



## ORIGINAL ARTICLE

# Impact of the COVID-19 pandemic on mental health in parents of infants with colic and on healthcare use

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## Abstract

**Aim:** To examine the impact of the COVID-19 pandemic on the mental health of parents of infants with colic and on healthcare use.

**Methods:** Retrospective cohort study. Data of 64 parents of infants with colic pre-pandemic and 43 parents of infants with colic during the pandemic were analysed using validated questionnaires on parental stress, depression and anxiety. Additionally, we evaluated the number of outpatient clinic visits and admission rates pre- and during the pandemic by collecting data on the diagnosis treatment combination 'excessive crying' from electronic patient files in three secondary hospitals in the Netherlands.

**Results:** Mothers in the pandemic group reported significantly higher levels of depression than mothers in the prepandemic group ( $12.3 \pm 7.0$  and  $8.8 \pm 5.2$ ;  $p = 0.04$ ). Moreover, mothers showed a trend towards higher stress levels during the pandemic ( $29.6 \pm 9.6$  and  $25.2 \pm 8.1$ ;  $p = 0.06$ ). During the pandemic, admission numbers of infants with colic compared to prepandemic data increased with 34% (146 vs. 196).

**Conclusion:** Mothers of infants with colic reported significantly more feelings of depression during the COVID-19 pandemic. Furthermore, the pandemic was associated with increased healthcare use amongst infants with colic. With the continuing pandemic, we recommend active perinatal support for this vulnerable population.

## KEYWORDS

depression, healthcare use, infant colic, parents, perinatal support

## 1 | INTRODUCTION

Excessive infant crying or infant colic (IC) is currently defined by the Rome IV criteria as recurrent and prolonged periods of crying in infants <5 months of age without underlying organic cause.<sup>1</sup> It is a source of major distress for parents leading to approximately 20% of paediatric consultations during the first months of an infant's life.<sup>2</sup> Mothers and fathers of infants with colic report more stress,

depression, anxiety and bonding problems.<sup>3-5</sup> The management goals are to help parents in coping with their child's excessive crying and to prevent long-term damage to the parent-infant relationship and child abuse.<sup>6</sup> In a number of countries, infants with IC are often hospitalised to relieve parental distress and exclude medical causes.<sup>7</sup> Since a medical cause is found in only 5% of infants and because of its favourable prognosis,<sup>8</sup> IC should primarily be treated with parental reassurance and social support.<sup>9</sup> However, it remains

**Abbreviations:** EPDS, Edinburgh Postnatal Depression Scale; IC, Infant colic; PSS, Perceived Stress Scale; STAI, Spielberger State-Trait Anxiety Inventory.

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challenging for professionals to detect when organic disease needs to be excluded and to provide accurate support in an early phase.<sup>6</sup>

The coronavirus pandemic 2019 (COVID-19) has been reported to influence widespread emotional distress in people who experienced quarantine or isolation.<sup>10,11</sup> A large study performed in Africa, Asia, and Europe, showed an adverse effect of the COVID-19 measures on mental well-being, mood, and feelings.<sup>12</sup> A review of the psychological impact of quarantine reported negative psychological outcomes, including post-traumatic stress symptoms, confusion, and anger.<sup>13</sup> In pregnant women, psychological distress was markedly increased during the pandemic with an important protective role for partner, social, and healthcare support.<sup>14</sup> Since parents of infants with IC report more mental health problems, and social support is an essential part of primary treatment, we hypothesised that parents of infants with IC may be more vulnerable to the psychosocial effects of the COVID-19 pandemic.

Therefore, the aim of this study was first to evaluate if parental mental health and well-being of infants with colic were affected by the consequences of the pandemic and second to evaluate the difference in the number of outpatients contacts and admission rates of infants with colic pre-pandemic and during the COVID-19 pandemic.

## 2 | PATIENTS AND METHODS

### 2.1 | Study design and population

This retrospective cohort study analysed data from two groups of parents with a colicky infant. The first group (prepandemic IC group) was included in the year prepandemic and consisted of parents visiting the paediatric outpatient clinic of a secondary hospital in the Netherlands (St. Antonius hospital, Nieuwegein) between August 2015 and March 2017. This study has been described before.<sup>5</sup> The second group (pandemic IC group) was recruited during the COVID-19 pandemic in two secondary hospitals in the Netherlands (SAN and Rivierenland hospital, Tiel) between October 2020 and February 2022.

Parents in these two groups were eligible if their infant fulfilled the diagnostic Rome IV criteria of IC.<sup>1</sup> Additionally, we focussed on the parental perception of crying. Parents must report the crying of their infant as problematic excessive in a face-to-face contact with their clinician. Exclusion criteria were insufficient knowledge of the Dutch language and, in the first group, a gestational age <36 weeks.

Additionally, we retrospectively collected data on the diagnosis treatment combination (DBC) 'excessive crying' from the electronic patient files of three secondary hospitals in the Netherlands (St. Antonius hospital, Rivierenland hospital and the Meander Medical Center, Amersfoort). Since the first lockdown in the Netherlands started 16th of March 2020 and the last quarantine measures ended 25th of February 2022, we defined the prepandemic period from March 2018 to February 2020 and the pandemic period from March 2020 to February 2022.

### Key Notes

- During the COVID-19, pandemic mothers and fathers of infants with colic reported more stress, depression and anxiety compared with parents of infants with IC prepandemic.
- Infants with colic were more often hospitalised, and there were more outpatient clinic visits during the COVID-19 pandemic.
- In a period of social isolation, active perinatal support is recommended to monitor mental health in parents of infants with colic.

The medical ethical commission deemed this study not subjected to the Dutch Medical Research Involving Human Subjects Act (WMO). Written informed consent was obtained from all participating mothers and fathers.

## 2.2 | Settings and data collection

### 2.2.1 | Parental mental health and well-being

To assess feelings of stress, depression and anxiety in parents of infants with colic, we used data from parents of infants with colic pre-pandemic and during the COVID-19 pandemic. Parental stress was assessed using a Dutch translation of the Perceived Stress Scale (PSS).<sup>15</sup> This instrument measures the global stress levels in the last month by rating the degree participants find their lives overloaded. The 14 items are rated on a 5-point scale ranging from 'never' to 'very often', and a sum score is calculated. A high sum score indicates an increased level of stress. Depressive symptoms were assessed using the Dutch version of the Edinburgh Postnatal Depression Scale (EPDS).<sup>16,17</sup> In this 10-item questionnaire, parents report emotional distress during the last week. Items are rated on a 4-point scale, yielding a sum score range of 0–30, and a higher score indicates more depressive symptoms. Parental anxiety was assessed using the short form of the validated Spielberger State–Trait Anxiety Inventory (STAI).<sup>18</sup> The six items are answered on a 4-point scale ranging from 'never' to 'very often', and a sum score is calculated. Higher scores on the STAI indicate a higher level of experienced anxiety.

### 2.2.2 | Outpatient clinic visits and admission rates

Outpatient clinic visits and admission rates of infants with colic were analysed prepandemic and during the COVID-19 pandemic. For both earlier defined periods, we retrospectively collected data in three Dutch hospitals on the total number of diagnosis treatment combination (DBC) 'excessive crying', outpatient clinic visits, and admission rates. In one hospital (St. Antonius) we also collected data on

all paediatric DBCs, outpatient clinic visits, and admission rates pre- and during the pandemic. By doing this, we intended to evaluate an absolute or relative change in health care use due to a potential shift in diagnosis during the pandemic.

### 2.3 | Statistical analysis

Data are presented as means ( $\pm$ SD), medians (range or IQR), or count (%), where appropriate.

Sociodemographic characteristics of patients were compared between the two groups (prepandemic IC group and pandemic IC group) using the Chi-square test (nominal/ordinal data) and independent samples T-test (continue data), or the Fisher Exact test/Mann-Whitney U test in cases of small samples/non-parametric data.

Mean sum scores of the questionnaires (PSS, EPDS and STAI) were compared between the prepandemic IC group and pandemic IC group using an independent samples T-test. We used linear regression analysis for potential confounders which were identified by a 10% change-in-estimate criterion for estimated associations. A  $p$ -value of  $<0.05$  was considered statistically significant.

All analyses were performed using IBM SPSS (IBM Statistics SPSS version 26).

## 3 | RESULTS

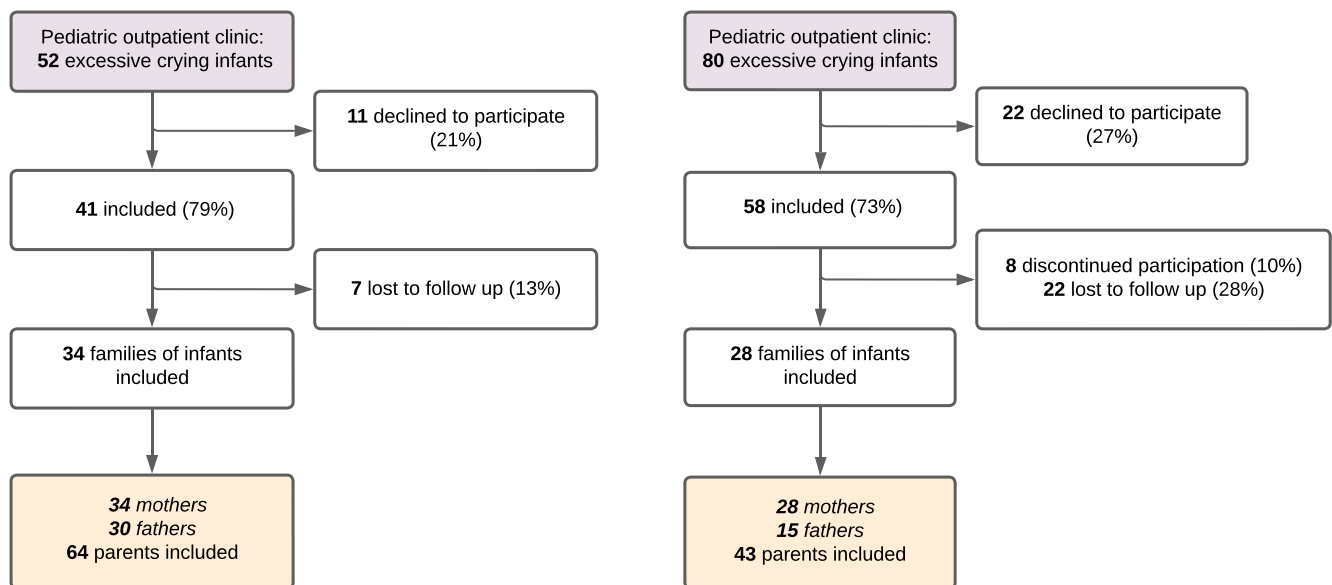
A total of 132 families of infants with colic were approached for participation, of whom 99 agreed to participate (Figure 1). In the pandemic group, eight families discontinued the study for various reasons, such as lacking time or feeling too stressed. In total, 29

families were lost to follow-up in both groups, resulting in the inclusion of 62 families of infants with colic (62 mothers and 45 fathers) in the final analysis.

Table 1 shows the sociodemographic characteristics of the participating families of infants with colic in the prepandemic and pandemic period. Compared with the prepandemic IC group, infants in the pandemic IC group had a significantly higher birthweight (3610g and 3350g). The differences in mental health mean sum scores were adjusted for birth weight as potential relevant confounding factor. There were no significant differences in gestational age at birth, infants' age at presentation, and proportion of firstborns. Also, there were no significant differences in parental characteristics between the two groups.

Results regarding parental mental health and well-being pre-pandemic and during pandemic are shown in Table 2. Mothers in the pandemic IC group showed significantly higher mean sum scores than mothers in the prepandemic IC group on depression ( $t[49] = -2.17$ ). In addition, there was a trend towards higher stress levels in the mothers of the pandemic group. In fathers, no differences were seen between the two groups.

An overview of patients with the diagnosis treatment combination (DBC) 'excessive crying' pre-pandemic and during the pandemic showed an increase of 17% (pre-pandemic: 632, pandemic: 737). There were 36% more outpatient clinic visits (pre-pandemic: 954, pandemic: 1300), and the number of patients with excessive crying who were admitted during the pandemic increased by 34% in comparison with the prepandemic period (pre-pandemic: 146, pandemic: 196) (Figure 2). Analysis of all paediatric DBC's in one hospital (St. Antonius) showed a decrease during the pandemic in total DBC's (43.009 and 39.246, -8.7%), outpatient clinic visits (52.789 and 52.077, -1.3%), and admissions (6.167 and 5.984, -3%).



First group (pre-pandemic IC group)

Second group (pandemic IC group)

FIGURE 1 Flow chart of inclusions pre-pandemic and pandemic IC group

TABLE 1 Sociodemographic characteristics of the participating families of infants with colic

	Pre-pandemic (n = 34)	Pandemic (n = 28)	p-value
Infants' age in week (SD)	8.5 (3.4)	9.6 (4.5)	0.29
Male gender (%)	22 (65)	15 (54)	0.37
Gestational age at birth in weeks (SD)	39.0 (1.3)	39.3 (1.6)	0.49
Birth weight in gram (SD)	3350 (491)	3610 (459)	<b>0.04</b>
Firstborn (%)			
Mother	13 (38)	14 (50)	0.35
Father	12 (40)	9 (60)	0.21
Feeding status (%)			
Exclusive breastfeeding	7 (21)	3 (11)	0.33
Formula only	27 (79)	22 (79)	
Both breastfeeding and formula	0 (0)	3 (10)	
Age in year (SD)			
Mother	31.3 (3.1)	30.3 (7.3)	0.49
Father	34.2 (4.4)	35.0 (4.4)	0.55
Ethnicity (Dutch-Caucasian) (%)			
Mothers	34 (100)	26 (93)	0.11
Fathers	29 (97)	2 (7)	0.61
Marital status of mother (%)			
Married	19 (66)	19 (68)	0.85
Non-married, living together	10 (34)	9 (32)	
Educational level of mother (%)			
Secondary school or less	2 (6)	3 (11)	0.08
Intermediate vocational training	16 (47)	6 (21)	
Higher vocational training	10 (29)	7 (25)	
University	6 (18)	12 (43)	
Educational level of father (%)			
Secondary school or less	6 (20)	1 (7)	0.26
Intermediate vocational training	6 (20)	4 (27)	
Higher vocational training	11 (37)	3 (20)	
University	7 (23)	7 (47)	

Bold values indicates p-value of < 0.05 was considered statistically significant.

## 4 | DISCUSSION

This study demonstrates that mothers of infants with colic report significantly higher levels of depression during the COVID-19 pandemic than mothers of infants with colic prepandemic. Moreover, there was a trend towards more maternal stress during the pandemic. Fathers, on the contrary, had similar feelings of depression, stress and anxiety. There was an increase in infants with IC outpatient clinic visits and admissions during the 2 years of the COVID-19 pandemic compared with the 2 years pre-pandemic.

To the best of our knowledge, this is the first study examining mental health and well-being in mothers and fathers of infants with colic during the COVID-19 pandemic. Previous studies showed that parents experience more feelings of stress, depression and anxiety when their infant cries excessively.<sup>3-5</sup> Our study evaluated these parental feelings during the COVID-19 pandemic. There is ample research to suggest that the COVID-19 pandemic has led to higher levels of stress, depression and anxiety in parents.<sup>19,20</sup> A recent review included eight studies with 7750 women in total in whom depression and anxiety states during the COVID-19 pandemic were compared with nonpandemic data. This review showed higher maternal depression and anxiety scores during the pandemic,<sup>21</sup> which is in line with our study, showing significantly higher levels of depression in mothers during the pandemic (mean EPDS score 12.3 versus 8.8). A cut-off score  $\geq 9$  identifies women who are at risk for depression, and a total score  $\geq 12$  is indicative of a clinically relevant depression.<sup>16</sup> Therefore, our results are highly relevant. Taking into account the overall mean EPDS score of 9.84 of women during the COVID-19 pandemic,<sup>21</sup> we hypothesise that the difference between the pre-pandemic IC and pandemic IC group could not be fully explained by the adverse effects of the pandemic alone. However, our study did not include a control group to examine this.

In contrast to the difference in maternal feelings, fathers of infants with colic showed similar stress levels, depression and anxiety pre- and during the pandemic. We speculate that fathers could have experienced more positive pandemic effects than mothers due to the possibility of spending more time with their child due to obligatory home working. In the Netherlands, mothers continued to do more child care during the pandemic but gender inequality of child care decreased.<sup>22</sup> An American online survey in 284 fathers demonstrated that 68% felt closer to their children since the pandemic, which could have led to improved bonding with their child.<sup>23</sup> On the contrary, the corresponding scores could also result from insufficient power to detect a difference.

Several studies have shown that mental issues during pregnancy are associated with an increased risk of having a child with IC after birth.<sup>3,4,24</sup> Increased psychological distress during the pandemic in pregnant women<sup>14</sup> could have resulted in more infants with IC. This could explain the increase in our study in the number of "excessive crying" diagnoses compared to the stable numbers of total paediatric diagnoses pre- and during the pandemic. Our results are in line with a German study, where infants with IC were more frequently

**TABLE 2** Reported levels of stress, depression, and state anxiety of mothers and fathers in the pre-pandemic and pandemic IC group

Variable	Pre-pandemic	Pandemic	Dif <sup>a</sup> , (p-value)	Dif <sup>b</sup> , (p-value)
Stress (PSS)				
Mother	25.2 ± 8.1 (N = 33)	29.6 ± 9.6 (N = 27)	+4.4 (0.06)	+3.8 (0.11)
Father	20.0 ± 6.2 (N = 29)	21.3 ± 8.9 (N = 15)	+1.3 (0.60)	+0.8 (0.74)
Depression (EPDS)				
Mother	8.8 ± 5.2 (N = 34)	12.3 ± 7.0 (N = 28)	<b>+3.5 (0.04)</b>	<b>+3.3 (0.04)</b>
Father	5.2 ± 3.9 (N = 29)	5.5 ± 5.4 (N = 15)	+0.3 (0.86)	+0.2 (0.89)
State anxiety (STAI)				
Mother	45.8 ± 12.4 (N = 34)	50.5 ± 14.4 (N = 28)	+4.7 (0.17)	+4.3 (0.23)
Father	41.2 ± 9.7 (N = 29)	41.8 ± 10.3 (N = 15)	+0.6 (0.85)	+0.8 (0.82)

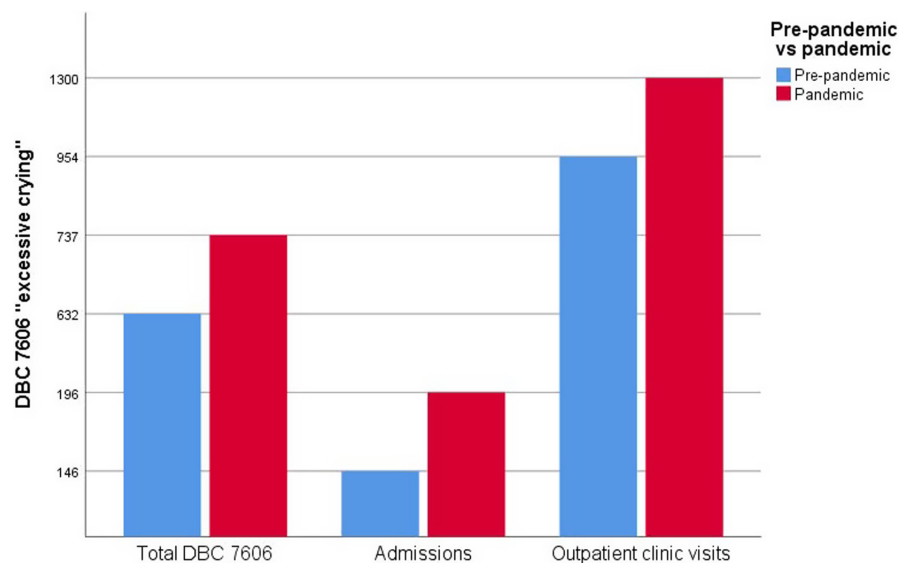
Note: Values are mean ± SD.

<sup>a</sup>Difference between prepandemic IC group and pandemic IC group.

<sup>b</sup>Difference between both groups corrected for birthweight.

Bold values indicates p-value of < 0.05 was considered statistically significant.

**FIGURE 2** DBC 7606 'excessive crying': total numbers, admissions, and outpatient clinic visits



reported by moms who gave birth during the COVID-19 pandemic than in a control non-pandemic cohort.<sup>25</sup> A higher maternal depression score strengthened this effect.<sup>25</sup>

The quarantine measures during the COVID-19 pandemic resulted in widespread social isolation causing emotional distress.<sup>10,11</sup> Previous research showed that perceived social isolation is accompanied by feelings of stress and anxiety.<sup>26</sup> On the other hand, the perception of family support is associated with lower depression levels and less parenting stress.<sup>27</sup> A recent Dutch study showed sufficient balance in protective and risk factors for parental care needs in 90% of parents prepandemic compared with 47% during the pandemic. Additionally, 39% of parents reported a lack of social support compared to 17% pre-pandemic.<sup>28</sup>

Since family physicians play an important role in excluding medical causes and providing parental support,<sup>29</sup> the decrease in support of the general healthcare system during the pandemic could also have contributed to feelings of isolation. With social support being one of the cornerstones in the management of infants with colic,<sup>9</sup> we speculate that the lack of family support during the COVID-19 pandemic negatively affected parental mental health and the burden of IC.

Our study offers a unique comparison of mental health and well-being data in a group of mothers and fathers of infants with IC pre- and during the pandemic. By clustering data from three Dutch hospitals, we were able to comprehensively evaluate the impact of the COVID-19 pandemic on outpatient clinic contacts

and admission rates of infants with colic. Results of this study are limited due to the lack of a pandemic control group of parents and infants without IC to evaluate whether the observed difference in parental feelings is a reflection of the burden of an infant with IC during pandemic or more a result of the pandemic and social isolation in general. Establishing causality is also prevented by the cross-sectional design. Another limitation is the small group of parents during the pandemic. Despite our efforts, many parents did not complete the questionnaires with a higher proportion of loss to follow-up in the pandemic group, which could have led to selection bias. The retrospective evaluation of admission rates makes it prone to confounding. Due to a significant reduction in the number of children referred to the hospital during the COVID-19 pandemic,<sup>30</sup> there was more capacity to hospitalise, which may have acted as a confounder leading to increased admission rates of IC infants.

In conclusion, during the COVID-19 pandemic, mothers of infants with colic reported significantly higher depression levels. Also, the pandemic was associated with increased IC health care use. In the light of the continuing pandemic, we hypothesise that active perinatal involvement, focussing on promoting family support as the cornerstone in the treatment of IC, can lead to significant improvements in mental health of those parents whose infants suffer from colic.

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## CONFLICT OF INTEREST

The authors report no conflict of interest.

## DATA AVAILABILITY STATEMENT

The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy restrictions.

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