for those who did not wish to receive further email reminders. Otherwise, a follow-up email was sent 2 weeks later, and a final reminder was sent after a further 4 weeks. The online survey hyperlink was live from April 29, 2022, to July 31, 2022. Of the 690 potential respondents, eighteen indicated that they did not meet the study eligibility criteria with reasons including not living in Canada during the study period, not being an active surrogate during COVID-19, or acting as a surrogate for her same-sex female partner. A total of 338 completed responses were received—a response rate of 50.3% (338/672); 18 were excluded because they were incomplete, leaving 320 for analysis.

Statistical analysis

The quantitative data were imported to SPSS Version 28.0 (IBM Corp., Armonk, NY, USA) for analysis using descriptive statistics, reliability tests, cross-tabulations, Pearson's correlation, χ^2 or Fisher's exact tests (where applicable), t-tests, one-way ANOVA with Tukey post hoc tests, univariate linear regressions, and block-entry hierarchical linear regression. Homogeneity of variances was checked for ANOVA; multicollinearity in the regression models was assessed by the variance inflation factor. Model assumptions must be confirmed before proceeding with statistical interpretations. Missing data were excluded when calculating the frequency distribution; the total number of available responses for each variable was displayed in the study tables. Some 5-point and 7-point ordinal scales were collapsed into three points when reporting the frequency distribution in the tables. The reliability tests, correlations, t-tests, ANOVA, and regressions were conducted using the full 5-point and 7-point ordinal scales; the χ^2 and Fisher's exact tests were conducted using the collapsed 3-point scales for cross-tabulation analyses. All statistical tests were two-sided, and a p-value < 0.05 was considered statistically significant.

Results

Sample characteristics

Table 1 shows the demographics and surrogacy characteristics of the 320 study respondents. Most respondents were aged between 31 and 40 at the start of their surrogacy journey ($n = 198$, 61.9%), identified as White ($n = 273$, 85.3%) and in a partnered relationship ($n = 216$, 67.5%). Respondents reported that their IPs were subdivided between domestic ($n = 138$, 45.2%) and international residents ($n = 167$, 54.8%), with most being same-sex male couples ($n = 185$, 60.7%). At the time of the survey, 36.7% ($n = 112$) were at various stages of the surrogacy process, and the others completed their journey with either a successful live birth ($n = 153$, 50.2%) or a failed outcome ($n = 40$, 13.1%).

Mental health and surrogacy experience

Table 2 shows the impact of COVID-19 on respondents' personal life, mental health, and surrogacy experience. More than a quarter ($n = 83$, 27.2%) expressed "high" COVID-19 infection concerns during surrogacy; nearly a third ($n = 96$, 31.5%) found the COVID-19 restrictions had a "high" negative impact on their surrogacy journey. Nevertheless, 89.5% ($n = 273$) had a "good" relationship with their IPs, and 63.6% ($n = 194$) were "highly" satisfied with their surrogacy experience during COVID-19.

Two-thirds ($n = 192$, 65.1%) of respondents reported experiencing one or more mental health issues on a checklist of panic attacks, mild to severe anxiety, mild to severe depression, postpartum blues, and postpartum depression since the pandemic (referred to as the "Mental Health YES" group), and the other third did not ($n = 103$, 34.9%) (referred to as the "Mental Health NO" group). A quarter (26.4%, $N = 78$) of respondents were on mood-stabilizing medication during COVID-19. Of the 192 respondents in the "Mental Health YES" group, 83.9% ($N = 161$) had a mental health history prior to COVID-19, although 46.9% ($N = 90$) had never been on mood stabilizing medication before COVID (see mental health variables in Table 2). Nearly three-quarters ($N = 219$, 74.2%) had a "high" receptivity to receive mental health services if needed.

Compared to the "Mental Health YES" group, significantly more respondents in the "Mental Health NO" group reported a "low" level of COVID impact in six of the seven personal life areas: (i) family income (60.9% vs. 77.7%, $p < 0.05$), (ii) employment (58.9% vs. 74.8%, $p < 0.05$), (iii) mental health (28.6% vs. 71.8%, $p < 0.001$), (iv) physical health (50.5% vs. 73.8%, $p < 0.001$), (v) eating habits (48.4% vs. 69.9%, $p < 0.01$), and (vi) lifestyle choices (49.0% vs. 74.8%, $p < 0.001$). When comparing the means of COVID-19 impact scores, PHQ-4 and UCLA-3 total scores (Table 2), the "Mental Health YES" group had (i) a significantly higher PHQ-4 score (mean = 7.1 ± 2.6 vs. mean = 4.7 ± 1.2, $p < 0.001$), (ii) a significantly higher UCLA-4 score (mean = 5.2 ± 2.0 vs. mean = 3.8 ± 1.5, $p < 0.001$), and (iii) a significantly higher COVID-19 impact score (mean = 17.8 ± 6.4 vs. mean = 13.6 ± 6.4, $p < 0.001$) compared to the "Mental Health NO" group.

With regard to surrogacy experience during COVID-19, the "Mental Health YES" group included a significantly higher proportion of respondents who (i) had a "high" level of COVID-19 infection concerns during surrogacy (32.3% vs. 17.5%, $p < 0.01$), (ii) experienced a "high" level of COVID-19 restriction impact on their surrogacy experience (40.1% vs. 14.6%, $p < 0.001$), (iii) had a "low" level of surrogacy satisfaction (20.8% vs. 9.7%, $p < 0.05$), and (iv) had "medium" and "low" receptivity levels to receive mental health services (28.7% vs. 20.4%, $p < 0.005$) compared to the "Mental Health NO" group. Nonetheless, no significant group difference was found in their relationship with IPs ($p > 0.05$).

Mental health and social support

The quantity and quality of respondents' social support during COVID-19 are shown in Table 3. Compared to the "Mental Health NO" group, the "Mental Health YES" group (i) had significantly smaller social support networks of family and friends (mean = 3.1 ± 1.2 vs. mean = 2.6 ± 1.1, $p < 0.001$), and (ii) received significantly less social support from their friends (mean = 4.0 ± 1.0 vs. mean = 3.7 ± 1.2, $p < 0.01$) and their family (mean = 4.2 ± 1.0 vs. mean = 3.6 ± 1.3, $p < 0.001$). Similar patterns were found when analyzing the MSPSS-12 scale and its three subscales. When comparing the "Mental Health NO" group with the "Mental Health YES" group, the latter scored significantly lower on the (i) MSPSS-12 Family subscale (mean = 23.2 ± 4.4 vs. mean = 19.5 ± 6.0, $p < 0.001$); (ii) MSPSS-12 Friend subscale (mean = 22.8 ± 4.5 vs. mean = 20.7 ± 5.2, $p < 0.001$), (ii) MSPSS-12 Significant Other subscale (mean = 24.3 ± 3.4 vs. mean = 22.2 ± 5.8, $p < 0.001$), and (iii) MSPSS-12 scale (mean = 70.3 ± 10.2 vs. mean = 62.4 ± 14.3, $p < 0.001$). On the other hand, no significant group differences were found in the physical distance to the social support network ($p > 0.05$) and the number of surrogates known personally ($p > 0.05$). Similarly, no significant group differences were found in the levels of support received from IPs ($p > 0.05$), surrogacy agencies ($p > 0.05$), and other surrogates known personally ($p > 0.05$).

Table 1 Respondents' demographics and surrogacy characteristics during the COVID-19 pandemic (N = 320)

Demographics	N (%)	Surrogacy characteristics	N (%)
Age (years)		**Agency involvement**	
≤ 30	68 (21.3)	No	57 (18.7)
31–35	94 (29.4)	Yes	248 (81.3)
36–40	104 (32.5)	Total	305 (100)
≥ 40	54 (16.9)		
Total	320 (100)		
Ethnicity		**First-time surrogate**	
Non-White	47 (14.7)	No	108 (35.4)
White	273 (85.3)	Yes	197 (64.6)
Total	320 (100)	Total	305 (100)
Province		**Intended parent type**	
Ontario	163 (50.9)	Heterosexual couple	99 (32.5)
Other	157 (49.1)	Same-sex male couple	185 (60.7)
Total	320 (100)	Single man	18 (5.9)
		Same-sex female couple	1 (0.3)
		Single woman	2 (0.7)
		Total	305 (100)
Relationship status		**Intended parent residence**	
Partnered	216 (67.5)	Domestic	138 (45.2)
Non-partnered	104 (32.5)	International	167 (54.8)
Total	320 (100)	Total	305 (100)
Number of children		**Timing of first embryo transfer**	
1	58 (18.2)	Pre-pandemic (≤ 1 year)	37 (12.1)
2	132 (41.4)	First wave (Alpha)	38 (12.5)
3	78 (24.5)	Second wave (Beta)	81 (26.6)
≥ 4	51 (16.0)	Third wave (Gamma)	51 (16.7)
Total	319 (100)	Fourth wave (Delta)	40 (13.1)
		Fifth wave (Omicron)	58 (19.0)
		Total	305 (100)
Highest level of education		**COVID vaccine status at first embryo transfer**	
High school or less	73 (22.8)	None	170 (55.7)
Community college	166 (51.9)	One to three doses	135 (44.3)
University	81 (25.3)	Total	305 (100)
Total	320 (100)		
Income type		**Surrogacy status at survey time**	
Full-time income	205 (64.1)	Embryo transfer stage	41 (13.4)
Part-time income	60 (18.8)	On-going pregnancy	53 (17.4)
Irregular income	14 (4.4)	Treatment on-hold after a pregnancy loss	12 (3.9)
No income[a]	41 (12.8)	Treatment on-hold after failed transfer(s)	6 (2.0)
Total	320 (100)	Ended with a live birth	153 (50.2)
		Ended with a failed outcome	40 (13.1)
		Total	305 (100)

Table 1 (continued)

Demographics	N (%)	Surrogacy characteristics	N (%)
Annual household income in CAD			
≤ $30,000	55 (17.2)		
$30,001–$50,000	70 (21.9)		
$50,001–$70,000	78 (24.4)		
$80,001–$100,000	48 (15.0)		
> $100,000	69 (21.6)		
Total	320 (100)		
Family budget			
Tight	108 (33.8)		
Average	131 (40.9)		
Comfortable	81 (25.3)		
Total	320 (100)		

[a]This category includes surrogates who were full-time students, unemployed, and full-time homemakers who were not looking for work

Mental health predictors

A hierarchical linear regression model (Table 4) was used to identify predictors influencing mental health measured by PHQ-4. Univariate linear regressions of PHQ-4 were conducted first to select statistically significant predictors with $p < 0.05$, using all the variables in Tables 1–3, except the post-COVID mental health variable in Table 2 due to collinearity with the dependent variable. Two variables from Table 1 (family budget and IP residence), eight variables from Table 2 (UCLA-3 total score, COVID-19 impact score, COVID-19 infection concern, COVID-19 restriction impact, mental health history before COVID-19, willingness to seek mental health services, surrogacy satisfaction, and relationship with IP), and one variable from Table 3 (MSPSS-12 total score) were significant. These eleven variables were then grouped in a clinically meaningful way for the block-entry hierarchical linear regression model. UCLA-3 was entered into the second last block to examine its isolated effect on mental health, whereas MSPSS-12 was entered into the last block to examine its buffering effect on mental health.

The final hierarchical regression model explained 39.4% of the variance in PHQ-4 scores ($R^2_{adj} = 0.37$), with 2.4% variance contributed by demographic variables in block 1, 12.6% by mental health-related variables in block 2, 13.4% by COVID-19-related variables in block 3, 4.8% by surrogacy-related variables in block 4, 5.2% by a loneliness variable in block 5, and 1.1% by a social support variable in Block 6. In the final model, significant predictors of PHQ-4 were as follows: (i) pre-COVID-19 mental health history ($\beta = -0.22$, $p < 0.001$), (ii) COVID-19 impact scores ($\beta = 0.18$, $p < 0.01$), (iii) surrogacy satisfaction ($\beta = -0.17$, $p < 0.01$), (iv) UCLA-3 ($\beta = 0.25$, $p < 0.001$), and (v) MSPSS-12 scores ($\beta = -0.14$, $p < 0.05$).

Discussion

To our knowledge, the study sample ($N = 320$) is the largest in the current body of surrogacy research literature. This is also the first study investigating surrogates' experiences during the COVID-19 pandemic. Five significant predictors were associated with surrogates' mental health during the pandemic in the hierarchical regression model: (i) pre-COVID-19 mental health history, (ii) the degree of COVID-19 impact on personal life, (iii) the level of surrogacy satisfaction, (iv) the degree of loneliness, and (v) the level of social support. Since no demographic and surrogacy characteristic variables were significant in the model within our sample, it seems plausible that any surrogates who faced similar challenges in the pandemic would be at risk of emotional distress. ASRM practice guidelines state that surrogates should be informed of the potential risks associated with the process and the psychosocial implications of pregnancy on themselves, their families, and relationship dynamics [5]. Our findings shed light on factors associated with critical mental health concerns made salient during the pandemic.

Among the 65% of respondents experiencing mental health challenges since the pandemic, our analyses reveal that this group of surrogates was much more negative or doing much worse in all the variables under investigation in Tables 2 and 3 compared to the group with no mental health concerns. Despite experiencing significantly more COIVD-19 impact in six out of seven personal life areas, this group was also significantly less comfortable seeking mental health support for reasons not explored in our survey. When interpreting these findings, it is important to note that mental health concerns are highly common among the public. The Centers for Disease Control and Prevention estimated that more than 50% of Americans will be diagnosed with a mental illness or disorder at some

Table 2 Personal life, mental health, and surrogacy experience during the COVID-19 pandemic (N=320)

	All[a]; N (%) or mean ± SD, range	Mental Health NO Group[b]; N (%) or mean ± SD, range	Mental Health YES Group[c]; N (%) or mean ± SD, range
I. Impact of COVID-19 on personal life			
COVID-19 impact on personal life			
a. Family relationship			
Low	204 (63.9)	72 (69.9)	117 (60.9)
Medium	66 (20.7)	21 (20.4)	41 (21.4)
High	49 (15.4)	10 (9.7)	34 (17.7)
Total	319 (100)	103 (100)	190 (100)
b. Family income			
Low	207 (64.9)	80 (77.7)	117 (60.9)
Medium	52 (16.3)	12 (11.7)	32 (16.7)
High	60 (18.8)	11 (10.7)	43 (22.4)
Total	319 (100)	103 (100)	192 (100)
c. Employment			
Low	201 (63.0)	77 (74.8)	113 (58.9)
Medium	44 (13.8)	11 (10.7)	29 (15.1)
High	74 (23.2)	15 (14.6)	50 (26.0)
Total	319 (100)	103 (100)	192 (100)
d. Mental health			
Low	139 (43.6)	74 (71.8)	55 (28.6)
Medium	82 (25.7)	16 (15.5)	60 (31.3)
High	98 (30.7)	13 (12.6)	77 (40.1)
Total	319 (100)	103 (100)	192 (100)
e. Physical health			
Low	186 (58.3)	76 (73.8)	97 (50.5)
Medium	80 (25.1)	19 (18.4)	52 (27.1)
High	53 (16.6)	8 (7.8)	43 (22.4)
Total	319 (100)	103 (100)	192 (100)
f. Eating habits			
Low	176 (55.2)	72 (69.9)	93 (48.4)
Medium	62 (19.4)	13 (12.6)	43 (22.4)
High	81 (25.4)	18 (17.5)	56 (29.2)
Total	319 (100)	103 (100)	192 (100)
g. Lifestyle choices			
Low	183 (57.4)	77 (74.8)	94 (49.0)
Medium	60 (18.8)	11 (10.7)	45 (23.4)
High	76 (23.8)	15 (14.6)	53 (27.6)
Total	319 (100)	103 (100)	192 (100)
COVID-19 impact score[d]	16.4 ± 6.7, 7–35	13.6 ± 6.4, 7–33	17.8 ± 6.4, 7–35
II. Impact of COVID-19 on surrogacy experience			
COVID-19 infection concern during surrogacy			
Low	166 (54.4)	70 (68.0)	93 (48.4)
Medium	56 (18.4)	15 (14.6)	37 (19.3)
High	83 (27.2)	18 (17.5)	62 (32.3)
Total	305 (100)	103 (100)	192 (100)
COVID-19 restriction impact on surrogacy experience			
Low	118 (38.7)	61 (59.2)	55 (28.6)
Medium	91 (29.8)	27 (26.2)	60 (31.3)
High	96 (31.5)	15 (14.6)	77 (40.1)
Total	305 (100)	103 (100)	192 (100)

Table 2 (continued)

	All[a]; N (%) or mean ± SD, range	Mental Health NO Group[b]; N (%) or mean ± SD, range	Mental Health YES Group[c]; N (%) or mean ± SD, range
Surrogacy satisfaction during COVID-19			
Low	52 (17.0)	10 (9.7)	40 (20.8)
Medium	59 (19.3)	19 (18.4)	38 (19.8)
High	194 (63.6)	74 (71.8)	114 (59.4)
Total	305 (100)	103 (100)	192 (100)
Relationship with intended parents			
Poor	14 (4.6)	3 (2.9)	9 (4.7)
Neutral	18 (5.9)	5 (4.9)	12 (6.3)
Good	273 (89.5)	95 (92.2)	171 (89.1)
Total	305 (100)	103 (100)	192 (100)
III. Mental health before and since COVID-19			
PHQ-4 total scores	6.3 ± 2.5, 4–16	4.7 ± 1.2, 4–10	7.1 ± 2.6, 4–16
PHQ-4 Anxiety subscale scores	3.3 ± 1.4, 2–8	2.5 ± 0.8 2–5	3.8 ± 1.5, 2–8
PHQ-4 Depression subscale scores	3.0 ± 1.3, 2–8	2.2 ± 0.6, 2–5	3.3 ± 1.4, 2–8
UCLA-3 total scores	4.7 ± 1.9, 3–9	3.8 ± 1.4, 3–9	5.2 ± 2.0, 3–9
Lifetime history of mental health issues[e] before COVID-19			
Yes	185 (62.7)	24 (23.3)	161 (83.9)
No	110 (37.3)	79 (76.7)	31 (16.1)
Total	295 (100)	103 (100)	192 (100)
Ever been on mood stabilizing medication before COVID-19			
Never	173 (58.6)	83 (80.6)	90 (46.9)
6 months or less	51 (17.3)	12 (11.7)	39 (20.3)
Between 6 months and 2 years	21 (7.1)	3 (2.9)	18 (9.3)
Over 2 years	50 (16.9)	5 (4.9)	45 (23.4)
Total	295 (100)	103 (100)	192 (100)
Experienced mental health issues[e] since COVID-19			
Yes	192 (65.1)	N/A	N/A
No	103 (34.9)		
Total	295 (100)		
On mood stabilizing medication during COVID-19			
Never	217 (73.6)	99 (96.1)	118 (61.5)
6 months or less	35 (11.9)	1 (1.0)	34 (17.7)
Between 6 months and 2 years	43 (14.6)	3 (2.9)	40 (20.8)
Total	295 (100)	103 (100)	192 (100)
Receptivity to seek mental health services if needed			
Low	23 (7.8)	1 (1.0)	22 (11.5)
Medium	53 (18.0)	20 (19.4)	33 (17.2)
High	219 (74.2)	82 (79.6)	137 (71.4)
Total	295 (100)	103 (100)	192 (100)

[a]The total cases in column 2 do not equal the total cases in columns 3 and 4 due to the exclusion of missing data in bivariate cross-tabulation

[b]Mental Health NO Group = respondents reported not experiencing any mental health issues on a checklist of panic attacks, mild to severe anxiety, mild to severe depression, postpartum blues, and postpartum depression since the pandemic

[c]Mental Health YES Group = respondents reported experiencing one or more mental health issues as in [b] above

[d]COVID-19 impact score was calculated by adding the score of the seven COVID-19 impacts on personal life (5-point scale)

[e]A checklist of mental health issues as in [b] above was provided to indicate the presence or absence of concerns

Table 3 Quantity and quality of social support during the COVID-19 pandemic ($N = 320$)

	All[a]; mean ± SD, range	Mental Health NO Group[b]; mean ± SD, range	Mental Health YES Group[c]; mean ± SD, range
I. Quantity of social support			
Number of supportive family members and friends in social support network[d]	2.8 ± 1.1, 1–5	3.1 ± 1.2, 1–5	2.6 ± 1.1, 1–5
Number of surrogates known personally[e]	2.1 ± 1.2, 1–5	2.2 ± 1.3, 1–5	2.0 ± 1.2, 1–5
Physical distance to social support network for practical help[f]	3.8 ± 1.3, 1–5	3.9 ± 1.3, 1–5	3.7 ± 1.4, 1–5
II. Quality of social support			
Level of social support received during surrogacy from the following group[g]			
a. Friends	3.8 ± 1.1, 1–5	4.0 ± 1.0, 1–5	3.7 ± 1.2, 1–5
b. Family	3.8 ± 1.2, 1–5	4.2 ± 1.0, 1–5	3.6 ± 1.3, 1–5
c. Intended parents	4.2 ± 1.0, 1–5	4.3 ± 1.1, 1–5	4.2 ± 1.0, 1–5
d. Surrogacy agency	3.4 ± 1.2, 1–5	3.5 ± 1.3, 1–5	3.4 ± 1.1, 1–5
e. Surrogates known personally	3.0 ± 1.4, 1–5	3.0 ± 1.4, 1–5	2.9 ± 1.5, 1–5
III. Quantity and quality of social support			
MSPSS-12 total scores	65.2 ± 13.5, 12–84	65.2 ± 13.5, 12–84	65.2 ± 13.5, 12–84
MSPSS-12 Family subscale scores	20.8 ± 5.8, 4–28	23.2 ± 4.4, 4–28	19.5 ± 6.0, 4–28
MSPSS-12 Friends subscale scores	21.4 ± 5.1, 4–28	22.8 ± 4.5, 8–28	20.7 ± 5.2, 4–28
MSPSS-12 Significant Other subscale scores	22.9 ± 5.2, 4–28	24.3 ± 3.4, 16–28	22.2 ± 5.8, 4–28

[a]The total cases in column 2 do not equal the total cases in columns 3 and 4 due to the exclusion of missing data in bivariate cross-tabulation

[b]Mental Health NO Group = respondents reported not experiencing any mental health issues on a checklist of panic attacks, mild to severe anxiety, mild to severe depression, postpartum blues, and postpartum depression since the pandemic

[c]Mental Health YES Group = respondents reported experiencing one or more mental health issues as in [b] above

[d]5-point item from 1, "none," to 5, "10 people or more"

[e]5-point item from 1, "none," to 5, "10 people or more"

[f]5-point item from 1, "within walking distance," to 5, "more than 2 hours driving distance"

[g]5-point item from 1, "very low," to 5, "very high"

point in their lifetime, and one in five Americans will experience a mental illness each year [22]. Nonetheless, our findings are relevant to fertility clinics, ART practitioners, mental health professionals, and all parties involved in third-party reproduction. They use clinical parameters to identify surrogates who are more susceptible to mental health challenges but may be more reluctant to seek help, so that psychological support can be offered proactively instead of relying on their initiation until crises happen [4, 14]. Future studies are needed to understand surrogates' attitudes and perceived barriers to help-seeking behaviors, the reasons for some surrogates' reluctance to see mental health practitioners and receive professional help, and how mental health services can be tailored to meet surrogates' needs without stigmatizing them.

Pre-pandemic studies found that surrogates' satisfaction was associated with IPs' residence, surrogate-IP relationships, spousal and family support along the surrogacy pathway, pregnancy outcomes, and whether a successful live birth occurred at the end of the journey [11, 13, 23–25]. In this study, most surrogates were highly satisfied with their surrogacy experience despite undergoing the

process during the pandemic. Our hierarchical regression model also revealed that surrogacy satisfaction was a protective factor of surrogates' mental health. Furthermore, nine in ten surrogates reported having a good relationship with their IPs, and four in five received a high level of support from their IPs. Our data suggest that during the unprecedented global pandemic with many restrictions on IPs' surrogacy involvement, IPs were able to find alternative ways to provide high levels of support to their surrogates to compensate for the loss of in-person relationship-building opportunities and the adverse effects of COVID-19 on the surrogacy experience. These findings, together with the pre-pandemic research literature, show that IP support and surrogate-IP relationships make a fundamental contribution to surrogacy satisfaction.

In this study, the levels of support received from surrogacy agencies and the number of surrogates known personally were not associated with respondents' mental health during COVID-19, suggesting that the social support provided by the surrogacy community during the pandemic made no difference to respondents' mental health. This finding contradicts available data showing the

Table 4 Hierarchical regression model of mental health measured by Patient Health Questionnaire (PHQ-4)

	Standardized coefficients ß	t	R^2	R^2_{adj}	ΔR^2	F
Block 1 (Demographics variable)			0.024	0.020	0.024	7.060**
Family budget** (add)	−0.153	−2.657				
Block 2 (Mental health–related variables)			0.149	0.140	0.126	17.003***
Family budget	−0.098	−1.792				
Mental health history before COVID-19*** (add)	−0.316	−5.80				
Willing to seek mental health service** (add)	−0.158	−2.91				
Block 3 (COVID-19-related variables)			0.283	0.268	0.134	18.959***
Family budget	0.053	0.956				
Mental health history before COVID-19***	−0.252	−4.911				
Willing to seek mental health service*	−0.101	−1.981				
COVID impact score*** (add)	0.337	5.418				
COVID infection concern (add)	0.060	1.137				
COVID restriction impact (add)	0.100	1.756				
Block 4 (Surrogacy-related variables)			0.331	0.310	0.048	15.682***
Family budget	0.076	1.381				
Mental health history before COVID-19***	−0.262	−5.205				
Willing to seek mental health service	−0.081	−1.602				
COVID impact score***	0.297	4.825				
COVID infection concern	0.068	1.317				
COVID restriction impact	0.036	0.614				
Relationship with IP (add)	0.002	0.043				
Intended parent residence* (add)	−0.099	−2.000				
Surrogacy satisfaction*** (add)	−0.229	−3.989				
Block 5 (Loneliness variable)			0.383	0.361	0.052	17.641***
Family budget	0.086	1.629				
Mental health history before COVID-19***	−0.232	−4.765				
Willing to seek mental health service	−0.047	−0.959				
COVID impact score***	0.203	3.252				
COVID infection concern	0.046	0.910				
COVID restriction impact	0.009	0.154				
Relationship with IP	0.049	0.894				
Intended parent residence	−0.068	−1.411				
Surrogacy satisfaction***	−0.187	−3.350				
UCLA-3*** (add)	0.293	4.891				
Block 6 (Social support variable)			0.394	0.370	0.011	16.726***
Family budget	0.082	1.577				
Mental health history before COVID-19***	−0.220	−4.510				
Willing to seek mental health service	−0.016	−0.323				
COVID impact score**	0.184	2.943				
COVID infection concern	0.055	1.092				
COVID restriction impact	0.017	0.300				
Relationship with IP	0.061	1.123				
Intended parent residence	−0.058	−1.209				
Surrogacy satisfaction**	−0.168	−2.998				
UCLA-3***	0.248	3.956				
MSPSS-12* (add)	−0.135	−2.248				

$^*p<0.05$; $^{**}p<0.01$; $^{**}p<0.001$

instrumental social support values provided by surrogacy agencies [23, 26]. One plausible explanation for the minimal contribution of surrogacy support during COVID-19 is that the stringent social distancing measures and the fears of COVID exposure through human contacts greatly diminished the overall protective power of surrogacy community networks. Moreover, much social support organized by surrogacy agencies during the pandemic, such as retreats, support groups, and social gatherings, were either canceled or switched to cyberspace, thereby preventing surrogates from obtaining maximum benefit from the surrogacy community support system. The restrictions on in-person social interactions could also deprive networking opportunities with other experienced surrogates for instrumental support.

Studies conducted during the COVID-19 pandemic have demonstrated that higher levels of loneliness were associated with depression and anxiety symptoms in women [27, 28], confirming that loneliness can contribute to the development of mood disorders [29]. This observation is supported by our hierarchical regression model as loneliness was found to be a significant predictor of mental health. The lack of community support during COVID-19 may increase surrogates' feelings of loneliness and isolation when navigating the surrogacy journey. This may also explain that even though both loneliness and social support were significant predictors in our model, loneliness emerged as a more substantial contributor to the total variance than social support (5.2% vs. 1.1% of the variance) in predicting mental health outcomes.

Here we identify several study design limitations that could affect the generalizability of our findings. Response bias must be considered as all survey respondents were recruited from a single IVF center and all the data were collected through a self-reported survey without chart review. As with all studies recruiting respondents retrospectively, those with a negative experience of the surrogacy process, or the clinic as a whole, may have been less likely to participate. However, our study design did not permit a direct comparison between respondents and non-respondents. Furthermore, mental health concerns before and during the pandemic were investigated using a checklist; the accuracy of these self-reported diagnoses cannot be confirmed without supporting clinical data. Finally, retrospective reporting is always limited by recall bias which may hinder respondents' ability to assess the impact of COVID-19 effects on their experience accurately. Obviously, there was no "unaffected by COVID-19" group to compare our sample to due to the historical nature of the research. Thus, isolating the effects of COVID-19 *eo ipso* was not possible with our methodology.

Conclusions

The fertility and prenatal care disruptions during COVID-19, its impact on personal life, infection fears, and restrictions on health facilities created an unprecedented challenge to surrogacy care, putting surrogates at higher risk of experiencing mental health symptoms. Fertility clinics should ensure adequate psychological screening of surrogate candidates and counsel them appropriately on the potential induced stress of surrogacy commitment on personal and family life for preparation [4, 14, 30]. ART practitioners and mental health professionals should offer proactive psychosocial support services to surrogates who are highly susceptible to mental health challenges based on certain clinical parameters, for example, a prior mental health history [4]. Since surrogates are potentially marginalized by various socio-economic factors, and potentially stigmatized by receiving mental health services during surrogacy, these issues call for future research to bridge the clinical gaps. These could include longitudinal studies on surrogates' mental health, case–control studies involving surrogates and non-surrogates, and controlled experimental studies to test the effectiveness of individual and group psychosocial intervention models geared to the needs of surrogates and the circumstances of surrogacy. Public health crises can disproportionately harm marginalized groups, as evident in COVID-19. Therefore, protecting and advancing the mental well-being of women participating in surrogacy is crucial to mitigate their short-term and long-term psychological risks.

Declarations

Ethics approval This study was approved by Veritas Research Ethics Institution (PSY_V1_APR12 2022) prior to subject recruitment.

Consent to participate Informed consent was obtained from anonymous survey participation.

Competing interests The authors declare no competing interests.

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