







## Online Debate on HPV Vaccination In Brazil: A Cross-Sectional Study

### Debate Online sobre a Vacinação contra o HPV no Brasil: Estudo Transversal

### Debate en línea sobre la vacunación contra el VPH en Brasil: un estudio transversal

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#### ABSTRACT

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Introduction: Perceptions of the HPV vaccine are essential to understanding users' perspectives and experiences regarding vaccination. This study aims to analyze the opinions expressed about HPV vaccination in an online community on the Facebook platform. Design: Observational study conducted through systematic non-participant observation. Data collection was carried out between February and March 2023 with users from a Facebook community. The data were cataloged and analyzed using IRaMuTeQ. Results: The greatest concern among participants was the potential side effects of the HPV vaccine. In addition, cultural values and religious beliefs, as well as the legal obligation to vaccinate, may lead the population to seek ways to avoid immunization. This highlights the need for effective educational strategies to increase HPV vaccine acceptance. Implications: The findings showed that social networks are promising research settings, as they provide information based on users' opinions and interactions. These data can support the development of public policies and communication strategies that encourage vaccination.

#### DESCRIPTORS

Social Network. Forum. Debate. Vaccine. Papillomavirus.

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## INTRODUCTION

Human Papillomavirus (HPV) is recognized as the primary etiological agent of cervical neoplasia, playing a crucial role in public health due to its strong association with cervical cancer. With more than 200 types described in the literature, HPVs are distinguished by their deoxyribonucleic acid (DNA) sequence and their oncogenic potential. Approximately 50 types affect the mucosa of the genital tract, and among these, types 16 and 18 are considered high-risk, being strongly associated with the development of cervical cancer and other anogenital cancers. This correlation underscores the importance of prevention and early detection through vaccination and regular screening, respectively, with the aim of reducing the incidence and mortality associated with these diseases<sup>(1-2)</sup>.

Cervical cancer is the fourth most common malignancy among women worldwide, and its main etiological agent, HPV, affects between 70-80% of the sexually active global population. In Brazil, more than 40% of men and women are infected (approximately 1 in every 10 people), with around 700,000 new cases recorded each year<sup>(3-4)</sup>.

Among the strategies for preventing HPV infection, vaccination is recognized as the most effective and cost-beneficial approach for individuals who have not yet initiated sexual activity<sup>(5-6)</sup>. The quadrivalent vaccine, known as Gardasil, was included in Brazil's National Vaccination Schedule in 2014 for boys and girls starting at 9 years of age. By 2023, approximately 70.5% of girls had received the first dose of the vaccine, but only 43% completed the two-dose schedule. For boys, since the vaccine became available, only 16.5% have been vaccinated<sup>(7-8)</sup>.

Thus, public HPV vaccination campaigns have faced challenges in reaching target coverage levels. Several factors contribute to this issue, including the massive spread of misinformation and anti-vaccine movements on the internet. These elements negatively influence public opinion on vaccination, making it even more difficult to achieve adequate immunization coverage<sup>(9-11)</sup>.

In this context, the role of information is fundamental, as the dissemination of false news online has significantly influenced public opinion. It is crucial to highlight the role of healthcare professionals, especially nurses in Primary Health Care (PHC), who work directly within the community and promote ongoing dialogue for the prevention of vaccine-preventable diseases<sup>(12)</sup>.

Therefore, this study aims to analyze the opinions expressed about HPV vaccination in a virtual community on the Facebook platform. The choice of this environment is based on its wide reach and representativeness, enabling the collection of diverse perspectives and user experiences regarding HPV vaccination. Understanding these opinions can provide insight into concerns about the vaccine and support the development of effective public health strategies to promote vaccination adherence.

## METHODS

This is an observational study conducted through systematic non-participant observation, in which the researcher observed and recorded comments from a public Facebook community without interacting or engaging with the research subjects. In this context, a community refers to a group of individuals brought together based on shared interests. These communities can be either public or private, providing an environment in which members interact, share content, discuss relevant topics, and offer mutual support within the community's defined context<sup>(13)</sup>.

In the community under study, participants interacted in a forum dedicated to discussing the guiding question, "What is your opinion about the HPV vaccine?" This question was proposed following the creation of the community one year after the vaccine's inclusion in the national immunization schedule, with the aim of understanding people's perceptions regarding a vaccination still surrounded by several taboos. It is important to note that the question was posed independently, with no specific instructions for participants' responses and no formal affiliation with research initiatives or public entities.

The forum is part of a public Facebook community that has been active since 2015 and had 8,791 user profiles at the time of data collection. Among these profiles, 241 participants were actively engaged in the forum. This is an open community, in which moderator approval is not required to become a member.

The inclusion criteria for the study were responses and comments related to HPV posted between January 2021 and January 2023. The selection of this period allowed for the capture of a representative sample of discussions and perceptions over two years, encompassing different stages of public awareness and

potential changes in vaccine perception.

As an exclusion criterion, responses deemed thematically irrelevant were manually removed. This procedure ensured that only responses pertinent to the research scope were analyzed.

Responses were initially collected, totaling 370 entries, of which 51 were excluded for not aligning with the research topic, resulting in 319 records. In the discussion forum format used, each profile was allowed to provide multiple responses, with each one identified as “R.” Results were analyzed based on individual responses rather than specific participants.

Data collection occurred between February and March 2023. For analysis, the software *Interface de R pour les Analyses Multidimensionnelles de Textes et de Questionnaires* (IRaMuTeQ) was used. Each response was collected individually according to the study’s criteria. Subsequently, each one was cataloged into a corpus along with the associated variables of month and year of the response in the forum, following the structure: \*resp01 \*year \*month. The resulting text corpus was prepared in a structured .txt file, formatted to be compatible with the software. This formatting ensured transparency and consistency in the textual analysis process.

In IRaMuTeQ, texts are divided into smaller segments to facilitate the identification of keywords and usage patterns. Each participant’s response to the question about the HPV vaccine was treated as an independent segment. Stopwords, punctuation, and special characters were removed, focusing on the most relevant words, and lemmatization was performed to reduce linguistic variations (for example, “vacina” and “vacinas” were reduced to “vacina”).

The frequency of words in the text segments was counted, and the most frequent words were considered more relevant. A co-occurrence matrix was created, in which the rows and columns represented words, and the values indicated the frequency of co-occurrence between them. Algorithms were used to calculate the distance between text segments based on word frequency, forming a Descending Hierarchical Classification (DHC) and the dendrogram. The dendrogram illustrated the groups formed and their connections, with lower branches indicating more similar segments<sup>(14)</sup>.

According to the literature, a utilization index of 75% or more was considered appropriate to ensure that the formed groups were representative of the data, indicating that co-occurring words were effectively grouped. The chi-square cutoff value was set between 0.07 and 0.01. In addition to these criteria, other factors were also considered, such as word distribution and the quality of associations<sup>(14)</sup>.

Based on the groups formed, we analyzed recurring themes and their relationships, using keywords to understand participants’ opinions and arguments. This qualitative analysis allowed for a better understanding of patterns and divergences in opinions about the HPV vaccine. This process resulted in a robust and detailed analysis, highlighting the most significant themes and the relationships between participants’ responses.

Thus, IRaMuTeQ presents several advantages compared to other text analysis methods. The software calculates word frequencies, identifying the most common ones in the corpus, which helps in understanding the most recurring themes and terms in the responses. For example, terms such as “cancer,” “law,” “reaction,” and “reason” appeared frequently, indicating that these are topics of concern and interest for participants. Moreover, IRaMuTeQ performs basic lexicographic analyses, which involve identifying and categorizing words within the corpus context. Terms such as “reaction,” “to know,” “facebook,” and “fear” were categorized to better understand opinions about the vaccine. The software also performs multivariate analyses that organize text segments into hierarchical groups based on word co-occurrence, facilitating the identification of emerging patterns and themes<sup>(14)</sup>.

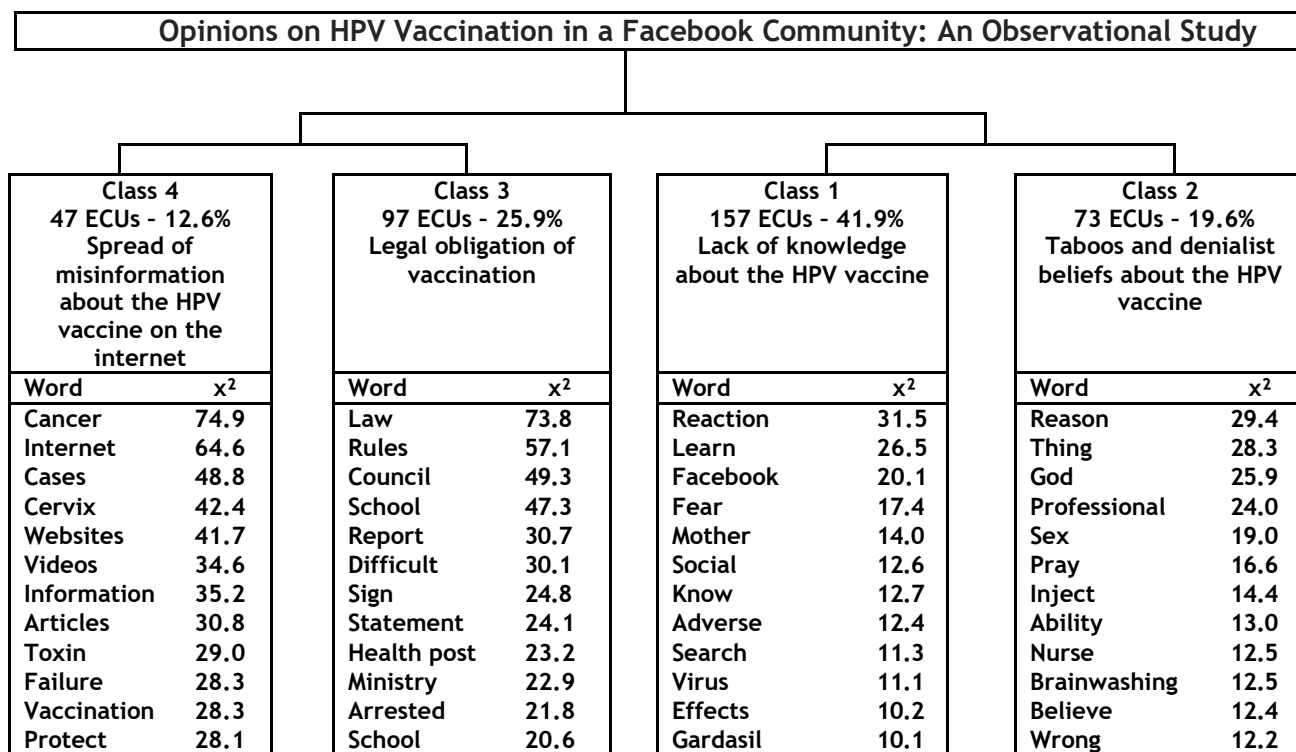
The study followed all ethical principles established by national and international research guidelines. Authorization was obtained from the community administrator for the research, and measures were taken to ensure participants’ anonymity, avoiding any form of direct or indirect identification.

## RESULTS

Lexical analysis using Descending Hierarchical Classification (DHC) resulted in 94 text segments, corresponding to a utilization rate of 81.3%, indicating the adequacy of the data. As shown in Figure 1, Classes 1 and 2, as well as Classes 3 and 4, are directly related. The classes were divided into subsections based on their characteristics.

The textual analysis performed through software revealed significant patterns in Classes 1 and 2, with words related to a lack of knowledge about the HPV vaccine and to taboos and denialist beliefs regarding HPV vaccination. In Classes 3 and 4, significant patterns were associated with the legal obligation to vaccinate and the spread of misinformation about the HPV vaccine on the internet.

**Dendogram** - Thematic structure of content related to the HPV vaccine debate shared in posts from a Facebook community, Rio de Janeiro, Brazil, 2023.



Source: IRaMuTeQ

#### Class 4. Spread of Misinformation about the HPV Vaccine on the Internet

Participants also engaged in discussions based on videos and testimonies available online. These digital resources had a significant influence on participants' opinions and perceptions, despite the lack of clarity regarding the accuracy and quality of the information sources used.

*I watched the first two videos and didn't want to watch any more, my heart was filled with sadness. (R40)*

*I read an article online saying the vaccine is meant to sterilize the population, for birth control. (R87)*

*The body doesn't eliminate the virus naturally? I read that online. (R66)*

*After joining the community, I saw so many videos that I got scared. (R299)*

Within the community, discussions of non-scientific clinical cases found online were common, involving unverified reports and information not supported by scientific evidence. These trends reflect a tendency to rely on unverified sources of information.

*(...) the article said that Gardasil crossed the blood-brain barrier. (R16)*

*We don't want any more Gardasil victims like the one in that article. (R200)*

Thus, parents' refusal to vaccinate may be influenced by the prevalence of fake news in the community, representing a significant factor in low adherence to the vaccination campaign. The spread of incorrect or misleading information may fuel misinformation and heighten doubts about the efficacy and safety of vaccines.

### Class 3. Legal Obligation to Vaccinate

Class 3 addresses legal norms that associate the decision not to vaccinate children with allegations of parental negligence or failure in caregiving. In the community, there were reports indicating resistance to vaccination, showing that some parents vaccinated their children due to legal requirements. Couples who chose not to vaccinate were more aware of legal guidelines and the possible consequences of their decision. In discussions, these participants detailed situations and advised other parents on how to avoid vaccination through medical exemption certificates or physician statements justifying vaccine refusal.

*I had to look for another pediatrician. The one who's been his doctor since birth refused to help with the certificate. (R212)*

*Get a medical certificate from the pediatrician exempting her from taking the vaccine. (R3)*

*I cried a lot, never felt so helpless in my life (...), only got a statement from a doctor saying she couldn't take that damn vaccine. (R50)*

*I took them all to the doctor and asked for a refusal letter, claiming the vaccine poses serious health risks. (R112)*

Reactions of fear were observed among parents related to the possibility of losing custody of their children to the Child Protection Council. These concerns reflect parental insecurity regarding the legal and administrative implications of vaccination.

*Guys, I don't want to vaccinate my baby, but the city hall called and said if I didn't, they would notify the Child Protection Council. (R111)*

*They told me I'd be required to answer to the Child Protection Council. (R210)*

*The counselor told me the only way for my daughter not to take the vaccine would be through the courts (...), I didn't vaccinate, and then the Council got involved. (R170)*

Forum comments indicated that some participants have a negative view of school involvement in vaccination. These perceptions may be related to concerns about privacy violations, the school's authority in health matters, or the effectiveness of vaccination campaigns in the school environment.

*I fought a war with the Health Center and the school. (R77)*

*I cried out of anger, was forced to vaccinate my son. Otherwise, he wouldn't get a spot at school. (R21)  
At my daughter's school, they tried to convince me, and I signed the refusal form. (R73)*

*I went to the Health Center to get the vaccination certificate to enroll my daughter in school—one thing shouldn't have anything to do with the other. (R55)*

It was observed that participants who chose not to vaccinate their children associated this decision with a sense of care and parental protection, considering it an expression of responsibility. This view contrasts with the legal perspective, which often emphasizes the importance of vaccination for public health and disease prevention.

### Class 1. Lack of Knowledge about the HPV Vaccine

This class encompasses the majority of the terms in the textual corpus. Its high concentration (41.98%) reflects the fact that it was the most discussed thematic class in the community, gathering meanings attributed to parental concern about the vaccine's side effects.

*The side effects of this vaccine are serious; it's not worth taking the risk. (R11)*

*You don't know what the vaccine can do to your body's cells. (R54)*

*I didn't vaccinate my son, I'm afraid of the side effects. (R22)*

Some debates were based on texts and articles found online, indicating that group members demonstrated potential for empowerment, showing the ability not only to seek information but also to critically assess the content found and discuss others' autonomy in choosing whether to vaccinate.

*I read online about the HPV vaccine's side effects. We need to get more informed... (R125)*

*The last sentence of the article said, "more research is needed to reach a conclusion about the possible side effects." (R212)*

*I saw it all on a website—it has serious side effects, go check it out too. (R90)*

Participants acknowledged the benefits of the HPV vaccine and its importance in preventing cervical cancer. However, they still expressed doubts. This analysis suggests that although there is a general understanding of the vaccine's benefits, there remains a need to provide more detailed information to address concerns and uncertainties.

*How does this vaccine work? I know it's important to keep vaccinations up to date. (R134)*

*I know it's important to vaccinate, but I think we should read the package insert and the official sanitary document first. (R228)*

*I'm not against vaccines, but I didn't let my daughter take Gardasil because of the side effects. (R14)  
Should I vaccinate my daughter? I don't want her to get cancer. (R119)*

*I'm worried, I vaccinated her to protect her from cancer, but my daughter fainted out of nowhere. Was it because of the vaccine? (R23)*

These testimonials reflect parents' concerns when deciding whether to consent to vaccination due to possible side effects, highlighting the need for greater efforts to help them understand the vaccine's risks.

## **Class 2. Taboos and Denialist Beliefs Regarding the HPV Vaccine**

This category discussed themes related to cultural perceptions, beliefs, and values about sexual behavior and the role of healthcare professionals. Cultural values had a strong influence, encouraging some parents not to consent to their children's vaccination and creating obstacles to the work of healthcare professionals in promoting and preventing this disease.

*They say it's prevention, but that's not in the Bible. (R31)*

*They're saying our kids are having sex. (R120)*

*We weren't made to manage injected substances. (R213)*

*Let's pray for our country and for the mothers and fathers who suffered from the horror of this vaccine. (R33)*



Also discussed was the ability of healthcare professionals to provide information that influences vaccine acceptance, emphasizing the importance of their role, especially nursing staff, who play a key role in administering vaccines, clarifying doubts, and offering clear, evidence-based information to increase public confidence and vaccine acceptance.

*These health workers have been brainwashed. (R88)*

*And when we go to the Health Center, the nurses practically call us stupid. (R96)*

*A nurse told me she couldn't force me because they only study the benefits of the vaccine. (R236)*

*The nurse didn't want to explain anything to me. (R9)*

## DISCUSSION

The findings provide insight into understanding vaccination barriers in the country, highlighting how health-related content—when associated with individual and social positions within a social network community—can influence opinion formation even in the absence of scientific evidence. This demonstrates that the more intense the discussion on the topic, the greater its influence, guiding individuals either positively or negatively<sup>(13)</sup>.

It was observed in the forum of the studied community, and corroborated by other studies, that false information, once disseminated, tends to negatively influence the population. This type of information can adversely affect vaccination campaigns, increasing the risk of disease transmission. In the case of the HPV vaccine, it contributes to the rise in cervical cancer cases<sup>(13,15)</sup>.

Fake news represents a significant contemporary issue from social, political, and ideological standpoints—and especially for public health. The internet has become fertile ground for anti-vaccine discourse, which is often based on alleged correlations between vaccines and adverse effects. According to the literature, discussions about the adverse effects of the HPV vaccine have increased globally, dividing public opinion. While developed countries have advanced in these debates, developing countries such as Brazil face a growing incidence of new cervical cancer cases and a decline in vaccination adherence<sup>(11,15)</sup>.

A study conducted in South America revealed that only 55% of mothers reported having heard about the HPV vaccine. Among them, 27% indicated that they had initiated HPV vaccination for their children, and of those, only 14% confirmed having completed the required dose series. The study highlighted the mothers' lack of knowledge about HPV infection and the importance of vaccination<sup>(15,16)</sup>.

Another study demonstrated that during the COVID-19 pandemic, the anti-vaccine movement gained even more visibility. To this day, in the post-pandemic period, obstacles, doubts, and lack of awareness regarding vaccination persist, generating insecurity and hindering the effectiveness of policies from the National Immunization Program<sup>(17)</sup>.

A separate study sought to assess the influence of media coverage of adverse events related to the Gardasil vaccine in New Zealand. It was observed that news about the vaccine's side effects led to a significant increase in Google searches on the topic during the same month and served as negative predictors for reduced vaccination coverage<sup>(18)</sup>.

Another factor that influenced the forum responses and, consequently, vaccination decisions, was the knowledge and beliefs of parents, which must be carefully assessed in the context of vaccine refusal. A study on HPV vaccination examined this influence, demonstrating that parental perceptions and understandings play a significant role in the decision to vaccinate their children. Concerns about safety, lack of information, and cultural influences were identified as contributing factors to vaccine refusal<sup>(19,20)</sup>.

Regarding the legal aspects of vaccine refusal, Law No. 6,259 of 1975, regulated by Decree No. 78,231 of August 12, 1976, establishes mandatory vaccination in Brazil. The decree stipulates that it is every citizen's duty to undergo mandatory vaccination, as well as to ensure vaccination for minors under their custody or responsibility<sup>(21)</sup>. The requirement aims to protect children, but it should not be applied absolutely; flexibility is necessary in cases where vaccination may pose risks. This context involves a conflict between individual freedom and public health, requiring an appropriate balance between collective health protection and respect for individual liberties<sup>(22)</sup>.

Another study demonstrated that mandatory child vaccination is one of the last-resort measures adopted by health professionals. Nevertheless, this approach is considered one of the strictest and most effective strategies for promoting child immunization<sup>(23)</sup>.

This study makes a unique contribution by highlighting the impact of social networks on opinion formation regarding HPV vaccination—an aspect not always captured by traditional research methods. By exploring how online discussions influence individual attitudes and correlating the impact of negative content with decreased vaccination adherence, the study offers valuable data for informing public policies aimed at mitigating these effects and improving vaccination coverage.

Thus, these results have the potential to support health policies and communication strategies. It is essential to adopt an approach that combats misinformation. This includes developing communication campaigns tailored to different audiences and accessible through various media channels. Culturally and religiously sensitive approaches are crucial for building trust and increasing vaccine acceptance. Furthermore, it is vital to strengthen the training and confidence of healthcare professionals, enabling them to provide clear and reliable information to parents and caregivers<sup>(24)</sup>.

## LIMITATIONS

This study presents limitations related to internet access and sample representativeness. Individuals with limited internet access were unable to participate in the studied social network, which excluded the collection of opinions from this segment of the population—potentially characterized by lower income and lower educational level—and who might require more information about vaccination. Additionally, the results are restricted to a specific community within that social network, which prevents generalization of the findings to a broader audience, thereby reducing the applicability of the results to more diverse and varied contexts.

## CONTRIBUTIONS TO PUBLIC HEALTH

It is suggested that future research investigate the dynamics of social exclusion related to internet access, exploring how different levels of access may influence opinions and attitudes toward HPV vaccination. Moreover, it is important to expand the sampling beyond specific communities on social networks to achieve broader population representation.

This study is innovative in using a social network as a research setting to investigate perceptions about HPV vaccination within the national context. The results contribute with information that may support the implementation of strategies within the Unified Health System (SUS), with the potential to aid the development of policies related to human papillomavirus vaccination.

## CONCLUSION

This study contributes to the understanding of barriers to HPV vaccination by identifying the main concerns and influences leading to vaccine hesitancy. The research revealed concern among participants regarding the potential side effects of the HPV vaccine. Cultural values and religious beliefs also exerted strong influence, resulting in resistance to vaccination based on cultural perceptions and mistrust toward healthcare professionals. Furthermore, the legal obligation to vaccinate led some participants to seek ways to avoid immunization, out of fear of legal consequences such as intervention by the Child Protection Council. These findings highlight the need for effective educational strategies that address both scientific and cultural aspects to increase acceptance of the HPV vaccine.

It is recommended that healthcare professionals invest in educational and awareness campaigns, both in physical and digital environments, using interactive and informative content based on scientific evidence. Health programs should be culturally sensitive and promote respectful dialogue with the community. In addition, social networks—with their wide circulation of discourse, opinions, and dissemination of information—should be more thoroughly explored in health research.

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## ORIGIN OF THE ARTICLE

Original article.

## AUTHOR CONTRIBUTIONS

Araújo ETH participated in the conception and design of the study, literature review, writing of the manuscript and assisted in data analysis. Miranda JS, Miranda PIG and Rocha JS performed analysis and interpretation of statistical data and review of content. Ferreira LL and Peres MAA contributed to the intellectual critical review of the

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content. All authors reviewed and approved the final version to be published and declare themselves responsible for all aspects of the work, ensuring accuracy and integrity.

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#### **APPROVAL BY THE RESEARCH ETHICS COMMITTEE**

The research project was approved by the Research Ethics Committee, according to nº 4.647.282 and CAAE 43914721.0.0000.5238.

#### **CONFLICT OF INTEREST**

The authors declare no conflict of interest.