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Impact of the COVID-19 pandemic on the functioning of the human milk bank of a maternity hospital in the city of Rio de Janeiro, Brazil

Impacto da pandemia de COVID-19 no funcionamento de do banco de leite humano de um hospital maternidade do município do Rio de Janeiro, Brasil

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ABSTRACT

Introduction: Human milk bank is a specialized service, linked to a maternal/or children's hospital, responsible for actions to promote, protect and support breast milk and execution of collection, processing, quality control and distribution of human milk. Like most health services, this specialized service was impacted during the COVID-19 pandemic. **Objective:** To know the impact of the COVID-19 pandemic on the Human Milk Bank of Maternidade Leila Diniz, Rio de Janeiro, providing the necessary knowledge to managers to expand strategies for capturing human milk in addition to the protection and promotion of Breastfeeding. Also, to describe the strategies used to promote the uptake of human milk (HM) during the COVID-19 pandemic. **Method:** The individual indicators were the number of individual appointments, number of home visits, number of donors, number of recipients, volume of household collections, volume of microbiological milk, number of individuals examined for milk, number of household collections, Dornic and volume of pasteurized human milk. Data involved the period from February 2019 to March 2021, and was related to the services carried out by the HMB of the Leila Diniz Maternity Hospital, Rio de Janeiro. Indicators referring to the periods before and during the COVID-19 pandemic were compared. **Results:** It was observed that in the period during the pandemic, despite the reduction in the number of individualized visits at the HMB, there was a substantial increase in home visits, which promoted a greater volume of HM collected and distributed, and consequently a greater number of HM quality analyses (microbiological, crematocrit and Dornic acidity) were performed as well as a greater volume of HM was pasteurized. **Conclusions:** It is concluded that, even in a time of pandemic and social isolation, it was possible, safely and with quality, to care for newborns who are premature, or who have low birth weight in the Neonatal Unit.

KEYWORDS: Human Milk Bank; Breastfeeding; Quality of Health Care

RESUMO

Introdução: O Banco de Leite Humano (BLH) é um serviço especializado, vinculado a um hospital materno e/ou infantil, responsável por ações de promoção, proteção e apoio ao aleitamento materno e execução de atividades de coleta, processamento, controle de qualidade e distribuição do leite humano (LH). Assim como a maioria dos serviços de saúde, esse serviço especializado sofreu impactos durante a pandemia de COVID-19. **Objetivo:** Conhecer o impacto da pandemia de COVID-19 no BLH da Maternidade Leila Diniz, Rio de Janeiro, fornecendo conhecimento necessário aos gestores para ampliar as estratégias de captação de LH além da proteção e promoção do aleitamento materno. Além disso, buscou-se descrever as estratégias utilizadas para promover a captação do LH durante a pandemia de COVID-19. **Método:** Os indicadores coletados foram o número

de atendimentos individuais, número de visitas domiciliares, número de doadoras, número de receptores, volume de leite coletado, volume de leite distribuído, número de análises microbiológicas, número de análises de crematócrito, número de análises de acidez Dornic e volume de leite humano pasteurizado (LHOP) nos períodos de fevereiro de 2019 a março de 2021, realizados pelo BLH da Maternidade Leila Diniz. Foram comparados os indicadores referentes aos períodos anterior e durante a pandemia de COVID-19. **Resultados:** No período da pandemia, apesar da redução do número de atendimentos individualizados no BLH, houve substancial aumento nas visitas domiciliares, o que promoveu maior volume de LH coletado e distribuído, consequentemente maior número de análises de qualidade do LH (microbiológica, crematócrito e acidez Dornic) foram realizadas assim como um maior volume de LH foi pasteurizado. **Conclusões:** Mesmo em época de pandemia e isolamento social, foi possível manter o fornecimento de LHOP para atender aos recém-nascidos prematuros ou de baixo peso na Unidade Neonatal.

PALAVRAS-CHAVE: Banco de Leite Humano; Aleitamento Materno; Qualidade da Assistência à Saúde

INTRODUCTION

Human milk (HM) is considered the gold standard food and has a unique composition to meet the needs of our species. Breast milk is of great importance when it comes to immunological aspects. Lactoferrin, lysozyme, and immunoglobulins, especially secretory IgA, are the whey proteins involved in the protection system. In addition to their nutritional functions, proteins are responsible for regulating growth and intestinal motility, as well as maturing the gastrointestinal system; glycoproteins act as anti-infectious agents; secretory IgA and lactoferrin act as immunomodulators and anti-inflammatories, and lysozyme stands out as an anti-inflammatory agent[1].

The World Health Organization (WHO), the United Nations Children's Fund (UNICEF), and the Brazilian Ministry of Health (MS) recommend that breastfeeding should be exclusive for the first 6 months of life and supplemented with appropriate food up to 2 years of age or more[2,3].

Breastfeeding (BF) is a fundamental human right and directly affects the health and mortality patterns of populations. It prevents diarrhea, respiratory infections, obesity, and chronic non-communicable diseases in adulthood, and increases the child's intellectual development. Among breastfeeding mothers, it also prevents breast cancer and postpartum obesity. If all families adopted the practice of exclusive breastfeeding (EBF) until their children were 6 months old, followed by EBF supplemented with other foods, it would be possible to save the lives of more than 800,000 children and 20,000 women in the world every year[3,4,5,6,7,8].

EBF has improved in recent decades, with the prevalence of EBF at 6 months increasing from 4.7% in 1986 to 37.1% in 2006. Currently, the prevalence of exclusive EBF among children under 4 months was 59.7% and among those under 6 months was 45.8%[5].

The woman's sociocultural, psychological and physical conditions are some of the factors that make it impossible for her to breastfeed, as well as the child's health conditions[7,9,10]. If breastfeeding is impossible, the most natural option is to use donated and pasteurized HML from Human Milk Banks (HMB), chosen according to caloric value as a nutritional therapy strategy for premature newborns admitted to the neonatal unit with HMB[1].

The HMB is considered a strategy of the National Breastfeeding Policy, responsible for promoting and protecting breastfeeding and carrying out the activities of collection, quality control, pasteurization, and distribution of pasteurized HM[11].

Brazil is an international benchmark and has the largest and most complex network of milk banks in the world. The Global Network of Human Milk Banks (rBLH-Br) is an initiative of the Ministry of Health, through the Fernandes Figueira Institute of the Oswaldo Cruz Foundation (IFF/Fiocruz). There are currently 223 HMBs and 211 collection points in Brazil[12].

The action model of the National Policy for the Promotion, Protection and Support of Breastfeeding is based on an articulated, integrated and mutually supportive network that has the characteristics of complex and interdependent interventions, which include management and political articulation, which develop efficient and effective policies related to breastfeeding; legal protection for breastfeeding, which guarantees a woman's right to breastfeed her child and protects against unethical *marketing*; the Brazilian Feeding and Breastfeeding Strategy, which strengthens health teams in the basic network by developing actions related to breastfeeding; in the hospital sphere: The Baby-Friendly Hospital Initiative (BFHI), the Kangaroo Method, and the Brazilian Network of Human Milk Banks, which are associated and enhance each other in caring for the newborn and protecting breastfeeding; education, communication, and social mobilization, the aim of which is to disseminate knowledge in relation to breastfeeding and mobilize society; and monitoring and evaluation, which follow up on breastfeeding indicators and the interventions applied to the policy[11].

The BFHI was conceived in 1990 by the WHO and UNICEF with the aim of protecting, supporting, and encouraging breastfeeding, and was incorporated by the Ministry of Health in 1992. The aim was to mobilize the entire health team to change the conduct and routines in maternity hospitals responsible for early weaning. In order to be accredited as a BFHI, maternity hospitals must follow the ten steps to successful breastfeeding and Ordinance No. 1,153 of May 22, 2014. Brazil currently has 329 Baby-Friendly Hospitals and recognizes the importance of the units that provide assistance[13].

On March 11, 2020, COVID-19 was characterized by the WHO as a pandemic. COVID-19 is an infectious disease that causes a severe acute respiratory syndrome caused by infection with the new coronavirus (SARS-CoV-2). The most common symptoms are fever, dry cough, and tiredness, as well as other less common symptoms such as pain and discomfort, sore throat, diarrhea, headache, and loss of taste and smell. The way of infection is basically through inhaling droplets that spread through the air when an infected person sneezes, coughs, or speaks. Another form of infection can occur through contact with contaminated surfaces which, through the touch of the hands, can carry viral particles to the mouth, nose, and eyes. Because of this, the main form of protection adopted was social distancing, as a measure to reduce contagion, as well as the use of masks and hand hygiene[14].

The initial lack of knowledge about SARS-CoV-2, coupled with the social distancing policy, which advised the population to remain in their homes, changed the way various health services, including the HMB, functioned and were attended to.

Considering the importance of disseminating data to managers that can help expand strategies for collecting HM and protecting and promoting breastfeeding, this study aims to understand the impact of the COVID-19 pandemic on HMBs. In addition, we sought to describe the strategies used to promote HM collection during the COVID-19 pandemic.

METHOD

This is a cross-sectional study whose data was obtained from the rBLH-BR Production System and the activity record books of the HMB of the Leila Diniz Maternity Hospital/Lourenço Jorge Municipal Hospital, from February 2019 to March 2021. The data was divided into two groups: Group 1 included data from February 2019 to February 2020 referring to the period before the pandemic, and Group 2 included data from March 2020 to March 2021 collected during the pandemic.

The study was carried out at the Leila Diniz Maternity Hospital, which is part of the Lourenço Jorge Municipal Hospital, located in Barra da Tijuca, Rio de Janeiro, RJ. This is a municipal maternity hospital which, according to data from the National Registry of Health Establishments (CNES), has 59 clinical obstetric beds, 23 surgical obstetric beds, 15 conventional neonatal intermediate care beds (Ucinco), ten type II neonatal intensive care beds (UTIN II), four kangaroo neonatal intermediate care beds (UCINCa), and is qualified as a Baby-Friendly Hospital[15].

The study was approved by the Human Research Ethics Committee of the Rio de Janeiro Municipal Health Department (CEP/SMS-RJ) with Certificate of Submission for Ethical Appraisal (CAAE) No. 54378321.1.0000.5279 and substantiated opinion No. 5.185.366, on December 22, 2021. As this is an observational, retrospective, non-interventional study, the Free and Informed Consent Form (FICF) is not required.

The indicators collected were: number of individual visits, number of home visits made to collect HML, number of HML donors, number of recipients, volume of milk collected, volume of HML distributed to the HMB recipient, number of microbiological analyses carried out, number of crematocrit analyses, number of Dornic acid analyses, and volume of LHOP (pasteurized human milk). These indicators are part of the Quality Assurance and Certification Program for the HMB or human milk collection points (PCLH) and are necessary for registering and maintaining monthly information on the national HMB network[16].

The crematocrit test is the analytical technique carried out on each bottle of raw human milk (LHOC) to determine the cream content, which allows the fat content and energy content of the LHOC to be calculated. The Dornic acidity test is used to determine the titratable acidity of the LHOC (Dornic method), with a value of between 1 and 8° D[17] being acceptable.

For the statistical analysis of the data, the normal distribution of the variables was checked using the Kolmogorov-Smirnov test. Considering that all the variables showed a non-normal distribution, the non-parametric Mann-Whitney U-test was used to check whether there was a statistically significant difference between the variables of the two groups (before and during the pandemic), considering a significance level of $p < 0.05$. The *Statistical Package for Social Sciences* (SPSS), version 13.0, was used for the statistical analysis. The data is presented as median and interquartile range.

RESULTS AND DISCUSSION

The Table shows the results of the ten indicators evaluated. It can be seen that during the pandemic, despite the reduction in the number of individual visits to the HMB, there was a substantial increase in home visits, which led to a greater volume of HM being collected and distributed, and consequently a greater number of HM quality analyses (microbiological, crematocrit, and Dornic acidity), as well as a greater volume of HM being pasteurized. The Table shows the results of the ten indicators evaluated.

It can be seen that, during the appointments made at the HMB in Groups 1 and 2, there was a statistically significant difference in the number of individual appointments made between the 2019 and 2020 groups ($U = 27$; $p = 0.003$). Group 1 had a higher number of appointments (Md = 690; AI = 152) compared to Group 2 (Md = 468; AI = 170).

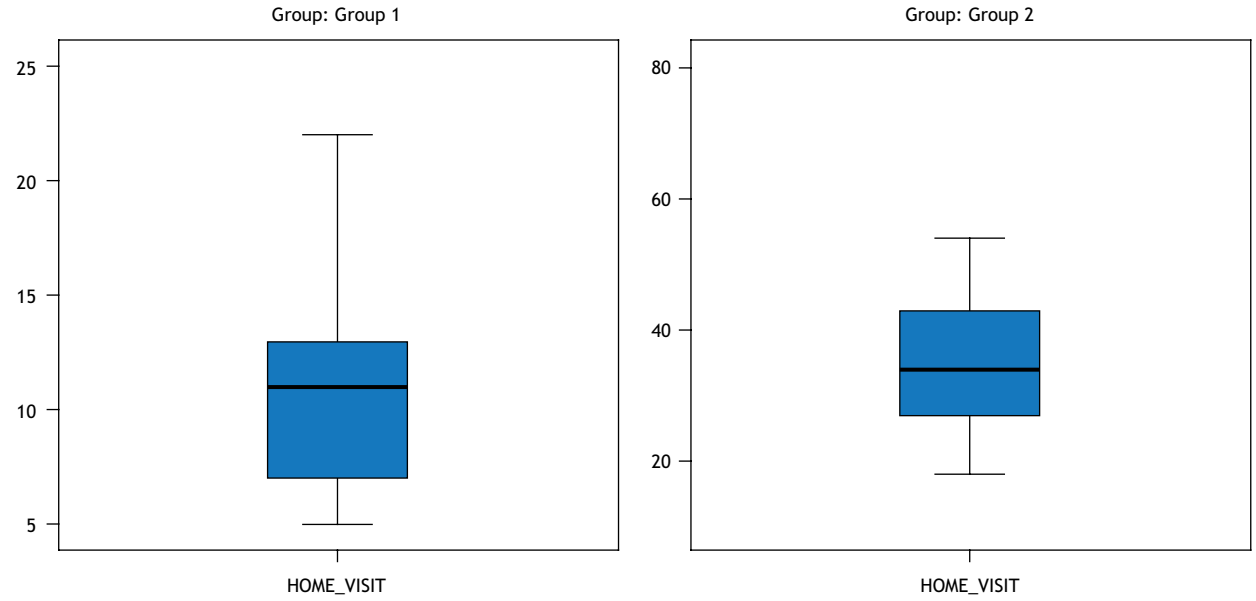
When comparing the number of home visits made in Groups 1 and 2 (Figure 1), it can be seen that there was a statistically significant difference in the number of home visits made between Groups 1 and 2 ($U = 3$; $p < 0.001$). Group 2 had a higher number of home visits (Md = 34; AI = 22) compared to Group 1 (Md = 11; AI = 7), which was inversely related to the number of individual visits to the HMB.

There was a statistically significant difference in the amount of HM collected (Figure 2) between Groups 1 and 2 ($U = 44.000$;

Table. Median and interquartile range of human milk bank indicators for the period before and during the COVID-19 pandemic.

Indicators analyzed	Group 1* Md	Group 1* AI	Group 2** Md	Group 2** AI	U test	p value
Individualized service	690,00	152,00	468,00	170,00	27,000	0,003
Home visits	11,00	7,00	34,00	22,00	3,000	< 0,001
Donor	93,00	28,00	95,00	32,00	76,500	0,681
Receiver	30,00	5,00	33,00	14,00	49,500	0,720
Human milk collected (L)	42,51	10,29	55,10	18,78	44,000	0,038
Human milk distributed (L)	32,34	13,86	36,20	19,00	50,000	0,077
Microbiological tests	119,00	48,00	164,00	54,00	37,000	0,015
Crematocrit	132,00	50,00	164,00	62,00	40,500	0,024
Dornic acidity	132,00	59,00	193,00	77,00	39,000	0,020
Pasteurized human milk (L)	31,73	7,78	44,48	17,42	40,000	0,022

Source: Prepared by the authors, 2023.
*Group 1: period from February 2019 to February 2020. **Group 2: March 2020 to March 2021; Md: median; AI: interquartile range; L: liters.



Source: Prepared by the authors, 2023.

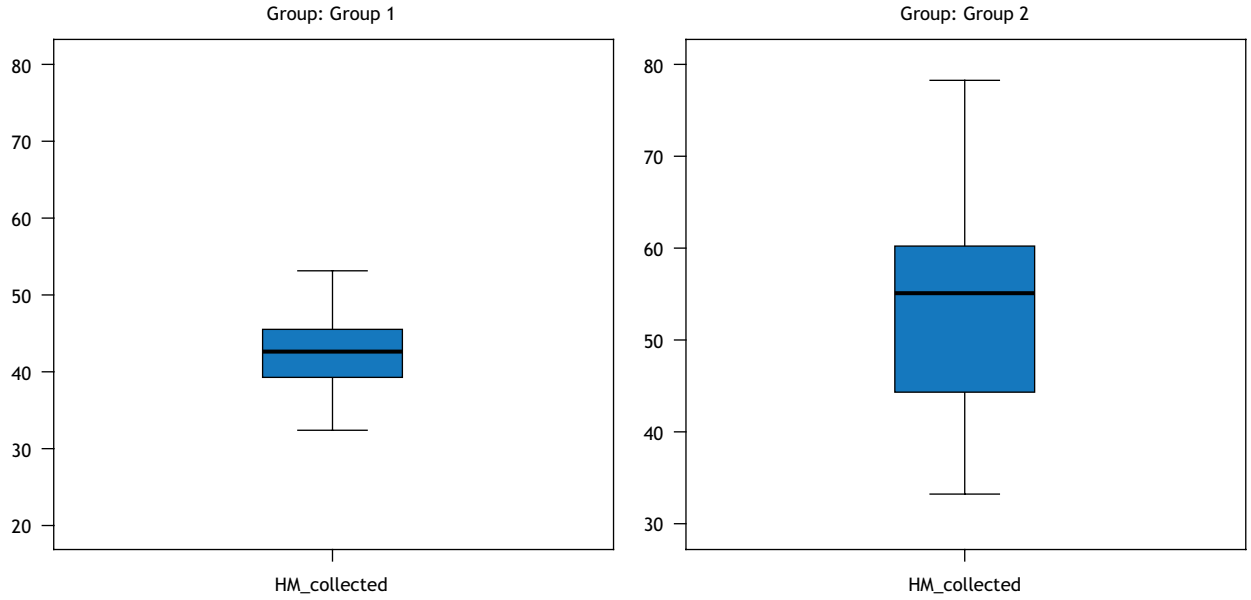
Figure 1. Number of home visits carried out in the period before the COVID-19 pandemic (Group 1) and during the COVID-19 pandemic (Group 2).

p = 0.038). Group 2 collected more HM (Md = 55.10; AI = 18.78) than Group 1 (Md = 42.51; AI = 10.29). Figure 3 shows that there was no statistically significant difference in the amount of HM distributed between Groups 1 and 2 (U = 50.000; p = 0.077).

Regarding the analyses carried out on the donated milk, there was a statistically significant difference in the number of microbiological tests (U = 37.000; p = 0.015), crematocrit (U = 40.500; p = 0.024), and Dornic acidity (U = 39.000; p = 0.020) between Groups 1 and 2. More microbiological tests were carried out in Group 2 (MD 164.00; AI 54) compared to Group 1 (MD 119.00; AI 48). The same occurred for crematocrit in Group 2 (MD 164.00; AI 62) and Group 1 (MD 132.00; AI 50), Dornic acidity Group 2 (MD 193.00; AI 77); Group 1 (MD 132.00; AI 59).

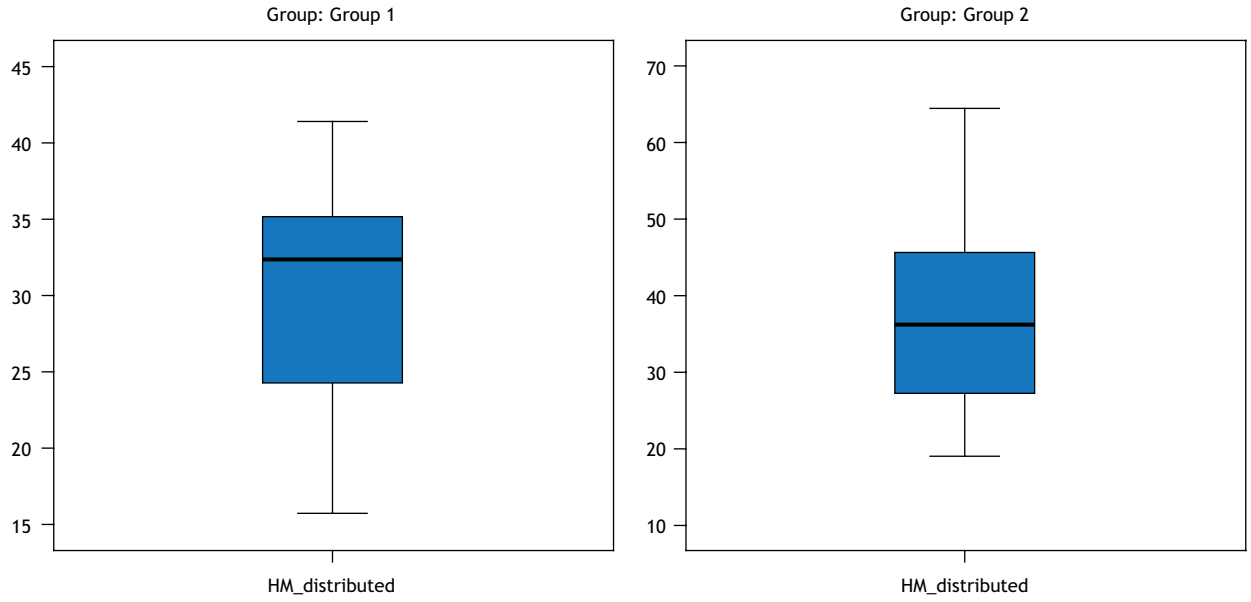
Regarding pasteurization of the HM collected, there was a statistically significant difference (U = 40.000; p = 0.022) between Groups 1 (Md 31.73; AI 7.78) and Group 2 (Md 44.48; AI 17.42) as can be seen in the Table.

The HMB is a specialized, non-profit service linked to a maternal and/or child hospital, responsible for actions to promote, protect, and support breastfeeding and for carrying out activities to collect, process, quality control, and distribute HMB. Some health units have a PCLH, which can be considered a fixed or mobile unit, in-hospital, or out-of-hospital, technically linked to



Source: Prepared by the authors, 2023.

Figure 2. Volume of HM collected in liters in the period before the COVID-19 pandemic (Group 1) and during the COVID-19 pandemic (Group 2).



Source: Prepared by the authors, 2023.

Figure 3. Volume of HM distributed in liters in the period before the COVID-19 pandemic (Group 1) and during the COVID-19 pandemic (Group 2).

the HMB and administratively linked to a health service or HMB, responsible for promoting, protecting, and supporting breastfeeding and carrying out activities to collect breast milk and store it for later delivery to the HMB[17].

There are currently 223 HMBs and 213 collection points in Brazil, of which 17 HMBs and six collection points are located in the state of Rio de Janeiro[12].

In order for the HMB to function perfectly, it must follow the regulations of the Resolution of the Collegiate Board of Directors of the National Health Surveillance Agency No. 171, of September 4, 2006, which sets out the Technical Regulations for the operation of HMBs, which require a qualified professional to be in charge of technical responsibility (RT) and food technology. In the HMBs of municipal hospitals in the city of Rio de Janeiro, the RT professional responsible for food technology is

the nutritionist, who according to the Federal Council of Nutrition is a professional in the area of clinical nutrition who can be responsible for nutritional and dietary assistance in HMBs and collection points[18].

All the professionals who work in the HMB must take qualification courses in promoting, protecting, and supporting breastfeeding, as well as a course in the processing and quality control of human milk I for the RT professional and the person responsible for food technology, thus providing a record of professional training and qualification[17].

Due to the COVID-19 pandemic, some technical recommendations were created by rBLH-BR to guide HMB services on COVID-19 prevention and control measures to be adopted in the care and processing of HL. Regarding breastfeeding, the recommendation is to maintain it, as long as the mother is clinically able and wishes to breastfeed, and all guidance should be provided in order to carry out measures to minimize the risk of contamination[19].

Breast milk donation is contraindicated for women with symptoms compatible with flu syndrome or a confirmed case of COVID-19, as well as those who have had contact with positive cases. However, breastfeeding women and their babies should be monitored to prevent complications. It is important to note that to be a donor it is essential to be healthy[20].

Breastfeeding should always be prioritized. Recent studies have found SlgA SARS-CoV-2 antibodies in 80% of breast milk from previously infected mothers[21]. IgA antibodies with reactivity to SARS-CoV-2 have been observed in breast milk from previously infected mothers but their durability and strength in relation to protection among breastfed babies is not yet known. It is worth noting that the presence of IgA in breast milk prevents the baby from infection and death[22].

The commitment to maintaining both the BF and donations to the HMB during the COVID-19 pandemic is related to the benefit of the HM in relation to the risks of transmitting the disease. There have been several perceived strategies to prevent the impacts of the pandemic from negatively affecting the functioning of the HMB. The main strategies observed during the study period were the intensification of social media communication, the support of the Rio de Janeiro city council's communication department and the promotion of health education activities. HM donation campaigns, bottle donation campaigns, campaigns to encourage breastfeeding, health care guidelines and talks to small groups of pregnant women are some examples of the actions carried out with the HMB team, breastfeeding women, civil society, businesspeople, and management bodies as the main stakeholders.

As soon as the COVID-19 pandemic was declared by the WHO, although there was no interruption in the service provided by the HMB, many mothers did not come to the unit, which was the main factor in the decrease in individual care. Brazil presented an uncertain panorama, with a lack of reliable information regarding the number of initial deaths[23]. Thus, it was possible to observe that the strategies created during the COVID-19 pandemic, about collecting HM, were extremely important.

Regarding the increase in HM collection, many mothers started working from *home*, which favored breastfeeding and the consequent increase in milk production, enabling a greater number of donations to the HMB, which can also be observed in other studies[24]. In addition, the report of successful experiences on the HMB's social media of women who have obtained support for breastfeeding and donated breastmilk has raised awareness of the increase in HM donations.

Regarding home visits, the increase was due to the organization of the logistical structure by the Rio de Janeiro city government together with the HMB's RT through programmatic coordination 4.0 (Cap 4.0), which made *motorcycle couriers* available, and by the hospital's own administrative management, which provided weekly transport for home visits and collection, thus maintaining breast milk stocks even during the pandemic, which can also be observed in state hospitals that carry out home visits, according to the Rio de Janeiro State Health Department[25].

The number of children treated in the neonatal unit remained stable, with no increase in the amount of milk distributed. Regarding the analyses carried out on the milk collected, the increase is due to the increase in milk collected and the subsequent pasteurization process, since these analyses are part of the Technical Regulations for the Operation of Human Milk Banks[17].

CONCLUSIONS

It was possible to see that, during the COVID-19 pandemic, care practices in relation to breastfeeding and the HMB were extremely important for maintaining breastfeeding and caring for premature or low birth weight newborns with LHOP.

During the pandemic, despite the reduction in the number of individual visits to the HMB, there was a substantial increase in home visits, which led to a greater volume of HM being collected and distributed, and consequently a greater number of HM quality analyses (microbiological, crematocrit, and Dornic acidity) were carried out, as well as a greater volume of HM being pasteurized.

It was clear that spreading the word is fundamental and that the joint efforts of the HMB team, breastfeeding women, civil society through donations of bottles to store the donated milk, management bodies, big business owners who shared their spaces to publicize the HM donation campaign, encouraging breastfeeding through their media, talks to small groups of pregnant women, taking every precaution in their communities *on site*, and the dissemination of the campaigns by the Rio de Janeiro city council's communications department were crucial to the success of maintaining HM stocks during the COVID-19 pandemic, thus minimizing the impact caused initially and highlighting the activities that provide a quality service and should be recognized in their entirety.

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Authors' Contribution

Moreira APAS, Oliveira AGM, Silva TTC - Conception, planning (study design), analysis, data interpretation, and writing of the work. All the authors approved the final version of the work.

Conflict of Interest

The authors inform that there is no potential conflict of interest with peers and institutions, political or financial, in this study.