



Risk factors that influence early cessation of breastfeeding

Factores de riesgos que influyen en el abandono precoz de la lactancia materna

Dionis Ruiz Reyes ¹, <https://orcid.org/0000-0003-3061-1892>

Alain Pérez Alvarez ², <https://orcid.org/0000-0002-1527-910X>

Maykel Ricardo Bernal La Nuez ², <https://orcid.org/0009-0003-3880-6253>

Néstor Miguel Carvajal Otaño ³, <https://orcid.org/0000-0002-0386-3181>

¹ Villa Clara University of Medical Sciences. Villa Clara, Cuba.

² Artemisa Faculty of Medical Sciences. Artemisa, Cuba.

³ Arnaldo Milián Castro Santa Clara Clinical Surgical University Hospital. Villa Clara, Cuba.

* **Corresponding author:** dionys.reyes@nauta.cu

Received: 30/02/2024

Accepted: 20/12/2024

How to cite this article: Ruiz Reyes D, Pérez Alvarez A, Bernal de La Nuez MR, Carvajal Otaño NM. Risk factors that influence early cessation of breastfeeding. MedEst. [Internet]. 2025 [cited access date]; 5(1):e216. Available in: <https://revmedest.sld.cu/index.php/medest/article/view/216>

ABSTRACT

Introduction: Breastfeeding provides infants with the nutrients necessary for their healthy growth and development. The reasons why mothers chose to start artificial or mixed breastfeeding are the mother's occupation (work,

Articles from MedEst Magazine are shared under the terms of the Creative Commons Attribution-NonCommercial 4.0 International license.

Email: revmedest.mtz@infomed.sld.cu Website: www.revmedest.sld.cu



student), low milk production, and to a lesser extent, mastalgia and cracked nipples.

Objective: to describe the risk factors that influence the mother to abandon breastfeeding early.

Methods: a bibliographic review was carried out by consulting original articles, case reports and open access systematic reviews in peer-reviewed academic publications from the last 5 years. The databases of ScieELO, Regmed, Dialnet, Mayoclinic, among others, were reviewed. The search terms included care; risk factors; breastfeeding; Sars-Cov-2; as well as its translation into English.

Development: Early cessation of breastfeeding is conditioned by a series of factors, generally of maternal origin and under the influence of certain economic, psychological and cultural conditions.

Conclusions: The factors that influence mothers to stop breastfeeding early are early motherhood, low educational level, socio-cultural taboos, marital stability, maternal occupation and the impact of the SARS-CoV-2 pandemic.

Keywords: Early cessation; Risk factors; Breastfeeding

RESUMEN

Introducción: la lactancia materna proporciona a los lactantes los nutrientes necesarios para su crecimiento y desarrollo saludable. Las causas por las que las madres optaron por iniciar una lactancia artificial o mixta es la ocupación materna, (laboral, estudiantil), baja producción de leche, y en menor porcentaje mastalgia y grietas en los pezones.

Objetivo: describir los factores de riesgo que influyen en la madre para el abandono precoz de la lactancia materna.

Métodos: se realizó una revisión bibliográfica consultando artículos originales, reportes de caso y revisiones sistemáticas de acceso abierto en publicaciones académicas revisadas por pares, de los últimos 5 años. Se revisaron las bases de dato de ScieELO, Regmed, Dialnet, Mayoclinic, entre otras. Los términos de búsqueda incluyeron atención; factores de riesgo; lactancia materna; Sars-Cov-2; así como su traducción al inglés.

Desarrollo: el abandono precoz de la lactancia materna es condicionado por una serie de factores generalmente de origen maternos y bajo la influencia de determinadas condiciones económicas, psicológicas y culturales.

Conclusiones: los factores que influyen en las madres para un cese precoz en el desarrollo de lactancia materna son la maternidad temprana, el bajo nivel educacional, tabúes socio-culturales, la estabilidad conyugal, la ocupación materna y el impacto de la pandemia por el SARS-CoV-2.

Palabras clave: Abandono precoz; Factores de Riesgo; Lactancia Materna

INTRODUCTION

Breastfeeding is a physiological, instinctive act, an adaptive biological inheritance of mammals and the ideal and best way to feed newborns. On the other hand, this physiological act can be influenced by the attitude of the woman, the family and social environment, among other things. ⁽¹⁾

The superiority of breast milk when it comes to feeding the newborn is indisputable. This argument is based on historical reasons since the birth of man, whose survival is probably due to the adequacy of breast milk. Few would oppose natural breastfeeding as a source of nutrition for the newborn due to its emotional satisfaction, simplicity, hygiene and biological and immunological characteristics. ⁽²⁾

The World Health Organization (WHO) recommends breastfeeding (BF) within the first hour after birth and feeding the infant with this food alone for the first six months. It is the optimal form of nutrition for babies for the healthy growth and development of the baby. ^(1,2)

At birth, the physiological conditions for the consumption, digestion and complete absorption of certain nutrients exist, and during the first two years of life, the digestive, renal, immune and neuromuscular systems reach their maturity. ⁽³⁾ Breastfeeding is the perfect way to provide young children with the nutrients they need for healthy growth and development. In fact, all women can breastfeed if they have good knowledge and support from the family and the health system. ⁽⁴⁾

Worldwide, exclusive breastfeeding is recommended for six months, then introducing safe and age-appropriate foods and continuing breastfeeding until 2 years or more. The most important benefits of breastfeeding are the

reduction of infant mortality and morbidity. In Cuba, despite successful breastfeeding campaigns and family doctors, mothers are recommended to exclusively breastfeed for the first 6 months and continue with breast milk thereafter, gradually adding other foods according to the age of the child. ⁽⁵⁾

Although the bibliography consulted by the authors arrived at few articles that addressed the subject in the country and more specifically in Villa Clara, it is known that approximately 20 % of mothers in Santa Clara stop breastfeeding in a period prior to 6 months for different reasons. This constitutes a health problem. ⁽⁵⁾

It has been shown that the early abandonment of exclusive breastfeeding brings with it multiple complications in other stages of life. Currently, in Cuba, research continues on the benefits of exclusive breastfeeding. However, there seems to be a gap in terms of the risk factors that condition its early abandonment. For a child to receive and be fed with LM in today's societies, every day is a complex task. It is paradoxical, but for a totally natural and physiological event, different maternal and paternal factors, the family environment and the social environment must be harmoniously combined. ⁽⁶⁾

Despite all the benefits that this type of feeding brings to the baby, there are multiple factors that determine the temporary or permanent suspension of breastfeeding. The analysis of the factors that contribute to the early abandonment of breastfeeding indicates that they may depend on the mother, the newborn (NB), the family environment, the health institutions themselves and sociocultural aspects.

This is precisely the guiding principle of this work, which aims to describe the main risk factors involved in the early abandonment of breastfeeding. The reason for this work was the high incidence in our setting of mothers who decide to stop breastfeeding earlier than planned despite the benefits attributed to it.

MATERIALS AND METHODS

A bibliographic review was carried out, consulting original articles, case reports and open-access systematic reviews in peer-reviewed academic publications from the last 5 years. All updated bibliographies found were included in the study and those that were not were excluded. The databases of SciELO, Regmed, Dialnet, Mayo Clinic, among others, were reviewed. The

search terms included breastfeeding, risk factors, early abandonment; as well as their translation into English.

DEVELOPMENT

The early abandonment of breastfeeding is conditioned by a series of factors, generally of maternal origin and under the influence of certain economic, psychological and cultural conditions. This risk predisposes to various diseases; among which are digestive disorders associated with alterations in the dietary regime, poor weight gain in the newborn-infant, immunosuppression that predisposes to multiple diseases of infectious cause and atopic diseases, among others. For the mother, it is a factor related to the appearance of breast and cervical cancer, the breakdown of the psychosocial balance between mother and child, infectious diseases of the breast tissue, among others. ⁽⁷⁾

Breastfeeding is a physiological act that ensures survival, designed by nature to ensure the survival of the human species, since it offers the newborn food, immune protection and emotional security through the secure bond between mother and child. It is considered a complex process that requires the optimal functioning and synchrony of two organisms: that of the mother and that of the baby. ⁽⁸⁾

Milk is produced by the cells that form the alveoli of the mammary gland. These alveoli are arranged in clusters and are surrounded by muscle-type cells that are very important in the release of milk. Milk production depends on two main factors: prolactin and oxytocin. Prolactin production is stimulated primarily by the child's sucking, but there are also other stimuli, such as the baby's crying, its smell and its contact, among others. ⁽⁶⁾

Breast milk goes through 4 stages and each has different volumes and qualitative and quantitative compositions, but all are necessary for the growth and development of the infant. These are: precolostrum, colostrum, transitional milk and mature milk. ^(6, 7)

The team of researchers agrees that breastfeeding is a healthy way not only physically but psychologically that contributes to the growth and development of the infant.



The WHO and the Cuban Health System recommend that mothers exclusively breastfeed until 6 months of age, which would guarantee an optimal nutritional status and the prevention of infectious and allergic diseases. ^(9,10)

They also recommend continuing breastfeeding from 6 months of age, while offering the baby other complementary foods, until a minimum of 2 years. According to the WHO, from the first 2 years breastfeeding should be maintained until the child and the mother decide, without any time limit. It is not known what the "normal" duration of breastfeeding is in the human species. ⁽¹⁰⁾

The authors of this research consider it necessary to exclusively breastfeed until 6 months of age and to complement it with other foods until 2 years of age. From the above, it is derived that early abandonment of breastfeeding is conceptualized as the interruption of the process prior to 6 months of age of the infant.

The terms and characteristics of breastfeeding are understood from the cultural context of breastfeeding mothers, so that breastfeeding periods can be extended, as well as the variability of cultures existing in the world. ⁽¹⁰⁾

Breastfeeding has multiple benefits and positive consequences for the development of the child, as well as healthy advantages for the mother. Despite the beneficial effects of breastfeeding, early weaning is increasing in many developing countries, mainly due to socioeconomic circumstances that separate the infant from the mother. Various risk factors can influence this, including: ⁽¹⁰⁾

Culturally based erroneous beliefs: such as the fact of suspending breastfeeding in the face of benign breast diseases (mastitis, benign cysts and fibroadenomas).

Flat or inverted nipples and implants: currently there are resources and strategies to continue breastfeeding in women who are in these circumstances.

Problems in the child such as weak suction and refusal to eat: despite this, breastfeeding should be maintained for the minimum established time, always keeping in mind the multiple advantages that breast milk offers to the baby and the harm of abandoning it early.

Maternal age below 20 years: Generally, there is maternal immaturity to assimilate the process and carry it out with optimal efficiency and effectiveness, which is why the process in these patients requires family and specialized support. In many cases, the mother's student role leads her to distance herself from breastfeeding, due to her rapid return to educational units.

The low level of maternal education: leads to a lack of preparation and insufficient cultural development to understand the need for the breastfeeding process and for it to be fully carried out. The lack of knowledge of the subject in many cases leads them to offer foods other than breast milk, in many cases sugary or salty, which create a discriminatory environment for the baby, who prefers the aforementioned and moves away from breastfeeding. This indicates the need to provide knowledge about milk extraction techniques, temporary storage and correct use of it in order to extend the benefits that this natural activity offers.

The dysfunctional family environment: influences both directly and indirectly the maternal psyche and life, turning around the existing priorities in the home. Maternal absenteeism leads to babies being left in the care of relatives, close people or nurseries, where their own customs or standards of management for feeding children depend. The mistaken perception that the baby is hungry or not full due to not having enough milk in the breast is a frequent question in childcare consultations.

On the subject, it must be clarified that the risk factors mentioned are considered to have a lack of guidance as their main cause. To this end, it is recommended to increase promotional activities in the health area such as: instructing the mother and family on how to breastfeed the baby, promoting exclusive breastfeeding and providing information on its advantages, among others.

Breastfeeding is not only the mother's responsibility; during this period, she is vulnerable and needs help physically and emotionally. It is known that the negative emotional states of families with functional problems negatively influence the success of breastfeeding. The SARS-CoV-2 pandemic had a negative impact on birth care and breastfeeding. ^(11, 12, 13)

The lack of knowledge of the mechanisms of contagion and the potential risks for the mother and the newborn, even though vertical transmission of the virus has not been demonstrated, has led to the abandonment of practices

such as skin-to-skin contact and early initiation of breastfeeding, which offer great benefits for maternal and child health. ⁽¹⁴⁾

Taking into account the available scientific evidence and the protective effect of breastfeeding, the WHO and other organizations recommend maintaining mother-child contact and breastfeeding in cases of suspected or confirmed SARS-CoV-2 infection in the mother, adopting preventive procedures to minimize the risk of contagion, such as hand hygiene before and after contact with the newborn, as well as the use of a mask. If a temporary separation of the mother and child is required, it is recommended to feed the newborn with expressed breast milk. ⁽¹⁴⁾

The presence of IgA antibodies against SARS-CoV-2 has been confirmed in the milk of infected women, so breastfeeding could reduce the clinical impact of the disease in the infant, if the infant becomes infected. ⁽¹⁴⁾

It is considered that despite the presence of this virus in the mother, she should continue breastfeeding since it has been proven that breastfeeding is an immunizing factor.

González Castell et al., ⁽¹⁵⁾ report in their study that in almost half of the cases early weaning is associated with maternal decisions or perceptions, which do not necessarily reflect reality, the impression that the child "is still hungry" is not always associated with an objective fact or is not related to the child's growth curve. This could be minimized with more information in health checks or with breastfeeding clinics.

Breastfeeding studies show that promoting exclusive breastfeeding in diverse social, economic and cultural contexts requires that family members understand the factors that influence many mothers to not use exclusive breastfeeding. ⁽¹⁶⁾

Wei Pang et al., ⁽¹⁷⁾ and Christian P et al., ⁽¹⁸⁾ in their research address the issue of the complete abandonment of breastfeeding in an abrupt manner, where the people in the study consider that there is a pathological mother-baby bond when breastfeeding is prolonged beyond the baby's first year of life.

During the age of 20 to 34 years is the optimal stage for conception, since the woman has already completed her biological maturation, which leads to a better preparation for procreation. Studies such as that of Bridge G et al., ⁽¹⁹⁾

report that the mothers who breastfed the least were those over 35 years of age, followed by adolescents, as our study also showed.

The mother's educational level reflects in a positive way that the higher the educational level, the lower the risk of abandoning breastfeeding. This is described by Pérez Escamilla et al.,⁽²⁰⁾ and when comparing the groups reflected in their study, it can be observed that there is a predominance of the highest educational levels among those who exclusively breastfed for a longer time, specifically those who completed pre-university and university.

Without a doubt, any health promotion activity in relation to breastfeeding has more fertile ground in those mothers who have a higher cultural level.

The decision of mothers most of the time is to stop breastfeeding due to the feeling that the baby is hungry or not full and that there is not enough milk in the breast, which is why these are the most frequent causes of abandonment.^(20, 21)

For the authors of this research, the high incidence of cases of abandonment of breastfeeding associated with aesthetic reasons, despite the advantages of this physiological act. This suggests the need to propose improvement actions to obtain a positive impact on breastfeeding.

Researchers found that there is a relationship between the start and end of breastfeeding and the presence of diseases in the infant. As the period of breastfeeding is shorter or non-existent, acute respiratory infections predominate, which are one of the most frequent diseases in childhood, mainly in the first year of life. These are responsible for 50% of pediatric consultations.^(20,21)

The rates of respiratory tract infections, as well as deaths caused by them, are lower in exclusively breastfed infants. It has been proven that breast milk protects the child against germs such as respiratory syncytial virus, rhinovirus, Haemophilus influenzae and pneumococcus, lasting up to 2 years after exclusive breastfeeding has been suspended, which is particularly important in otitis media and pneumonia. Studies conducted in Sweden provide between 5 and 10 years of immunological protection in the case of Haemophilus influenzae.⁽²²⁾

Children who are exclusively breastfed in the first 6 months of life not only reduce the risk of infections, but also show a shorter evolution time and less severity. There is overwhelming evidence that breastfeeding protects against

the two main causes of death in children under 5 years of age: pneumonia and diarrhea. Almost half of all episodes of diarrhea and a third of all respiratory infections can be prevented by breastfeeding. ⁽²²⁾

The authors consider that mothers need information and training on how to feed and care for their babies, as well as support, encouragement and family assistance after birth and there is never enough time spent on this. It is necessary to know this physiological act; as well as the different factors in the family and the surrounding environment that come together to achieve this goal, since tiredness, fatigue and stress experienced by the mother can, by themselves, inhibit the production of the hormone prolactin and increase cortisol levels.

In Cuba, the Program for the Declaration of Medical Offices, Polyclinics and Hospitals as Mother-, Child-Friendly is being carried out, which contributes to the existence of greater information and preparation of health personnel. Likewise, the education and awareness of working mothers has been raised regarding the importance of breastfeeding and the benefits of this type of feeding, which unfortunately does not have the place it deserves worldwide. ⁽⁵⁾

CONCLUSIONS

Early cessation of breastfeeding is a target for global intervention. It is closely related as a root cause to the development of morbid conditions such as malnutrition, respiratory infections and diarrheal diseases, which lead to early mortality.

BIBLIOGRAPHIC REFERENCES

1. Fondo de las Naciones Unidas para la Infancia. Lactancia materna. [Internet] Ciudad de México: UNICEF; 2021 [cited 20/09/2023]. Available in: <https://www.unicef.org/mexico/lactancia-materna>
2. Álvarez Sintés, R. Lactancia Materna. En: Temas de Medicina General Integral. La Habana: Editorial Ciencias Médicas; 2014. 3 ed. v1. P. 1051-71.
3. OMS. Nutrición: Lactancia materna exclusiva. [Internet]. 2020 [cited 20/09/2023]: [aprox. 5p.]. Available in: https://www.who.int/nutrition/topics/exclusive_breastfeeding/es/

4. Fiallos Brito EJ, Villacrés Gavilanes SC. Lactancia materna y alimentación complementaria en relación con la obesidad infantil. Rev Inf Cient [Internet]. 2023 [cited 20/09/2023]; 102. Available in: <https://revinfcientifica.sld.cu/index.php/ric/article/view/4219/5804>
5. Hernández Magdariaga A, Hierrezuelo Rojas N, González Brizuela CM, Gómez Soler U, Fernández Arias L. Conocimientos de madres y padres sobre lactancia materna exclusiva. MEDISAN [Internet]. 2023 [cited 20/09/2023]; 27(2):e4336. Available in: <https://medisan.sld.cu/index.php/san/article/view/4336/html>
6. Reyes Montero Y, Alonso Uría RM, Rodríguez Alonso B, Castillo Isaac E. Factores clínicos y sociodemográficos en lactantes con destete precoz. Rev Cuban Pediatr. [Internet] 2020 [cited 20/09/2023]; 92(4):e671. Available in: <http://www.revpediatria.sld.cu/index.php/ped/article/view/671/625>
7. Baeza Gozalo P, Sola Cía S, López Dicastillo O. Breastfeeding and rooming-in in the management of neonatal abstinence syndrome. Scopingreview. Anales Sis San Navarra [Internet]. 2023 [cited 20/09/2023]; 46(2):e1048. Available in: http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1137-66272023000200011&lng=es
8. Strahan AE, Guy GP Jr, Bohm M, Frey M, Ko JY. Neonatal abstinence syndrome incidence and health care costs in the United States, 2016. JAMA Pediatr [Internet] 2020 [cited 20/09/2023]; 174(2):200-202. Available in: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6990852/>
9. Lembeck AL, Tuttle D, Locke R, Lawler L, Jimenez P, Mackley A et al. Breastfeeding and formula selection in neonatal abstinence syndrome. Am J Perinatol [Internet] 2021 [cited 20/09/2023]; 38(14): 1488-1493. Available in: <https://pubmed.ncbi.nlm.nih.gov/32604445/>
10. Bhatt P, Umscheid J, Parmar N, et al. Predictors of Length of Stay and Cost of Hospitalization of Neonatal Abstinence Syndrome in the United States. Cureus. [Internet] 2021 [cited 20/09/2023]; 13(7):e16248. Available in: <https://pubmed.ncbi.nlm.nih.gov/34373810/>

11. Grossman MR, Berkwitt AK, Osborn RR, Citarella BV, Hochreiter D, Bizzarro MJ. Evaluating the effect of hospital setting on outcomes for neonatal abstinence syndrome. J Perinatol [Internet] 2020 [cited 20/09/2023]; 40(10):1483-1488. Available in: <https://pubmed.ncbi.nlm.nih.gov/32086436/>
12. Singh R, Rothstein R, Ricci K, Visintainer P, Shenberger J, Attwood E et al. Partnering with parents to improve outcomes for substance exposed newborns-a pilot program. J Perinatol [Internet] 2020 [cited 20/09/2023]; 40(7):1041-1049. Available in: <https://pubmed.ncbi.nlm.nih.gov/32203180/>
13. Yonke N, Jimenez EY, Leeman L, Leyva Y, Ortega A, Bakhireva LN. Breastfeeding motivators and barriers in women receiving medications for opioid use disorder. BreastfeedMed [Internet] 2020 [cited 20/09/2023]; 15(1):17-23. Available in: <https://pubmed.ncbi.nlm.nih.gov/31692370/>
14. Ortega Moreno MC, Castillo Saavedra EF, Reyes Alfaro CE. Factores asociados al abandono de la lactancia materna exclusiva en una ciudad de Perú. Revista Cubana de Enfermería. [Internet]. 2020 [cited 30/11/2023]; 26(2), [aprox. 13p.]. Available in: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S0864-03192020000200008
15. González Castell LD, Unar Munguía M, Bonvecchio Arenas A, Ramírez Silva I, Lozada Tequeanes AL. Prácticas de lactancia materna y alimentación complementaria en menores de dos años de edad en México. Salud Pública Mex [Internet]. 2023 [cited 30/11/2023]; 65:s204-s210. Available in: <https://saludpublica.mx/index.php/spm/article/view/14805>
16. Cuevas Nasu L, Bautista Arredondo S, Colchero MA, Gaona Pineda EB, Martínez-Barnetche J, Alpuche-Aranda C, et al. Metodología de la Encuesta Nacional de Salud y Nutrición 2021. Salud Pública Mex. [Internet] 2021 [cited 30/11/2023]; 63(6):813-8. Available in: https://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0036-36342021000600813
17. Wei Pang W, Ting Tan P, Cai S, Fok D, Chien Chua M, Sock Bee L, et al. Nutrients or nursing? Understanding how breast milk feeding affects child



cognition. European J Nutr.[Internet] 2020 [cited 30/11/2023]; 59:609-19. Available in: <https://pubmed.ncbi.nlm.nih.gov/30809702/>

18. Christian P, Smith ER, EunLeeS, Vargas AJ, Bremer AA, Raiten DJ. The need to study human milk as a biological system. Am J ClinNutr. [Internet] 2021 [cited 30/11/2023]; 113(5):1063-72. Available in: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8106761/>

19. Bridge G, Lomazzi M, Raman B. A cross-country exploratory study to investigate the labelling, energy, carbohydrate and sugar content of formula milk products marketed for infants. Br Dent J. [Internet] 2020 [cited 30/11/2023]; 228(3):198-212. Available in: <https://pubmed.ncbi.nlm.nih.gov/32060463/>

20. Pérez Escamilla R, Hernández Cordero S, Baker P, Barros AJD, Begin F, Chapman DN, et al. Breastfeeding crucially important, but increasingly challenged in a market-driven world. Lancet. [Internet] 2023 [cited 30/11/2023]; 401(10375):472-85. Available in: <https://pubmed.ncbi.nlm.nih.gov/36764313/>

21. Doubova SV, Leslie HH, Kruk ME, Pérez-Cuevas R, Arsenault, C. Disruption in essential health services in Mexico during COVID-19: an interrupted time series analysis of health information system data. BMJ Global Health. [Internet] 2021 [cited 30/11/2023]; 6(9):e006204. Available in: <https://pubmed.ncbi.nlm.nih.gov/34470746/>

22. Hernández Cordero S, Pérez Escamilla R, Zambrano P, Michaud Létourneau I, Lara Mejía V, Franco Lares B. Countries experiences scaling up national breastfeeding protection, promotion and support programmes: comparative case studies analysis. Matern Child Nutr. [Internet] 2022 [cited 30/11/2023]; 18(suppl 3):e13358. Available in: <https://pubmed.ncbi.nlm.nih.gov/35438250/>

STATEMENT OF AUTHORSHIP

DRR: Conceptualization. Data curation. Formal analysis. Funding acquisition. Investigation. Methodology. Writing the original draft and Writing review and editing.



APA: Conceptualization. Data curation. Formal analysis. Funding acquisition. Investigation. Methodology. Writing the original draft and Writing review and editing.

MRBN: Conceptualization. Data curation. Formal analysis. Funding acquisition. Investigation. Methodology. Writing the original draft and Writing review and editing.

NMCO: Conceptualization. Data curation. Formal analysis. Funding acquisition. Investigation. Methodology. Writing the original draft and Writing review and editing.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

SOURCES OF FINANCING

No external funding was received.

