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# Primary Health Care during the COVID-19 pandemic in Fortaleza, Brazil: associated factors and pattern of use by mothers and children up to 18 months of age

## Atenção Primária à Saúde durante a pandemia de COVID-19 em Fortaleza, Brasil: fatores associados e padrão de uso por mães e crianças de até 18 meses de idade

Luciano Lima Correia[I] , Márcia Maria Tavares Machado[I] , David Augusto Batista Sá Araújo[II] ,
Yuri Valentim Carneiro Gomes[II] , Maria Suelly Nogueira Pinheiro[II] ,
Hermano Alexandre Lima Rocha[I] , Denise Lima Nogueira[III] ,
Geziel dos Santos de Sousa[IV] , Simone Farias-Antuñez[V] , Márcia Caldas Castro[VI]

[I]Universidade Federal do Ceará, Department of Community Health – Fortaleza (CE), Brazil.
[II]Universidade Federal do Ceará – Fortaleza (CE), Brazil.
[III]Faculdade Luciano Feijão – Sobral (CE), Brazil.
[IV]Secretaria Municipal da Saúde de Fortaleza – Fortaleza (CE), Brazil.
[V]Universidade Federal de Santa Catarina, Department of Health Sciences – Florianópolis (SC), Brazil.
[VI]Harvard T.H. Chan School of Public Health, Department of Global Health and Population – Boston (MA), United States.

ABSTRACT

**Objective:** To analyze the delay or failure to seek primary health care by the mother-child dyads during the COVID-19 pandemic, a practice that has a high potential to increase maternal and child morbidity and mortality. **Methods:** Data from three survey rounds of the Iracema-COVID cohort study, collected 6, 12, and 18 months after birth, showed the patterns of postpartum attendance to primary health care consultation of the mother-child dyad. Crude and adjusted multinomial logistic regressions with robust variance were used to assess factors associated with nonattendance. **Results:** Among the 314 cohort mothers, 25% did not attend any primary health care consultation during the 18-months postpartum, while 30% of the mothers did all three. Regarding the child, 75% had regular primary health care consultations in all three survey rounds, while 4% did not attend any in their first 18 months of life. By the end of the first COVID-19 wave, the proportion of mother and child who attended the consultations had fallen by 23 and 18%, respectively. The main factors associated with nonattendance were mothers aged below 25 years, and mothers with more than one child. **Conclusion:** An important delay or nonattendance to primary health care consultation by the mother-child dyad was observed during the COVID-19 pandemic. Such practice, with a high potential to increase maternal and child morbidity and mortality, was particularly frequent among younger mothers and those with more than one child.
**Keywords:** Primary health care. Maternal and child health. Cohort study. Epidemiologic factors. COVID-19.

**CORRESPONDING AUTHOR:** Luciano Lima Correia. Rua Papi Junior, 1223, 5º andar, CEP: 60430-140, Fortaleza (CE), Brazil. E-mail: correialuciano@hotmail.com

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## INTRODUCTION

Population inadequate health practices have been widely reported during the COVID-19 pandemic, related to self-medication, use of non-scientifically recommended treatments, and especially the delay or failure to seek health care, even when recognized as necessary[1-6].

Adequate maternal health-seeking behavior practices at the critical perinatal stages, i.e., antenatal, delivery, postpartum and newborn care, have the potential to reduce maternal morbidity and mortality[7-9], as well as under-five mortality[10]. Of these, postpartum care is by far the most neglected worldwide, with low proportions of mothers seeking this care for their newborn children and especially for themselves[7,11-16].

Recognizing that the COVID-19 pandemic would have drastic effects on the maternal and child population, the Iracema-COVID longitudinal study started to follow up on a cohort of pregnant women. The Iracema-COVID study was designed to evaluate the health status of mothers using the public Brazilian Unified Health System (SUS) who were pregnant during the COVID-19 pandemic and their offspring, focusing on maternal common mental disorder (CMD), mother-child dyads interaction, and infant health and development. This study design enabled us to assess the contact of mother and child with primary health care (PHC) services and facilities along the entire length of the COVID-19 pandemic, as well as identify associated factors.

## METHODS

This was a longitudinal analysis of the pattern of PHC seeking behavior of mothers and children, users of public health services, followed up by the Iracema-COVID, a prospective cohort study carried out in Fortaleza, the capital city of the state of Ceará, northeastern region of Brazil. The study was approved by the Research Ethics Committee in Brazil (number 73516417.4.0000.5049).

Fortaleza had an estimated population of approximately 2.7 million inhabitants in 2020, and a human development index (HDI) of 0.754[17]. The city is divided into 121 neighborhoods, distributed in six administrative districts[18,19]. Around three-quarters of the population rely on the SUS and one-quarter uses a health security plan. Hospital deliveries reach about 98% of the city's births, of which 75% are carried out in public facilities, free of charge.

Iracema-COVID was designed to be representative of Fortaleza at administrative district level. The sample size was calculated (n=352) to detect a prevalence of 45.7% of maternal CMD[20], with a margin of error of 5 percentage points, and a 95% confidence interval (95%CI). For sampling purposes, we used data from the Brazil Live Birth Information System (SINASC) from July and August 2020. Mothers living in Fortaleza, who gave birth at public free of charge hospitals (about 75% of all births), and had complete address information were eligible to participate. Women that gave birth in private hospitals were deemed ineligible for not having their contact information available in public records. Out of 4,840 mothers that gave birth in July and August 2020, 3,567 were eligible for the study. Of those, 724 were randomly sampled (as the desired sample size was 352, we selected 372 additional women in anticipation of refusals and eventual problems with wrong or changed addresses), using the GSAMPLE module in Stata (StataCorp. 2019). All 724 women had at least three contact attempts by telephone and, of these, 351 agreed to participate in the baseline study, being interviewed at 6 months postpartum[21]. At subsequent survey rounds (12 and 18 months after birth), cohort participants were tracked and contacted by trained interviewers. At 12 months, 325 mothers agreed to participate (1 loss due to child death and 25 refusals). At 18 months, 331 mothers agreed to participate (20 refused). The 314 mothers included in the present study were interviewed in all three survey rounds[21].

Mothers who agreed to participate answered a telephone-based interview that lasted approximately 30 minutes. The enrollment period extended from January 8 to June 30, 2021, corresponding to the second wave of the COVID-19 pandemic, so the interviews were conducted remotely, while the second and third survey rounds were conducted in person, at the participant's home.

The study collected data on mother and child consultation in three moments over 18 months after birth[22]. At 6 months mothers were asked whether they and/or their baby had a medical consultation at a PHC facility since the birth discharge. At 12 and 18 months they were asked whether they had a PHC medical consultation in the previous 6 months.

To assess possible factors associated with PHC seeking behavior, maternal and infant characteristics were selected through a conceptual model (Supplementary Figure 1). On model's distal level, the predictors included socioeconomic status, monthly family income, cash transfers, and administrative district of residence. On an intermediate level, we considered the mother's age, self-reported skin color, schooling, living without a partner, smoking, alcohol consumption, and number of children. Lastly, on a proximal level, we included the maternal depressive symptoms, whether the mother had been tested for COVID-19, and fear of being contaminated.

Maternal age was grouped into two categories: 18–24, and ³25 years. Geographically, mothers were classified accordingly to residence in the six administrative districts. Self-reported maternal skin color was categorized as white, black and brown. Socioeconomic classes were constructed based on the Brazilian Association of Population Studies (ABEP) market research classification that considers 5 categories from A to E (A being the highest level, and E being the lowest), which were grouped into three categories:

A/B, C, D/E. Schooling was assessed through the mother's number of years of formal education (0–8, 9–11, and >11). Smoking and alcohol — consumptions were assessed as Yes/No questions. Maternal depressive symptoms were assessed by the Self-Reporting Questionnaire (SRQ-20), a 20-item self-report screening tool developed by the World Health Organization (WHO) to detect psychological distress. The SRQ-20 was validated for application to the Brazilian population using a cut-off point of eight or more as a positive indicator of morbidity with 83% sensitivity and 80% specificity[23]. Food insecurity was assessed through the Brazilian Food Insecurity Scale (EBIA)[24].

The outcome variables that expressed the pattern of behavior of mother-child in seeking for postpartum consultation in PHC, over the period covered by the three survey rounds, comprised four outcomes as follows:

a) No attendance to PHC consultation — when mothers did not attend any PHC consultation.
b) Stop attending PHC consultation — when mothers sought PHC in the first round, but stopped doing so.
c) Start attending PHC consultation — when mothers did not seek PHC in the first round but began to do so in subsequent rounds.
d) Full attendance to PHC consultation — when mothers searched for PHC during the three rounds.

Iracema-COVID's first survey round was conducted 6 months after birth and started at the beginning of the second physical distancing period imposed in Fortaleza in January 2021. Therefore, interviews were done remotely by trained researchers between January and June 2021. The second and third rounds were carried out through face-to-face interviews at home, from July to September 2021 and from January to March 2022, respectively. The onset of the second survey round (12 months after birth) coincided with the end of the second physical distancing period in July 2021, and the third survey round (18 months after birth) corresponded to the beginning of the third wave of the COVID-19 pandemic in January 2022 (Supplementary Figure 2). All survey rounds utilized standardized questionnaires. Verbal informed consent was obtained from all participants.

Descriptive statistics of maternal characteristics were obtained for each survey round. Tests of differences between the characteristics of the three survey rounds were carried out using a chi-square ($\chi^2$) test.

The proportion of participants reporting consultation in a PHC facility in each survey round, considering a recall period of 6 months, was examined. The difference in proportions of consultations was calculated for both mothers and children, comparing the first and second survey rounds, and the second and third, using McNemar's test for paired data[25].

For each survey round, crude and adjusted multinomial logistic regressions with robust variance were performed to estimate risk ratios, and their respective 95%CI, for the associations between PHC consultations of mothers and children with the investigated predictors. Statistical analyses were performed in Stata version 16.1 (StataCorp. 2019. Stata Statistical Software: Release 16. College Station, TX: StataCorp LP)

## RESULTS

A total of 314 mothers, who used the public health system, were followed up during the 18-months postpartum in the Iracema-COVID cohort study. About 30% of mothers were between 18 and 24 years old, only 22% had not reached high school, more than half had a job and two-thirds received cash transfers. Among children, almost 10% were born with low weight and 62% had fallen ill during the period (Table 1).

One-quarter of the interviewed mothers did not attend any PHC consultation during the 18-month period postpartum, while 30% of the mothers did so (Table 2). The proportion of those who stopped attending (28%) was about twice higher than those who started attending (16%) PHC consultations. Child attendance pattern was quite distinct: three-quarters had regular PHC consultations in the three survey rounds, while 4% had none in their first 18 months of life. It is worth noting that while 95% of the full-attendance child had mothers who also attended all consultations, almost all non-attendance children (11/12) had mothers who did not seek consultations either.

Regarding the dynamics of mothers' access to PHC (Table 3), 42.2% had not attended any medical consultation in the postpartum period, while 90.6% and 58.2% reported no medical consultation in the previous 6 months when interviewed in the second and third survey rounds, respectively. Of the mothers who had no consultation in the first survey round, 83.9% continued without any consultation in the second round, while among those who had a consultation in the first round, 51.6% had not been consulted again in the second round (p<0.001). The difference between changes in the pattern of consultations (difference of proportion), indicates a 23.1% reduction in demand for PHC consultations by mothers from the first (6 months) to the second (12 months) survey rounds. A similar analysis performed from the second (12 months) to the third (18 months) round showed that there was a 7.3% increase in the third round of mothers who attended a consultation, although they were not consulted in the previous round (p=0.022).

The difference of proportion for child consultation (Table 3) showed 18.7% reduction in demand for child PHC consultations from the first to the second survey rounds (p<0.001). A similar analysis performed from the second to the third rounds showed that there was a 5.0% increase in children who attended a consultation, although they were not consulted in the previous round (p=0.073).

**Table 1. Distribution of main maternal and child study sample\* characteristics. Iracema-COVID cohort study. Fortaleza, Brazil, 2020-2022.**

| | n | % | 95%CI |
|---|---|---|---|
| **Maternal factors** | | | |
| Age (years) | | | |
| <25 | 96 | 30.6 | 21.25–40.42 |
| ≥25 | 218 | 69.4 | 62.70–75.31 |
| Skin color | | | |
| White | 57 | 18.2 | 8.74–29.90 |
| Brown | 219 | 69.8 | 63.31–75.86 |
| Black | 35 | 11.2 | 3.20–26.73 |
| Marital status | | | |
| Single | 109 | 49.8 | 39.82–59.28 |
| Married | 110 | 50.2 | 40.31–59.68 |
| Schooling (years) | | | |
| <8 | 68 | 21.7 | 12.90–33.75 |
| ≥8 | 246 | 78.3 | 72.78–83.42 |
| Parity | | | |
| 1 | 146 | 67.6 | 59.58–75.29 |
| ≥2 | 70 | 32.4 | 22.09–45.12 |
| Working mother | | | |
| Yes | 141 | 55.1 | 46.72–63.68 |
| No | 173 | 44.9 | 37.52–52.81 |
| Cash transfer | | | |
| Yes | 197 | 62.7 | 55.79–69.70 |
| No | 117 | 37.3 | 28.82–47.03 |
| Monthly family income (MW) | | | |
| <1 | 48 | 15.3 | 6.07–27.76 |
| 1-2 | 183 | 58.3 | 50.96–65.69 |
| ≥3 | 83 | 26.4 | 17.41–37.33 |
| Morbidity previous 6 months: | | | |
| Yes | 75 | 23.9 | 14.88–35.25 |
| No | 239 | 76.1 | 70.23–81.40 |
| **Child factors** | | | |
| Sex | | | |
| Male | 163 | 51.9 | 44.19–60.02 |
| Female | 151 | 48.1 | 40.14–56.60 |
| Low birth weight | | | |
| Yes | 30 | 9.6 | 2.11–26.52 |
| No | 284 | 90.5 | 86.46–93.64 |
| Morbidity previous 6 months | | | |
| Yes | 193 | 61.5 | 54.40–68.54 |
| No | 121 | 38.5 | 30.11–48.12 |

\*Sample n=314; CI: confidence interval.

Risk analysis shows that mothers aged 18 to 24 years were about 4 times more likely to have not attended a consultation in one or both rounds, compared to older mothers (Table 4). Mothers with less than 8 years of schooling were 2.6 times more likely to have attended no consultation after childbirth; a similar risk was observed in the group of mothers who were not working. Having more than one child increased the risk of not attending any consultation by 4 times, and by 2.5 times the risk of having consulted only in the 6-month postpartum period, the first round, but not in the subsequent rounds. Mothers receiving cash transfers had a 3.5 times greater risk of not having attended any consultations and an 81% higher risk of having had only one postpartum consultation. Belonging to families with very low monthly income (<1 minimum wage) was shown to be a factor strongly associated with mothers not seeking PHC consultations, with a risk 6.7 times higher compared to mothers with a monthly family income of 3 or more minimum wages. Also, not being the only child increased from 2 to 4 times the child's probability of not being taken to a PHC consultation (p<0.032), compared to a child who was consulted in every survey round.

The adjusted multinomial regression analysis compared mothers who did not seek consultation in at least one survey round with mothers who consistently attended a consultation in the three rounds. Young mothers (below 25 years) who had other children were important risk factors associated with not attending PHC consultations (Table 5). A similar analysis compared children who did not attend any consultation in the three survey rounds with children who were consistently taken to PHC consultation over the first 18 months of life (Table 5). Not being the only child (p=0.032), illness of mother (p=0.032), and child illness (p=0.014) remained as risk factors strongly associated with a child not attending PHC consultation.

## DISCUSSION

Delays or nonattendance to PHC consultation by mother-child dyads during the COVID-19 pandemic was observed, particularly among younger mothers and those with more than one child. This pattern, if not reverted soon, might result in increases in maternal and child morbidity and mortality.

**Table 2. Patterns of mother and child attendance to primary health care consultations in the three survey rounds, Iracema-COVID Cohort Study. Fortaleza, Brazil, 2020–2022.**

| Mother and child consultation | No attendance | Stop attending | Start attending | Full attendance | Total |
|---|---|---|---|---|---|
| | n (%) | n (%) | n (%) | n (%) | |
| No attendance | 11 (13.4) | 20 (24.4) | 8 (9.8) | 43 (52.4) | 82 (26.1) |
| Stop attending | 0 (0.0) | 21 (23.6) | 2 (2.3) | 66 (74.2) | 89 (28.3) |
| Start attending | 1 (2.0) | 7 (14.0) | 5 (10.0) | 37 (74.0) | 50 (15.9) |
| Full attendance | 0 (0.0) | 4 (4.3) | 1 (1.1) | 88 (94.6) | 93 (29.6) |
| Total | 12 (3.8) | 52 (16.5) | 16 (5.1) | 234 (74.5) | 314 (100.0) |

**Table 3. Dynamics of maternal and child demands for primary health care consultation during the COVID19 pandemic. Iracema-COVID cohort study. Fortaleza, Brazil, 2020-2022.**

| Mother consultations | | 2nd survey round*: 6–12 months after birth – n (%) | | |
|---|---|---|---|---|
| | | No | Yes | Total |
| 1st survey round*: mother consultation up to 6 months after birth n (%) | No | 115 (83.9) | 22 (16.1) | 137 (42.2) |
| | Yes | 97 (51.6) | 91 (48.4) | 188 (57.8) |
| | Total | 300 (90.6) | 31 (9.4) | 325 (100) |
| Difference in proportions† (95%CI)=-23.1% (-29.4; -16.7) | | | p-value† <0.001 | |

| Mother consultations | | 3rd survey round*: 12–18 months after birth – n (%) | | |
|---|---|---|---|---|
| | | No | Yes | Total |
| 2nd survey round: mother consultation 6–12 months after birth n (%) | No | 144 (69.9) | 62 (30.1) | 206 (65.6) |
| | Yes | 39 (36.1) | 69 (63.9) | 108 (34.4) |
| | Total | 183 (58.2) | 131 (41.7) | 314 (100) |
| Difference in proportions† (95%CI)=7.3% (0.79; 13.9) | | | p-value†=0.022 | |

| Child consultations | | 2nd survey round: 6–12 months after birth – n (%) | | |
|---|---|---|---|---|
| | | No | Yes | Total |
| 1st survey round: child consultation up to 6 months after birth n (%) | No | 18 (60.0) | 12 (40.0) | 30 (9.2) |
| | Yes | 73 (24.7) | 222 (75.2) | 295 (90.8) |
| | Total | 91 (28.0) | 234 (72.0) | 325 (100) |
| Difference in proportions† (95%CI) = -18.7% (-24.2; -13.2) | | | p-value†<0.001 | |

| Child consultations | | 3nd survey round: 12–18 months after birth – n (%) | | |
|---|---|---|---|---|
| | | No | Yes | Total |
| 2nd survey round: child consultation 6–12 months after birth N (%) | No | 38 (44.2) | 48 (55.8) | 86 (27.4) |
| | Yes | 32 (14.1) | 196 (85.9) | 228 (72.6) |
| | Total | 70 (22.3) | 244 (77.7) | 314 (100) |
| Difference in proportions² (95%CI)=5.0% (-0.07; 1.09) | | | p-value†=0.073 | |

*1st round, carried out from January to June 2021; 2nd round, carried out from July to September 2021; 3rd round, carried out from January to March 2022; †Difference in proportion and p-value from McNemar's test. CI: confidence interval.

**Table 4. Factors associated to maternal and child attendance to primary health care consultation at 1st and 2nd survey rounds. Iracema-COVID cohort study. Fortaleza, Brazil, 2020–2022.**

| Consultation | Attendance | No-No | | Yes-No | | No-Yes | |
|---|---|---|---|---|---|---|---|
| | Factors | RR (95%CI) | p-value | RR (95%CI) | p-value | RR (95%CI) | p-value |
| Mother | Maternal age (years): | | | | | | |
| | <25 | 3.84 (1.85–8.33) | <0.001 | 3.57 (1.72–7.69) | 0.001 | 4.55 (1.61–14.3) | 0.004 |
| | ≥25 | 1 | | 1 | | 1 | |
| | Maternal schooling (years) | | | | | | |
| | <8 | 2.56 (1.02–6.67) | 0.046 | 1.23 (0.43–3.57) | 0.698 | 0.57 (0.07–5.00) | 0.610 |
| | ≥8 | 1 | | 1 | | 1 | |
| | Birth order | | | | | | |
| | ≥2 | 4.0 (0.11–0.54) | <0.001 | 2.46 (0.17–0.94) | 0.035 | 0.74 (0.26–7.14) | 0.718 |
| | 1 | 1 | | 1 | | 1 | |
| | Cash transfer | | | | | | |
| | Yes | 3.45 (0.16–0.52) | <0.001 | 1.81 (0.30–0.99) | 0.045 | 1.68 (0.23–1.53) | 0.280 |
| | No | 1 | | 1 | | 1 | |
| | Monthly family income (MW) | | | | | | |
| | <3 | 1 | <0.001 | 1 | 0.047 | 1 | 0.264 |
| | ≥3 | 0.20 (0.10–0.38) | | 0.55 (0.30–0.99) | | 0.57 (0.21–1.53) | |
| Child | Child morbidity | | | | | | |
| | No | 1 | 0.670 | 1 | 0.607 | 1 | 0.016 |
| | Yes | 1.26 (0.42–3.79) | | 0.86 (0.49–1.50) | | 0.19 (0.05–0.73) | |
| | Birth order | | | | | | |
| | 1 | 1 | 0.015 | 1 | 0.002 | 1 | 0.032 |
| | ≥2 | 3.74 (1.28–10.8) | | 2.39 (1.38–4.14) | | 4.32 (1.13–16.4) | |

RR: relative risk; CI: confidence interval; MW: minimum wage.

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**Table 5. Adjusted\* risk factors for maternal and child attendance to primary health care consultation in the three survey rounds. Iracema-COVID cohort study. Fortaleza, Brazil, 2020–2022.**

| Consultation | Attendance | No-No | | Yes-No | | No-Yes | |
|---|---|---|---|---|---|---|---|
| | Factors | RR (95%CI) | p-value | RR (95%CI) | p-value | RR (95%CI) | p-value |
| Mother | Maternal age (years) | | | | | | |
| | <25 | 1 | 0.011 | 1 | 0.006 | 1 | 0.071 |
| | ≥25 | 0.33 (0.13–0.77) | | 0.29 (0.12–0.70) | | 0.30 (0.08–1.10) | |
| | Maternal schooling (years) | | | | | | |
| | <8 | 1 | 0.945 | 1 | 0.328 | 1 | 0.715 |
| | ≥8 | 0.95 (0.27–3.29) | | 2.18 (0.45–10.3) | | 1.55 (0.14–16.8) | |
| | Birth order | | | | | | |
| | ≥2 | 3.50 (1.46–8.38) | 0.005 | 2.95 (1.18–7.33) | 0.020 | 0.70 (0.12–4.02) | 0.696 |
| | 1 | 1 | | 1 | | 1 | |
| | Cash transfer | | | | | | |
| | Yes | 1.20 (0.51–2.85) | 0.667 | 1.25 (0.52–2.98) | 0.616 | 0.67 (0.15–2.82)1 | 0.582 |
| | No | 1 | | 1 | | | |
| | Monthly family income (MW) | | | | | | |
| | <1 | 1 | | 1 | | 1 | |
| | 1–2 | 1.45 (0.47–4.40) | 0.511 | 1.08 (0.32–3.65) | 0.894 | 0.43 (0.08–2.24) | 0.320 |
| | ≥3 | 0.40 (0.10–1.59) | 0.195 | 0.96 (0.25–3.76) | 0.957 | 0.22 (0.03–1.77) | 0.159 |
| Child | Child morbidity | | | | | | |
| | No | 1 | 0.564 | 1 | 0.638 | 1 | 0.014 |
| | Yes | 1.38 (0.46–4.22) | | 0.87 (0.49–1.53) | | 0.18 (0.04–0.70) | |
| | Birth order | | | | | | |
| | 1 | 1 | 0.018 | 1 | 0.005 | 1 | 0.032 |
| | ≥2 | 4.12 (1.27-13.3) | | 2.23 (1.27-3.90) | | 4.64 (1.13-18.9) | |

\*Final models of Multinomial Logistic Regression. RR: relative risk; CI: confidence interval.

Our results show that while 30% of mothers who gave birth during the first wave of the COVID-19 pandemic reported having been consulted at PHC facilities at 6, 12, and 18 months postpartum, a quarter (26%) did not return to a health unit for consultation 18 months after delivery. This is worrisome since the WHO recommends three postnatal visits to optimize maternal health outcomes[26]. About half of maternal deaths occurs within 12 months postpartum[27]. In Fortaleza, the number of maternal deaths during the pandemic of COVID-19 increased 69% from 2019 to 2020 and remained stable at a high level in 2021[28]. Indeed, a COVID-19 infection has been associated with obstetric complications and premature births, with consequences that extend beyond the puerperal period[29].

More than half of mothers who did not attend any PHC consultations reportedly took their children to PHC facilities for consultation consecutively in the three survey rounds, suggesting possible self-care negligence. Accordingly, a study in Pakistan found that mothers were 84% more likely to seek care for their children than for themselves, even in situations that recognizably required medical attention[11].

Although in a smaller proportion, it is concerning that about 4% of children did not attended any consultation after delivery during their first 18 months of life. Considering the 35,000 annual births in Fortaleza, this proportion rep-

resents 1,400 children without any basic health care, even though access to PHC in the city, as in the whole country, is free and widely available.

Regarding the dynamics of demand for PHC consultations, there was a 23% reduction in the demand for consultations by mothers in the period from 6 to 12 months, compared to the first 6 months postpartum; in the period from 12 to 18 months, there was a 5% increase in the demand for maternal consultations. Regarding child consultations, a similar pattern was observed, with an 18% reduction in demand for PHC consultation in the period from 6 to 12 months and an increase of 5% in the subsequent period of 12 to 18 months. In the United States, during the first wave of the COVID-19 pandemic, about 40% of adults reported delaying or avoiding contact with health services due to concern about contamination with COVID-19; 12% avoided even urgent and emergency care[30].

This period of decline followed by that of increase corresponded exactly to the second wave of COVID-19 and the subsequent period of health restriction measures softening. It is believed that, in addition to mobility restrictions, fear of contamination by COVID-19 in health facilities has contributed greatly to the reduction of PHC demand in the 6 to 12 months period[20]; the onset of vaccination may have reduced this fear and stimulated the demand for PHC by mothers after 12 months.

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The most important factors associated with nonattendance to PHC consultations were: mother's age below 25 years, not working mother, birth order, receiving cash transfer, and low monthly family income.

Younger mothers, aged 18 to 24 years, had 3 times higher risk of not attending a postpartum consultation compared to mothers aged 25 years or older. It is likely that a lower level of awareness of health risks found in younger mothers may explain this lower willingness to seek postpartum consultations[31]. A study carried out in the United States during the first wave of COVID-19 showed that, regardless of gender, young adults aged 18 to 24 were 50% more likely to avoid attending health services[30].

Birth order was another factor strongly associated with both mother and child no-PHC consultations. Mothers with two or more children were 3.5 and 4.1 times more likely to attend no postpartum consultations, respectively, for themselves and their child, compared to primiparous mothers. An increasing parity associated with a reduction in demand for PHC has been a recurrent finding in several studies carried out around the world, in countries such as Guatemala, Pakistan, India, Tanzania, Ethiopia, and Australia[1,16,32-36]. One of the explanations would be that multiparous mothers have already acquired greater experience in how to deal with postpartum health problems, and therefore feel safe not staying connected with health services[16], an attitude which could have been even exacerbated, or stimulated, during the pandemic period. However, it is also possible that mothers with more than one child have greater difficulty in leaving home for consultations, because they do not have anyone to leave the child(ren) with, or because they have a greater accumulation of domestic work. In this sense, it is recognized that mothers tend to prioritize family care, to the detriment of their health[36]. Indeed, during the COVID-19 pandemic in the United States people occupied as unpaid caregivers had a probability 3 folds higher of avoiding using urgent or emergency health facilities[30].

The main strength of this paper is the longitudinal design. While most studies on health care seeking behavior focus on describing the circumstances and characteristics of patients seeking specific care, we analyze mother-child dyads to characterize patterns of PHC seeking behavior from birth to the first 18 months of life. In addition, we leverage data collected by the Iracema-COVID study to identify factors associated with that behavior. Also important is the comprehensive characterization of care seeking behavior in the context of the COVID-19 pandemic, including repeated phases of limited mobility, lockdown, and relaxation of restrictive measures. This study has some limitations. Our results are representative of mothers with infants born during the COVID-19 pandemic in public hospitals in the fifth largest city in Brazil. Thus, they are representative of large urban areas in the country and should not be generalized to other contexts. The outcomes were based on the mother's report, with some possibility of recall bias. No sample calculation was performed for possible associations with other outcomes, in addition to the calculation for the main outcome of the study that was CMD, which should have an impact on its sampling power. Furthermore, the sample was not increased in size for confounding control purposes. There were 10% losses due to follow-up, and no analysis was performed to assess possible attrition bias.

The longitudinal study design aimed to characterize patterns of PHC seeking behavior during the 18-months postpartum of mother-child dyads. This provides a comprehensive description of the decline of PHC attendance along several phases of restrictive measures of the COVID-19 pandemic. We found that a considerable fraction of mothers (25%) and children (4%) remained up to 18 months without any contact with the most basic level of health care, under serious risk of morbidity and mortality, due to delays in the treatment of existing conditions, the lack of diagnosis of unsuspected problems, and the negligence with important preventive actions, such as basic vaccination. Young mothers and those with more than one child were particularly at risk of poor attendance and should constitute priority groups for actions aimed at improving postpartum follow-up in PHC.

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## RESUMO

**Objetivo:** Analisar o retardo ou a não procura por atenção primária à saúde por parte do bionômio mãe-filho durante a pandemia de COVID-19, uma prática que apresenta elevado potencial de aumentar a morbimortalidade materno-infantil. **Métodos:** Dados de três levantamentos do estudo longitudinal Iracema-COVID, realizados aos seis, 12 e 18 meses após o parto, identificaram padrões de procura por consultas na Atenção Primária à Saúde (APS) por parte do binômio mãe-filho. A regressão multinomial bruta e adjustada com variância robusta foi utilizada para avaliar os fatores associados com a não procura. **Resultados:** Entre as 314 mães da coorte, 25% não realizaram nenhuma consulta na APS durante o período de 18 meses pós-parto, enquanto 30% das mães o fizeram nos três contatos do seguimento. Com relação à consulta da criança, 75% realizaram consultas de APS nos três momentos, ao passo que 4% não realizaram nenhuma consulta em seus primeiros 18 meses de vida. Ao fim da primeira onda de COVID-19, a proporção de consultas na APS de mães e crianças caiu 23 e 18%, respectivamente. Os principais fatores associados à não procura por APS foram mães com idade abaixo de 25 anos e mães com mais de um filho. **Conclusão:** Houve importante retardo ou não procura por APS pelo bionômio mãe-filho durante a pandemia de COVID-19. Essa prática, com elevado potencial de aumentar a morbimortalidade materno-infantil, foi mais frequente entre mães mais jovens e com mais de um filho.

**Palavras-chave:** Atenção primária de saúde. Saúde materno-infantil. Estudos de coortes. Fatores epidemiológicos. COVID-19.