

# Parenting infants at the times of COVID-19: A cross-sectional study on parental stress in the province of Modena (Northern Italy)

Elena Righi<sup>1</sup>, Eleonora Ferrari<sup>1</sup>, Laura Lucaccioni<sup>2</sup>, Marco Fasano<sup>1</sup>, Beatrice Righi<sup>3</sup>,  
Viola Trevisani<sup>4</sup>, Lucia Palandri<sup>1</sup>

<sup>1</sup>Department of Biomedical, Metabolic and Neural Sciences, University of Modena and Reggio-Emilia, Modena, Italy; <sup>2</sup>Pediatric Unit, Department of Medical and Surgical Sciences for Mothers, Children and Adults, University of Modena and Reggio-Emilia, Modena, Italy; <sup>3</sup>Department of Mother and Child, Azienda USL- IRCCS of Reggio-Emilia, Reggio-Emilia, Italy; <sup>4</sup>Postgraduate School of Pediatrics, Department of Medical and Surgical Sciences for Mothers, Children and Adults, University of Modena and Reggio-Emilia, Modena, Italy

**Abstract.** *Background and aim of the work:* The advent of the COVID-19 pandemic and the consequent measures to prevent virus's spread particularly affected families with young children, that represent a complex system characterized by a constant interaction between the infant's and the parent's well-being. The present study aims to investigate the parenting stress experienced by parents with 6-month-old healthy infants surveyed from September 2019 to April 2021 in the Modena province (Northern Italy). *Research design and methods:* We carried out a cross-sectional study using the Parenting Stress Index-Short Form (PSI-SF) questionnaire to assess stress levels in the parent-child system. Since the questionnaire is meant to be self-completed by the participant, the survey could continue to be conducted remotely during the pandemic lockdown months. *Results:* Most parents exhibited physiological stress scores, but parents who have been interviewed during the pandemic period had a higher prevalence of stress problems. Subjects in the COVID group also showed a drop in the defensive response and a lower prevalence of stress problems when parenting siblings. *Conclusions:* These findings underline the importance of early detection of isolation's negative effects on households and strengthen the need for tailored familial support during stressful events, in order to promote parent and children's emotional well-being. ([www.actabiomedica.it](http://www.actabiomedica.it))

**Key words:** COVID-19, parenting stress, infants, social isolation, mental health, parent-child relationship

## Introduction

Globally the COVID-19 pandemic and related lockdowns introduced new stressors in many social contexts (1). The Emilia-Romagna region, and northern Italy in general, are some of the regions in the country that were most affected by the first waves of the COVID-19 pandemic (2). In the province of Modena (Emilia-Romagna, Northern Italy), social distancing measures and an actual lockdown protocol have been implemented beginning March 4, 2020,

with following variable degrees of restriction depending on the epidemiological situation. During such periods, besides the potential risk coming from the virus itself, families with school-age and pre-school children have experienced a particular pressure (3) because of increasing social isolation, loss of income, and school closures (4). Several studies have explored the effects of social isolation and school closures on children's mental health (5–7). However, it is also crucial to investigate how the entire family system responded to social distancing norms and to the whole emergency context

that took shape during the first COVID waves, particularly in the case of families with infants.

It is well known that educational practices and parental well-being are determinants of a child's social-emotional and behavioral characteristics (8,9), and the negative psychological impact of periods of quarantine and isolation on both parents and children has been evidenced (10,11). A recent study from Goldfeld et al (12) identified increased household stress as one of the main factors affecting children's health during COVID-19 pandemic. Moreover, according to Abidin paradigm (13), factors associated with parenting stress can be grouped into three categories: child characteristics, parent characteristics and situational-demographic variables directly related to parenting. In particular, situational factors include partner relationship, role restriction, parental health, and social support, and in periods of confinement social support is – by definition – lacking.

Considering therefore the level of parental stress as an important indirect factor influencing child development, there is still much to learn about the consequences of adult stress on negative mental health outcomes in children during COVID-19 initial waves. Several works have shown that the degree of the negative effects of loneliness, isolation, and community loss can vary, with more severe consequences for families with pre-existing vulnerabilities, children's disabilities or socioeconomic issues (14–17). Many recent works also highlight the increased risk of extreme parental stress development during COVID-19, focusing on the risk of parental burnout(18,19) and consequent children maltreatment (20). It also seems that living in an area with a higher risk of infection does not have a significant impact on the health of parents and kids, and that the perceived difficulty of daily life during quarantine is the main risk factor for the emergence of parenting stress (21).

Still, children present with a variety of needs at different ages, and parents of younger children typically experience higher levels of stress (22); to our knowledge, evidence is scarce about the challenges experienced by parents of healthy infants without specific pre-existing vulnerabilities within the first year of life during the pandemic. The COVID-19 pandemic outbreak occurred during the 6-month-follow-up

period of an ongoing perspective cohort study on phthalate exposure in Italian children and gave us the chance to analyze parenting stress in relation with both the specific demands of six-months-old infants and COVID-19 stressors.

The aim of the present study was to describe parenting stress of a cohort of families with a 6-month-old child: as the survey took place from September 2019 to April 2021, 34 parents have been interviewed before and 46 after the COVID-19 pandemic outbreak in Italy. Parenting stress was evaluated by the Parenting Stress Index short form (PSI-SF) questionnaire, a self-report tool designed to evaluate the magnitude of stress in the parent-child system, which is widely used by clinicians, validated across cultures and available in Italian. The main sociodemographic features of the cohort were considered to address potential differences in scores observed before and during pandemic.

## Participants and methods

### *Study design and participants*

In the present study we carried out a cross-sectional study involving families with a 6-month-old child, nested on a prospective cohort study (the Modena cohort study) that aimed at examining early-life exposure to endocrine disruptors (phthalates) and anthropometric and neuropsychological development in a cohort of Italian children during the first three years of life (23). The main study received the approval by the Area Vasta Emilia Nord Ethics Committee on November 30th, 2018 (Approval number: 715). Parents of all study participants provided informed consent for their children's participation and for data publication. Mothers were recruited during their hospitalization in the Obstetric ward from March 2019 to October 2020, immediately after childbirth. To be eligible for the primary cohort study, newborns needed to have mothers of legal age (>18 years old) at delivery, who understood the Italian language and had a singleton pregnancy. Other inclusion criteria were: delivering at full term (37–41 weeks), appropriate-for gestational-age (AGA) infant, Apgar score >7 at five minutes after birth. For the primary study, sample size calculation

was performed and it was estimated that about 200 newborns were needed: thus, 197 mother and child couples were enrolled. Among them, 80 parents completed the PSI-SF questionnaire at the 6 months follow-up visit, which determined the sample size for the current cross-sectional study. The six-month follow-up took place from September 2019 to April 2021.

### *Instruments*

We asked one parent of each family to fill in the Italian version of the Parenting Stress Index-Short Form (PSI-SF) (24), a validated test commonly used in clinical and research settings, to measure stress levels in the parent-child system. The PSI-SF is a condensed version (25) of the original Parenting Stress Index (PSI) developed by Richard Abidin in 1976 (13,26). The short form questionnaire includes 36 self-report items addressing three different components of parental stress: Parental Distress (PD), Parent-Child Dysfunctional Interaction (P-CDI), and Difficult Child (DC). The test allows as well to obtain a Total Stress (TS) index by combining scores obtained in the three subscales and a defensive response (DIF) measure based on specific items of the questionnaire. Parents complete the questionnaire by reading statements and rating their agreement on a 5-point Likert scale. They are asked to report their initial reactions to each statement. The PD subscale consists of 12 items that explore parental competence, stress related to the parental role, conflicts with the child's other parent, lack of social support, and possible depression. The 12-item P-CDI subscale assesses whether parents perceive their child as meeting their expectations and providing support. High scores indicate a threatened or underdeveloped parent-child bond. The DC subscale includes 12 items that evaluate fundamental aspects of the child's behavior to identify potential self-regulation issues. The Total Stress (TS) score reflects the overall parental concerns, stress from parent-child interactions, and stressors related to the child's behavior. The Defensive Response index (DIF) measures respondents' tendency to present a more positive self-image, minimize problems, or downplay stressors in the parent-child relationship. Raw scores are compared to the distribution of the scores of Italian parents with a child

of the same range of age and the corresponding percentile is attributed to the raw score (24).

When interpreting PSI-SF results, percentiles that fall between 15 and 80 are considered normal, while specialist support should be considered in the case of:

- raw scores above the 85<sup>th</sup> percentile on the PD, P-CDI, DC scales (these are considered high scores);
- TS raw score above the 90<sup>th</sup> percentile (subjects reaching these scores are experiencing a clinically significant level of stress).

Further, low DIF scores (raw score  $\leq 10$ ) may indicate an attempt to portray exceptional competence in parenting, a lack of investment in parenting activities and absence of typical stressors, or genuine high competence and balance in the parent's relationship with both child and partner and should be evaluated with attention.

Table 1 lists additional possible scores or combination of scores that could indicate a problem within the parent-child system (adapted from Abidin RR et al. (13)).

In the sociodemographic section of the PSI-SF questionnaire, we gathered information on age, gender, nationality, profession, number of children, and education for each parental couple. The parent filling the questionnaire also provided socio-demographic information for the partner. The same form was completed for the infant, capturing their age and gender.

Within the PSI-SF data collection form, parents were asked to provide qualitative descriptions of their profession in a free field. To ensure quantitative analysis, we converted this data using the European Socio-economic Groups (ESeG) (27) job categories, which were developed in 2014. The ESeG classification combines the traditional International Classification of Occupations (ISCO) (28) occupational categories, which consider the skills required for specific occupations, with employment status (employee or self-employed). This classification system aims to reflect the socioeconomic status of workers.

Regarding education levels, we categorized parents into three groups: none/primary/middle school, high school, and university or higher education.

**Table 1.** PSI Scores or combination of scores suggesting potential problems within the parent-child system (adapted from Abidin RR et al. (13)). PD: Parental Distress; P-CDI: Parent-Child Dysfunctional Interaction; DC: Difficult Child.

Raw Score	Possible Meaning/ Suggested Intervention
PD scale raw score is the highest score	Further investigation of parental adaptation is recommended.
PD scale raw score above the 90 <sup>th</sup> percentile & DC scale raw score under the 75 <sup>th</sup> percentile	It's likely that the parent is experiencing problems with his or her adjustment that are, at least in part, unrelated to their relationship with the child.
P-CDI raw score above the 95 <sup>th</sup> percentile	Score suggestive of possible child maltreatment in the form of neglect, denial, or physical abuse incidents caused by frustration.
P-CDI, PD and DC scales raw scores are equal or above the 90 <sup>th</sup> percentile	Likely risk of child abuse.
DC raw score above the 90 <sup>th</sup> percentile & P-CDI and PD scale raw score under the 75 <sup>th</sup> percentile	It is usually sufficient to intervene through brief parental counseling or parent support groups that concentrate on coping mechanisms (for stress, difficult relationships, problematic kid behavior, etc.).
P-CDI and DC above the 90 <sup>th</sup> percentile & PD scale raw score under the 75 <sup>th</sup> percentile	The parent is probably dealing with particularly challenging aspects of his or her child's personality or behaviour. A more intensive intervention program for the child is required, and it should include an accurate diagnostic evaluation of the child's functioning and behavioural adjustment.
DC raw score above the 95 <sup>th</sup> percentile	Further diagnostic investigation should be conducted to exclude the presence of significant psychopathologies in the child.

Complete data were obtained for the characteristics of the infants and mothers. However, data on age, education, and/or work were missing for 3 fathers (3.8%). Additionally, information on the number of children was missing for 2 couples (2.5%).

#### Data analysis

Categorical variables were summarized by absolute and relative frequencies, while median and interquartile ranges (IQR) were used for continuous variables, as data were not normally distributed as assessed by the Shapiro-Wilk normality test.

Descriptive statistical analyses were carried out both for the whole cohort of subjects and for parents evaluated before and during COVID pandemic depending on if they were evaluated before or after March 4<sup>th</sup>, 2020 (pre-COVID and COVID group).

Pearson's chi-square test or Fisher's exact test was used to compare categorical variables. Mann Whitney U test was used to analyze differences in two groups of numeric variables, as scores between Pre-COVID and COVID groups. Statistical analyses were performed using IBM SPSS Statistics package version 28.

## Results

### Socio-demographic features

80 parents with a healthy child of about 6 months of age completed the PSI-SF questionnaire. 34 forms were filled in before the pandemic started (pre-COVID group) and 46 after (COVID group). Most questionnaires were completed by mothers (94%), both before (88%) and during pandemic (98%). The main socio demographic characteristics of our cohort are shown in Table 2.

As for the baby features, most infants were male (61%) and 6 or 7 months old (84%); higher prevalence of older infants were observed in the COVID sub-group due to evaluation delays during the lockdown period. Most parents (67%) had only one child. About half (45%) of the mothers were older than 35 years, 74% reported to have a high educational level (University degree or PhD) and most were either professionals (35%) or clerks and skilled service workers (31%). More than half of the fathers (59%) were over 35, 48% held high school diplomas and were employed mainly as clerks and skilled service workers (40%) or professionals (21%). As for nationality, 98% of fathers

**Table 2.** Main socio-demographic (n and %) in the whole sample and in families investigated before or during COVID pandemics (the pre-COVID and the COVID group). Italy (2019-2021).

<i>Infant</i>	<b>Total (80)</b>	<b>Pre-COVID (34)</b>	<b>COVID (46)</b>	<b>p-value</b>
<i>Sex</i>				
<b>Male</b>	49 (61%)	22 (65%)	27 (59%)	0.378
<b>Female</b>	31 (39%)	12 (35%)	19 (41%)	
<i>Age (months)</i>				
<b>5</b>	8 (10%)	4 (12%)	4 (9%)	0.038
<b>6</b>	48 (60%)	26 (76%)	22 (48%)	
<b>7</b>	19 (24%)	4 (12%)	15 (33%)	
<b>8</b>	4 (5%)	0 (0%)	4 (9%)	
<b>9</b>	1 (1%)	0 (0%)	1 (2%)	
<i>Siblings</i>				
<b>0</b>	52 (67%)	24 (71%)	28 (61%)	0.164
<b>1</b>	20 (26%)	6 (17%)	14 (30%)	
<b>2</b>	5 (6%)	4 (12%)	1 (2%)	
<b>4</b>	1 (1%)	0 (0%)	1 (2%)	
<b>Missing</b>	2 (3%)	0 (0%)	2 (4%)	
<i>Interviewed parent</i>				
<b>Mother</b>	75 (94%)	30 (88%)	45 (98%)	0.100
<b>Father</b>	5 (6%)	4 (12%)	1 (2%)	
<i>Mother</i>				
<i>Age (at T6 evaluation)</i>				
<b>≤35 years</b>	44 (55%)	16 (47%)	28 (61%)	0.159
<b>&gt;35 years</b>	36 (45%)	18 (53%)	18 (39%)	
<i>Educational level</i>				
<b>None/primary/middle school</b>	1 (1%)	0 (0%)	1 (2%)	0.142
<b>High school degree</b>	20 (25%)	12 (35%)	8 (17%)	
<b>University or more</b>	59 (74%)	22 (65%)	37 (80%)	
<i>Work category</i>				
<b>Manager</b>	1 (1%)	1 (3%)	0 (0%)	0.813
<b>Professional</b>	28 (35%)	11 (32%)	17 (37%)	
<b>Technician &amp; associated professionals</b>	10 (13%)	4 (12%)	6 (13%)	
<b>Small entrepreneurs</b>	3 (4%)	1 (3%)	2 (4%)	
<b>Clerks &amp; skilled service employees</b>	25 (31%)	10 (29%)	15 (33%)	
<b>Skilled industrial employees</b>	2 (3%)	1 (3%)	1 (2%)	
<b>Lower status employees</b>	1 (1%)	0 (0%)	1 (2%)	
<b>Other non employed</b>	10 (13%)	6 (18%)	4 (9%)	
<i>Nationality</i>				
<b>Italian</b>	73 (91%)	31 (91%)	42 (92%)	0.577
<b>Non Italian</b>	4 (5%)	2 (6%)	2 (4%)	
<b>Missing</b>	3 (4%)	1 (3%)	2 (4%)	

(Continued)

<i>Infant</i>	<b>Total (80)</b>	<b>Pre-COVID (34)</b>	<b>COVID (46)</b>	<b>p-value</b>
<i>Father</i>				
<b>Age (at T6 evaluation)</b>				
≤35 years	29 (36%)	9 (26%)	20 (43%)	0.131
>35 years	47 (59%)	22 (65%)	25 (54%)	
Missing	4 (5%)	3 (9%)	1 (2%)	
<i>Educational level</i>				
None/primary/middle school	3 (4%)	1 (3%)	2 (4%)	0.875
High school degree	38 (48%)	17 (50%)	21 (46%)	
University or more	35 (44%)	14 (41%)	21 (46%)	
Missing	4 (5%)	2 (6%)	2 (4%)	
<i>Work category</i>				
Manager	4 (5%)	3 (9%)	1 (2%)	0.485
Professional	17 (21%)	7 (21%)	10 (22%)	
Technician & associated professionals	4 (5%)	3 (9%)	1 (2%)	
Small entrepreneurs	3 (4%)	2 (6%)	1 (2%)	
Clerks & skilled service employees	32 (40%)	13 (38%)	19 (41%)	
Skilled industrial employees	13 (16%)	5 (15%)	8 (17%)	
Lower status employees	2 (3%)	0 (0%)	2 (4%)	
Other non employed	1 (1%)	0 (0%)	1 (2%)	
Missing	4 (5%)	1 (3%)	3 (7%)	
<i>Nationality</i>				
Italian	61 (76%)	19 (56%)	42 (91%)	0.694
Non italian	1 (1%)	0 (%)	1 (2%)	
Missing	18 (23%)	15 (44%)	3 (7%)	

and 95% of mothers, were Italian. Demographic and socio-economics characteristics of the investigated families did not differ significantly in pre-Covid and Covid groups.

#### *Parenting stress assessment results*

The raw scores observed in our population expressed as median (IQR) are reported in Table 3.

All the median and the IQR values fell within the physiological percentiles scores' range (15-80<sup>th</sup> percentile) according to the distribution of scores in the Italian population (24) both in the pre-COVID and in the COVID group of parents and no statistically significant differences between the two groups

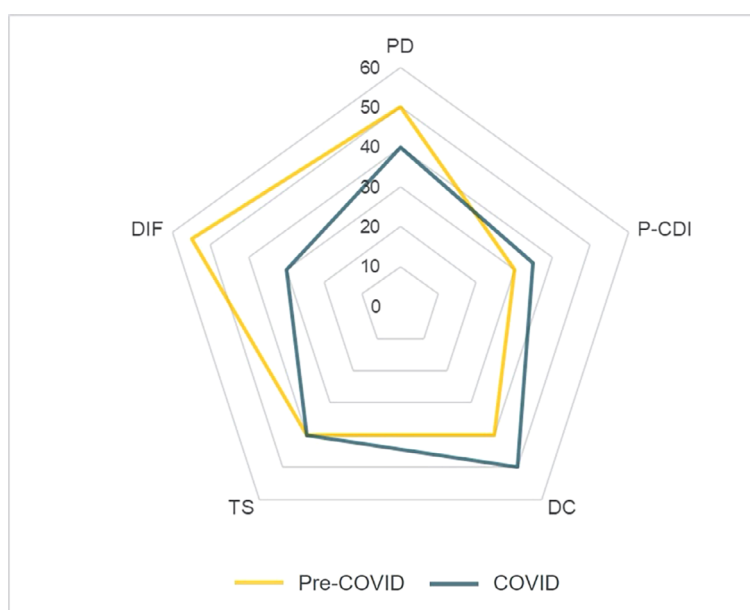
were observed both in total stress scores and in specific areas/sub-scales investigated by the questionnaire. Nevertheless, a chiastic pattern can be noticed by observing the median percentiles of recorded scores of different sub-scales in the two considered periods (pre-COVID and COVID) as reported in Figure 1.

Table 4 shows the prevalence of high scores (>85<sup>th</sup> percentile) on the PD, P-CDI and DC subscales, the prevalence of scores indicative of clinically significant stress (TS >90<sup>th</sup> percentile), and the number of scores suggesting a defensive attitude of the interviewed parent observed in the whole cohort and in parents evaluated before and during pandemic (pre-COVID and COVID group).



**Table 3.** PSI-SF total stress raw score and subscales' raw scores (median and IQR) observed in the whole population and in the pre-Covid and COVID subgroups. Italy (2019-2021).

PSI-SF Raw Scores	Median (IQR)			p-value
	Total (80)	Pre-COVID (34)	COVID (46)	
Parental Distress (PD)	25 (20-31)	25.5 (19.75-31.25)	24 (20.75-30.25)	0.903
Parent-Child Dysfunctional Interaction (P-CDI)	15.5 (14-19)	15 (14-17.5)	16 (14-20.25)	0.158
Difficult Child (DC)	22 (17-26)	19.5 (16-26)	22 (17-27)	0.589
Total Stress (TS)	64 (51.25-77)	63,5 (50.75-77.25)	64 (51.75-77)	0.559
Defensive Responding (DIF)	14 (12-18)	15.5 (11-18)	13 (12-18)	0.911

**Figure 1.** Median scores (expressed in percentiles calculated according to the distribution of scores in the Italian population) in the pre-Covid and COVID subgroups. Italy (2019-2021).

Abbreviations: PD: Parental Distress; P-CDI: Parent-Child Dysfunctional Interaction; DC: Difficult Child; TS: Total Stress; DIF: Defensive Responding.

**Table 4.** Prevalence of high and clinically significant scores in the Pre-COVID and COVID groups, and in the whole sample expressed as n (%). Italy (2019-2021).

Extra Range Scores	Total (80)	Pre-COVID (34)	COVID (46)	p-value
TS $\geq 90^{th}$ percentile	5 (6.3%)	0 (0.0%)	5 (10.9%)	0.057
PD $\geq 85^{th}$ percentile	13 (16.3%)	4 (11.8%)	9 (19.6%)	0.268
P-CDI $\geq 85^{th}$ percentile	6 (7.5%)	2 (5.9%)	4 (8.7%)	0.491
DC $\geq 85^{th}$ percentile	13 (16.3%)	5 (14.7%)	8 (17.4%)	0.498
DIF $\leq 10$ (raw score)	10 (12.5%)	7 (20.6%)	3 (6.5%)	0.063

Abbreviations: PD: Parental Distress; P-CDI: Parent-Child Dysfunctional Interaction; DC: Difficult Child; TS: Total Stress; DIF: Defensive Responding.

**Table 5.** Prevalence of clinically significant combination of scores in the Pre-COVID and COVID groups, and in the whole sample). Italy (2019-2021).

Combination of Scores	Total n (%)	Pre-COVID n (%)	COVID n (%)	<i>p</i> value
<i>PD highest raw score</i>	55 (68.8%)	25 (73.5%)	30 (60.2%)	0.293
<i>PD &gt;90<sup>th</sup> &amp; DC &lt;75<sup>th</sup> percentile</i>	7 (8.8%)	2 (5.9%)	5 (10.9%)	0.359
<i>P-CDI, PD ≤75<sup>th</sup> &amp; DC ≥ 90<sup>th</sup> percentile</i>	4 (5.0%)	2 (5.9%)	2 (4.3%)	0.570
<i>P-CDI, DC ≥90<sup>th</sup> &amp; PD ≤75<sup>th</sup> percentile</i>	2 (2.5%)	0 (0.0%)	2 (4.3%)	0.328
<i>DC ≥95<sup>th</sup> percentile</i>	3 (3.8%)	1 (2.9%)	2 (4.3%)	0.613
<i>P-CDI ≥95<sup>th</sup> percentile</i>	0 (0.0%)	0 (0.0%)	0 (0.0%)	N/A
<i>P-CDI, PD &amp; DC ≥90<sup>th</sup> percentile</i>	0 (0.0%)	0 (0.0%)	0 (0.0%)	N/A

Abbreviations: PD: Parental Distress; P-CDI: Parent-Child Dysfunctional Interaction; DC: Difficult Child; TS: Total Stress; DIF: Defensive Responding.

TS scores indicative of clinically significant stress (TS > 90<sup>th</sup> percentile) and suggesting the need for specialist assessment were recorded exclusively in the COVID group. Further, in the COVID group higher prevalences, although not statistically significant, of ≥85<sup>th</sup> percentile scores in PD, P-CDI and DC subscales were registered. On the other hand, in the COVID group, parents' defensive response (DIF) dropped significantly, suggesting a lower tendency of parents to minimize problems or present a more positive self-image in the parent-child relationship during the pandemic period.

The prevalence of specific score combinations indicative of potential problems within the parent-child system in the two groups (Pre-COVID and COVID) is reported in Table 5.

A PD score highest than all the other scores, suggesting the presence of parents with potential adjustment problems, was the most prevalent condition in our cohort of parents (68.8%) and its occurrence appeared higher in the PRE-COVID group; on the contrary, the proportion of parents probably experiencing personal adjustment problems partly independent of the child-parent relationship was higher in the COVID group as measured by the combination of a PD scale raw score above the 90<sup>th</sup> percentile and a DC scale raw score under the 75<sup>th</sup> percentile.

It also should be noticed that the COVID group showed a greater frequency of score combinations that can suggest a spectrum of problems ranging from mildly problematic child behavior to serious

psychopathologies in the child (P-CDI and DC above the 90<sup>th</sup> percentile & PD scale raw score under the 75<sup>th</sup> percentile, DC raw score above the 95<sup>th</sup> percentile).

No scores suggestive of abuse or risk of abuse were recorded in the sample studied (P-CDI raw score above the 95<sup>th</sup> percentile or P-CDI, PD and DC scales raw scores all equal or above the 90<sup>th</sup> percentile).

Finally, we analysed prevalence of high TS scores (≥85<sup>th</sup> percentile) observed in the whole cohort and in the two groups (Pre-COVID and COVID) in relation to the socio-demographic features of the investigated families (Table 6).

No specific child or parental characteristics appeared to be significantly associated to a higher probability of having TS scores ≥85<sup>th</sup> percentile, even though in the whole cohort younger, highly educated with managerial tasks parents appears more prone to report higher scores. Nevertheless, some child and parents' characteristics, including the number of siblings, the father's age and the mother's levels of education, professional task and nationality appear to act oppositely in pre-COVID and Covid group with regards to TS scores.

## Conclusion

The advent of the COVID-19 pandemic and the associated social distancing and infectious risk containment measures (including lockdown) represented an unprecedented event with a very high stressful



**Table 6.** TS scores (below or above the 85<sup>th</sup> percentile of the Italian population) distribution according to familial and sociodemographic factors in the whole sample and the pre-COVID and COVID and subgroups. Italy (2019-2021).

<i>Sociodemographic Features</i>		<b>Total (80)</b>			<b>Pre-COVID (34)</b>			<b>COVID (46)</b>		
		<i>In range (n=71)</i>	<i>≥85th perc (n=9)</i>	<i>p</i>	<i>In range (n=32)</i>	<i>≥85th perc (n=2)</i>	<i>p</i>	<i>In range (n=39)</i>	<i>≥85th perc (n=7)</i>	<i>p</i>
<b>Gender</b>	Female	28 (90%)	3 (10%)	0.512	12 (100%)	0 (0%)	0.412	16 (84%)	3 (16%)	0.620
	Male	43 (88%)	6 (12%)		20 (91%)	2 (9%)		23 (85%)	4 (15%)	
<b>Siblings</b>	One child	46 (88%)	6 (12%)	0.656	23 (96%)	1 (4%)	0.508	23 (82%)	5 (18%)	0.496
	> 1 child	23 (88%)	3 (12%)		9 (90%)	1 (10%)		14 (88%)	2 (12%)	
<b>Mother's age</b>	<35 years old	38 (86%)	6 (14%)	0.352	15 (94%)	1 (6%)	0.727	23 (82%)	5 (18%)	0.430
	≥35 years old	33 (92%)	3 (8%)		17 (94%)	1 (6%)		16 (89%)	2 (11%)	
<b>Father's age</b>	<35 years old	25 (86%)	4 (14%)	0.358	8 (89%)	1 (11%)	0.290	17 (85%)	3 (15%)	0.629
	≥35 years old	43 (91%)	4 (9%)		22 (100%)	0 (0%)		21 (76%)	4 (24%)	
<b>Mother's education</b>	High school and lower	19 (90%)	2 (10%)	0.564	11 (92%)	1 (8%)	0.588	8 (89%)	1 (11%)	0.583
	Degree and over	52 (88%)	7 (12%)		21 (96%)	1 (4%)		31 (84%)	6 (16%)	
<b>Father's education</b>	High school and lower	39 (95%)	2 (5%)	0.086	18 (100%)	0 (0%)	0.437	21 (91%)	2 (9%)	0.206
	Degree and over	29 (83%)	6 (17%)		14 (93%)	1 (7%)		16 (76%)	15 (24%)	
<b>Mother's occupation</b>	Manager or professional	26 (90%)	3 (10%)	0.579	11 (92%)	1 (8%)	0.588	15 (88%)	2 (12%)	0.482
	Other	45 (92%)	6 (8%)		21 (96%)	1 (4%)		24 (83%)	5 (17%)	
<b>Father's occupation</b>	Manager or professional	18 (86%)	3 (14%)	0.477	9 (90%)	1 (10%)	0.521	9 (82%)	2 (18%)	0.586
	Other	49 (89%)	6 (11%)		22 (96%)	1 (4%)		27 (84%)	5 (16%)	
<b>Mother's nationality</b>	Italian	66 (90%)	7 (10%)	0.361	30 (97%)	1 (3%)	0.119	36 (86%)	6 (14%)	1.000
	Non Italian	3 (75%)	1 (25%)		1 (50%)	1 (50%)		2 (100%)	0 (0%)	
<b>Father's nationality</b>	Italian	55 (90%)	6 (10%)	0.477	19(100%)	0 (0%)	N/A	36 (86%)	6 (14%)	1.000
	Non Italian	1 (100%)	0 (0%)		0 (0%)	0 (0%)		1 (100%)	0 (0%)	

potential for the entire world population. Apart from the mere biological risk related to infection with the SARS-CoV2 virus, individuals and households were faced with a particularly critical situation related to loss of income/employment, school closures and a wide range of socio-economic distress factors. A recent review from Whaley et al. (22) explored factors contributing to the risk of negative outcomes related to COVID-19 pandemic stress in parents and some of the highlighted elements are racial minority, low income and children's health concerns. Not only families with pre-existing vulnerabilities, however, were

impacted by the 'COVID-19 experience'. All parents who had children immediately before and during COVID-19 pandemic time had to spend a significant amount of time in a restricted social setting (29) and some of the most typical elements of such circumstance were (30): isolation, disrupted support systems, disrupted health care experiences, impact on mental health.

Therefore, we felt it was important to investigate the well-being of parents of healthy infants in the province of Modena, an area severely hit by the first waves of COVID-19.

Our results must be read considering their limitations and strengths. Firstly, neither the sample size nor the subject enrollment was made with the current topic in mind, because of the unanticipated and extraordinary character of the pandemic, which completely invested the longitudinal cohort study involving the same couples of parents. Secondly, different families were involved in the evaluation during the pre-Covid and the Covid period, even though the main familiar and socio-demographic features did not differ in the two investigated groups. Further, most questionnaires were filled in by mothers with a relevant prevalence of a high educational level, and this could be a source of a possible selection bias. To the best of our knowledge, this paper is the first to investigate stress in parents of 6-months-old healthy infants, analyzing data collected partly before and partly during the COVID-related restrictive measures of social distancing.

In both the Pre-COVID and COVID groups, our data showed a population with physiological stress scores and without any evidence of parental child abuse. However, in the COVID group, raw scores tended to be higher and overall parental concerns (TS) scores were more common. In particular, TS scores indicative of clinically significant stress (TS > 90th percentile) and suggesting the need for specialist assessment emerged only in the COVID group. In addition, a significant decline in the tendency to present a better self-portrait through defensive answers (DIF subscale) was observed in the group of parents interviewed after the pandemic outbreak.

Although the finding of physiological stress levels even after the advent of the pandemic is a reassuring finding, it is important to try to understand why scores have risen overall. According to Abidin paradigm, social support is a very important factor influencing parents of a newborn baby: parents who had pre-school children at the time of the COVID-19 pandemic outbreak had to spend a significant amount of time in a restricted social setting, putting them at risk of accumulating stress related to isolation and role restriction (31). Furthermore, considering the pandemic outbreak an exceptional and traumatic event in the life of the entire population, it is possible to hypothesize that parents in our sample felt free to express their stress, without

minimizing it and without portraying themselves as less stressed than they actually were.

Digging deeper into such trend, parental adjustment problems, even independent of the relationship with the child, were present in both subgroups (COVID and pre-COVID), while more cases requiring an intensified intervention program for the child or, at the very least, a more in-depth investigation to exclude the presence of significant psychopathologies were observed in the COVID group. Even outside the pandemic context, it is particularly clear that parents experience more stress than non-parenting people (32). What's interesting is that, in our research, scores suggesting a challenging parent-child connection that is, in the parent's opinion, hampered by particularly hostile behavioral or pathological traits of the kid, were more common in the COVID group. This finding is in line with many recent works highlighting the risks that a traumatic event like the pandemic poses to children's and teenagers' mental health (33). Nevertheless, it must be remembered that in the current study, we interviewed parents and, since children's needs vary at different developmental stages, parents of younger children who are unable of taking care of themselves typically experience greater levels of stress (22).

In the entire cohort, families with younger, highly educated parents with managerial responsibilities showed higher prevalences of elevated stress levels in the interviewed parent. Younger parents seem to report, also in previous literature, a greater tendency to develop stress related to their role for reasons such as less experience and greater job insecurity (34).

The picture described above can also be explained by the fact that heightened professional responsibilities adds to familial stress in parents with managerial tasks (35); furthermore in the case of an exceptional event such as the COVID-19 pandemic, a high level of education can represent a double-edged sword, allowing people to decipher the situation more clearly, but also to be more aware of the risks associated with the emergency (36). This is also revealed by looking at the frequency of high stress in relation to specific family characteristics in the two pre-COVID and COVID groups: prior to the pandemic, high levels of stress tended to be rare among families with advanced

degrees, but this was the opposite in the group of parents interviewed after COVID.

Other family characteristics showed opposite tendencies in the two groups: in contrast to previous studies documenting that having more children was associated with more parental stress (4,37,38), in our sample a lower frequency of elevated stress scores in families with more than one child during the pandemic period was observed. It is possible to assume that siblings in these households represented a resource for both the parent and the infant (e.g. in play, entertainment and domestic help) during the “lockdown”. Furthermore, in the COVID group, higher elevated stress scores were observed in families with fathers over 35 and with mothers in non-managerial jobs. This may be interpreted in light of the fact that, as with the mother’s education, the father’s age-related experience and knowledge may have brought more stress and worries during COVID-19. In families with mothers in technical/executive occupations, the increased percentage of high TS scores should be read considering that professionals such as clerks, blue-collar workers, caterers and cultural workers have been largely penalised by the lockdown, with severe changes in work patterns and/or loss of employment (4,39). Finally, it is not surprising that in the few families with non-Italian mothers investigated, high stress scores were more common in the overall sample and in the pre-COVID group (40); in the COVID group, on the other hand, high TS scores are more frequent in Italian mothers. As stated by Racine et al. (36), given the lack of literature on the issue, there are several possible theories, all of which are hypothetical, explaining why foreign women responded better to COVID-19 pandemic associated stressors (e.g. the development of coping skills who prepared them to deal with the “pandemic stress” due to previous exposure to adversity, according to Zimmerman’s (41) model of resilience).

Currently the COVID-19 pandemic is changing its impact over time, becoming an endemic disease, and various studies show that the acute effects of ‘pandemic stress’ are not necessarily meant to last forever (42)(43); it will be interesting to explore future trends in parental stress in our cohort as a function of the infants’ growth, the families features, and of the

constantly changing epidemiological situation related to SARS-CoV2.

In conclusion, the study highlights that, even if parenting 6-months-old infants is always a challenging experience, the general increasing trend of PSI test scores observed in the COVID group can suggest a possible impact of the pandemic on the studied households. Such a result must be taken into account in case of future pandemics and therefore of periods of forced isolation; early detection of problematic child-parent systems can open the door to tailored support treatments reducing the negative effects of challenging and traumatic events on children’s emotional growth and empowering the parent-child relationship.

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**Correspondence:**

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Eleonora Ferrari, MD

Resident in Public Health, Hygiene and Preventive Medicine

Department of Biomedical, Metabolic and Neural Sciences

University of Modena and Reggio-Emilia

Via Giuseppe Campi, 287

Modena, 41125 Italy

Phone: +39 3405901585

E-mail: [eleonora.ferrari149@gmail.com](mailto:eleonora.ferrari149@gmail.com)