

UNIVERSIDADE DE SÃO PAULO
FACULDADE DE ODONTOLOGIA DE BAURU

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**Fake news in pediatric dentistry: a quantitative and qualitative
study of information available on Instagram**

**Fake news em odontopediatria: estudo quanti-qualitativo das
informações disponibilizadas no Instagram**

BAURU

2023

ANNA PAOLA STRIEDER

Fake news in pediatric dentistry: a quantitative and qualitative study of information available on Instagram

Fake news em odontopediatria: estudo quanti-qualitativo das informações disponibilizadas no Instagram

Tese constituída por artigo apresentada à Faculdade de Odontologia de Bauru da Universidade de São Paulo para obtenção do título de Doutor em Ciências no Programa de Ciências Odontológicas Aplicadas, na área de concentração Odontopediatria.

Orientador: Prof. Dr. Thiago Cruvinel da Silva

BAURU

2023

Strieder, Anna Paola

Fake news in pediatric dentistry: a quantitative and qualitative study of information available on Instagram / Anna Paola Strieder. -- Bauru, 2023.

74 p. : il. ; 31 cm.

Tese (Doutorado) -- Faculdade de Odontologia de Bauru, Universidade de São Paulo, 2023.

Orientador: Prof. Dr. Thiago Cruvinel da Silva

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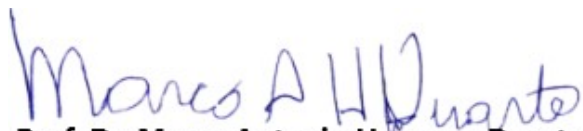
Tese apresentada e defendida por
ANNA PAOLA STRIEDER
e aprovada pela Comissão Julgadora
em 05 de outubro de 2023.

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DEDICATÓRIA

Aos meus queridos pais Darcio e Cleunice, pelo amor e dedicação que sempre estiveram presentes durante a minha vida, por nunca medirem esforços para que eu alcançasse a minha formação acadêmica, além do apoio e incentivo constantes na busca dos meus sonhos.

AGRADECIMENTOS

Ao meu orientador *Prof. Dr. Thiago Cruvinel da Silva*, minhas palavras nunca conseguirão expressar a gratidão que sinto. Agradeço pela sua generosidade e presença, por oferecer uma oportunidade de trabalhar e deixar-me aprender com você.

À minha *família*, meus pais *Cleunice e Dárcio*, e meu irmão Marcos pela compreensão e incentivo. A saudade dói todos os dias, mas me fortalece saber que todo o aprendizado será para benefício de todos nós. Amo vocês.

Ao meu noivo *Carlos*, por todo o amor dedicado e por toda a paciência que me proporciona com tanto carinho. Felizmente eu nunca estive sozinha em minhas tarefas e sempre pude contar com seu auxílio e incentivo, eu jamais teria conseguido sem você.

À *Faculdade de Odontologia de Bauru - FOB/USP* e à *comissão de pós-graduação desta instituição*.

Aos professores da Disciplina de Odontopediatria, *Professora Dr.ª Maria Aparecida de Andrade Moreira Machado, Professora Dr.ª Daniela Rios, Professora Dr.ª Thaís Marchini de Oliveira, Professor Dr. Natalino Lourenço Neto*, pelo conhecimento, experiências e confiança transmitidos.

Ao *Conselho Nacional de Desenvolvimento e Pesquisa (CNPq)* – processo [141898/2019-4] e a Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) pela concessão da minha bolsa de Doutorado, importante para meu aprimoramento profissional e pessoal.

Agradecimento especial para as minhas queridas amigas *Estefania Ayala e Daniela Cusicanqui*. Obrigada por todos os ensinamentos, apoio, carinho e companheirismo nos momentos mais difíceis.

“Não deixe que seus medos tomem o lugar dos seus sonhos”.

Walt Disney

RESUMO

Informações falsas ou incorretas encontradas nas mídias sociais, como o uso do colar de âmbar para a prevenção dos supostos sintomas da irrupção dentária, possuem o potencial de influenciar negativamente os comportamentos em saúde dos indivíduos. Neste contexto, o objetivo do estudo foi analisar a percepção e experiência dos usuários do Instagram relacionadas às informações sobre o uso do colar de âmbar na prevenção dos sintomas da irrupção dentária. Este estudo foi dividido em duas fases, objetivando (1) avaliar a interação de usuários do Instagram com postagens relacionadas ao colar de âmbar em português do Brasil e, posteriormente, (2) avaliar os comentários das postagens que apresentaram o maior nível de engajamento. Na primeira fase, as postagens foram coletadas usando estratégias de busca específicas na plataforma CrowdTangle, e posteriormente, categorizadas de acordo com sua facticidade (informação ou desinformação), tipo de mídia (álbum/foto ou vídeo/IGTV), sentimento (positivo ou neutro/negativo), profissão do autor (dentista/não dentista) e tipo de perfil (comercial ou pessoal). A maioria das postagens foi comercial, criada por não dentistas e publicada como álbum/foto, expressando um sentimento positivo e contendo desinformação. Enquanto o perfil pessoal e a presença de vídeos foram fatores preditivos para maior interação total, o perfil pessoal também foi fator preditivo para um melhor desempenho de propagação de uma postagem. Na segunda fase, foram avaliados 509 comentários de postagens sobre o colar de âmbar no Instagram com maior engajamento. As postagens foram acessadas e o conteúdo dos comentários foi organizado em nós e subnós. Os resultados foram organizados em mapas conceituais, gráficos hierárquicos, análises de agrupamentos, nuvens de palavras e árvores de decisão por meio do software Nvivo. Os temas mais frequentes encontrados nos comentários avaliados, classificados em ordem decrescente foram: i) recomendação de uso, ii) conhecimento, iii) aquisição, iv) depoimentos de eficácia do uso do colar de âmbar. Publicações relacionadas ao colar de âmbar receberam altos níveis de engajamento, evidenciando um interesse significativo no produto por parte dos usuários do Instagram. No entanto, esse interesse pode estar diretamente ligado ao suposto benefício do uso do produto: o alívio dos sintomas relacionados a irrupção dentária. Estes achados podem evidenciar uma abordagem incompleta por odontopediatras no manejo de bebês e na orientação de seus pais e cuidadores durante as consultas odontológicas, destacando a relevância deste estudo para a compreensão das necessidades dos pacientes.

Palavras-chave: dentes decíduos; erupção dentária; comportamento; eHealth.

ABSTRACT

Fake news in pediatric dentistry: a quantitative and qualitative study of information available on Instagram

False or incorrect information found on social media, such as the use of the amber necklace for the prevention of the supposed symptoms of dental eruption, has the potential to negatively influence individuals' health behaviors. Within this context, the aim of the study was to analyze the perception and experience of Instagram users related to information about the use of the amber necklace in the prevention of dental eruption symptoms. This study was divided into two phases, aiming (1) to evaluate the interaction of Instagram users with posts related to the amber necklace in Brazilian Portuguese and, subsequently, (2) to assess the comments of posts that presented the highest engagement. In the first phase, posts were collected using specific search strategies on the CrowdTangle platform, and subsequently categorized according to their facticity (information or disinformation), media type (album/photo or video/IGTV), sentiment (positive or neutral/negative), author's profession (dentist/non-dentist) and profile type (commercial or personal). Most posts were commercial ones, created by non-dentists and published as an album/photo, expressing a positive sentiment and containing misinformation. While personal profiles and the presence of videos were predictive factors for higher total interaction, personal profile was also predictive for better propagation performance of a post. In the second phase, 509 comments of amber necklace-related posts on Instagram with the highest engagement were evaluated. The posts were accessed and the content of the comments was organized into nodes and subnodes. The results were organized in conceptual maps, hierarchical graphs, cluster analysis, word clouds, and word trees using Nvivo software. The most frequent themes found in the evaluated comments, classified in descending order, were: i) recommendation of use, ii) knowledge, iii) acquisition, iv) testimonials of efficacy of the use of the amber necklace. Posts related to the amber necklace received high levels of engagement, evidencing a significant interest in the product by Instagram users. However, this interest may be directly linked to the supposed benefit of using the product: the relief of symptoms related to tooth eruption. These findings may highlight an incomplete approach by pediatric dentists in the treatment of infants and in the guidance of their parents and caregivers during dental appointments, highlighting the relevance of this study for the understanding of patients' needs.

Keywords: primary teeth; tooth eruption; behavior; eHealth.

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1 INTRODUCTION

1 INTRODUCTION

Every individual holds unique beliefs and practices concerning well-being and illness, deeply rooted in their cultural heritage and transmitted through generations, significantly influencing their way of life. Notably, popular knowledge plays a significant role in shaping personal lifestyles (1), often influenced by information obtained from mass media sources, even if lacking concrete evidence (2). Unfortunately, individuals tend to accept such information uncritically, perpetuating its spread and enhancing its persuasiveness, leading to potential harm (3, 4).

The internet has become a powerful tool for connecting like-minded individuals who share similar interests and beliefs (5). The widespread availability of smartphones and easy access to the virtual environment have facilitated access to vast amounts of health-related information (6). In the United States, for instance, 72% of young adults rely on the internet as a reliable source for health topics, with 59% seeking information about specific health conditions affecting themselves or their close ones (7). Similarly, in Brazil, 60% of Google users have admitted to seeking medical treatment-related content, and 28% reported searching for specific diagnoses (8).

Social media platforms have also emerged as a popular medium for discussions and expressions of concerns related to health conditions. However, this prevalence of social networks has also led to the spread of inappropriate and inaccurate information on the internet (9), including the circulation of fake news aimed at generating advertising revenue (10, 11). For example, our research group recently conducted a study revealing a global surge in Google users' interest in using amber necklaces to prevent tooth eruption-related signs and symptoms (12). Such misinformation finds a receptive audience on social media platforms like Instagram and can negatively impact the decision-making process of the general public (13).

Instagram, a free application founded by Brazilian Michel Krieger in 2010, allows users to share publicly available photographs and short videos, making it a valuable resource for monitoring health-related information (14-16). Users can follow notable figures, celebrities, businesses, and more, engaging through likes, mentions, and hashtags. Leveraging big data analysis of user activity on this platform can provide insights into the oral health needs of different demographics, aiding in the planning and implementation of targeted health

interventions and referrals to specialized oral health treatment systems. Behavioral medicine/dentistry, an interdisciplinary field combining knowledge from human and health sciences, plays a crucial role in understanding health and disease processes within diverse communities (17, 18). Our research group conducted a systematic review highlighting the direct link between negative health beliefs and increased fear and anxiety related to dental treatment (19).

Recognizing the importance of leveraging technology to understand and address oral health disparities among various populations, the American Academy of Pediatric Dentistry emphasizes research in this area (AAPD, 2017). Despite this, there is a notable lack of studies characterizing pediatric dentistry beliefs shared on social media and the subsequent impact of such posts on user opinions and behaviors. Thus, developing a specialized instrument to identify fake news about children's oral health on social media platforms becomes paramount. This would aid parents and guardians in navigating electronic health information, facilitating informed decision-making based on scientific evidence, and promoting social awareness within the context of child- and family-centered care.

2 ARTICLES

2 ARTICLES

This dissertation is presented in a format of two manuscripts, written according to the instructions and guidelines of the *European Journal of Paediatric Dentistry (EJPD)* and *International Journal of Paediatric Dentistry (IJPD)*, respectively.

- ARTICLE 1 - A digital study on predictive factors for Instagram users' engagement with amber necklace-related posts
- ARTICLE 2 - Glimpsing Amber's Power: Instagram Users' Teething Insights - A Qualitative Study

2.1 ARTICLE 1

A digital study on predictive factors for Instagram users' engagement with amber necklace-related posts*

Abstract

Aim: This study aimed to assess the engagement of Instagram users with Brazilian Portuguese posts related to amber necklaces for teething prevention, identifying predictive factors that can increase users' engagement with information and misinformation.

Methods: This digital study analyzed Brazilian Portuguese amber necklace-related posts on Instagram. The posts were collected using specific search strategies on CrowdTangle™. Subsequently, two independent investigators were trained and calibrated to categorize the posts concerning the proposed outcomes. The posts were categorized according to their facticity (information or misinformation), type of media (album/photo or video/Instagram TV), sentiment (positive, neutral, or negative), author's occupation (dentist or non-dentist), and type of profile (commercial or personal). Additionally, investigators compiled information about the time of publication (days) and interaction metrics (total interaction and overperforming score). The statistical analysis assessed the inter-examiner reliability, group comparisons, and the factors associated with interaction and misinformation. *P* values <0.05 were considered significant.

Results: The posts were primarily commercial, created by non-dentists, and published as albums/photos expressing a positive sentiment and containing misinformation. While a personal profile was a predictive factor for higher total interaction and overperforming scores, the identification of videos only predicted higher total interaction.

* The article presented in this Thesis was written according to the **European Journal of Paediatric Dentistry (EJPD)** instructions and guidelines for article submission.

Conclusion: Videos and personal profiles were predictive factors for higher user engagement with amber necklace posts on teething prevention on Instagram, even with the warnings of health organizations and the lack of scientific evidence to confirm its efficacy.

Keywords: eHealth, Misinformation, Primary dentition, Tooth eruption

Introduction

Personal lifestyle is profoundly influenced by popular knowledge [Putland et al., 2011], which is often based on opinions and publications found in the mass media [Ford and Kaphingst, 2009]. In this sense, social media has revolutionized the way people interact with each other, serving as a platform to read, watch, listen, and understand other people's health experiences. It acts as a bridge between groups and individuals who face real-life interaction difficulties and lack face-to-face support [Singleton et al., 2016]. Previous studies have indicated that online information can contribute to the individual's awareness of oral health [Albert et al., 2014], improve prognosis and treatment adherence, and facilitate professional-patient communication [Rathert et al., 2017].

On the other hand, social media also contributes to spreading fake news - false or misleading information intentionally presented as credible information [Apuke and Omar, 2021], often to generate more revenue through advertising [Chen et al., 2015]. In this context, Baltic amber has gained popularity as a "traditional healing resource" capable of alleviating the discomfort of teething in babies due to hypothetical succinic acid's analgesic and anti-inflammatory properties [Nissen et al., 2019]. A recent study demonstrated a global increase in Google users' interest in using amber necklaces, indicating that people are likely to believe in the effects of jewelry or talismans on physical and biological aspects [Strieder et al., 2019]. However, even if such information is not necessarily committed to facts and evidence, individuals usually accept them as truth, tending to replicate their contents, which contributes to the increase of the propagation of information and its persuasiveness [Arndt and Jones, 2018]. Hence, such inappropriate information finds fertile ground for widespread dissemination on social media, affecting negatively the decision-making process of the general public [Ellison and Boyd 2013].

Monitoring health behaviors through technology is crucial for understanding and reducing oral health disparities among different populations, making investigations in this area of

fundamental importance [American Academy of Pediatric Dentistry 2022]. Nevertheless, there is a lack of digital studies evaluating the popularity of posts about the use of amber necklaces by babies on social media platforms such as Instagram. This social media platform allows users to publicly upload and share photos and short videos. Users can also follow feeds of known individuals, celebrities, and businesses and engage with their posts by liking, commenting, and adding hashtags (a word or expression preceded by the hash sign #). Brazil has a staggering number of Instagram users, ranking third globally with around 113.5 million users [Kemp, 2022].

Therefore, this study aimed to assess the engagement of Instagram users with Brazilian Portuguese posts related to amber necklaces for teething prevention, identifying predictive factors that can increase users' engagement with both information and misinformation.

Methods

Study design and ethics

This digital ethnographic study analyzed Brazilian Portuguese amber necklace-related posts on Instagram. Posts were collected using specific search strategies on CrowdTangle™, a tool from Meta Platforms, Inc. to analyze and report information on social media (version 2023, Menlo Park, USA). Two independent investigators (***blinded to peer review***) were trained and calibrated to categorize the posts according to their facticity (information or misinformation), type of media (album/photo or video/Instagram TV), sentiment (positive, neutral, or negative), author's occupation (dentist/non-dentist), and type of profile (commercial or personal). In addition, investigators compiled information about the time of publication (days) and interaction metrics (total interaction and overperforming score). The statistical analysis assessed the inter-examiner reliability, group comparisons, and the factors associated with interaction and misinformation.

This study did not require institutional review board approval from the Council of Ethics in Human Research of ***blinded to peer review*** because federal regulations do not apply to research using publicly available data that does not involve human subjects.

Search strategy

To gather the information for this research, we utilized CrowdTangle™ which is a web scraping tool owned by Meta Inc. that allows for the examination of several social media metrics, including posts, data, profile information, and performance scores associated with particular keywords in distinct periods and languages, permitting the ranking of posts by specific interaction metrics [Gomaa et al., 2022]. CrowdTangle™ access is restricted to authorized entities, such as qualified organizations such as universities and researchers. Our research team was given permission to access this platform solely for the investigation of misinformation in Dentistry.

This study selected only posts on Instagram produced in Brazilian Portuguese by authors located in Brazil. They were retrieved using a search strategy developed by the combination of 10 terms, as follows: "colar de âmbar" OR "colar de ambar" OR "âmbar báltico" OR “colar de dentição” OR #ambarbaltico OR #colardeambarbaltico OR #colardeambar AND (dentição OR dente OR dentes). The keywords were determined through exploratory analysis of terms and hashtags to ensure the maximum recovery of data on Instagram.

Data collection

In order to include the most popular posts, they were ranked based on their total interaction. On September 28, 2021, raw data of interaction metrics and content of posts were retrieved from CrowdTangle™ and converted to .csv format. Before the qualitative analysis, a manual qualitative assessment of the raw dataset was conducted by a researcher (***blinded to peer review***) who preprocessed data concerning the exclusion of duplicates, reposts, and non-amber necklace-related posts. These posts were then anonymized by blacking out names, profiles, and

people's eyes in images, and were numbered and saved in sequence in Google Slides (Google, Mountain View, CA, USA), which was later converted to a .pdf file. This systematic process allowed for the ethical analysis of messages by different investigators at different times, ensuring standardization and preventing inconsistencies.

Qualitative data analysis

After training with the presentation of protocols and the discussion of the representative features of the posts, two investigators (***blinded to peer review***) confirmed their calibration by the intraclass correlation coefficient (ICC) for absolute agreement, considering the analysis of 20% of the sample of posts. The cases of divergence of opinion were posteriorly decided by reviewers' consensus. Then, the two trained and calibrated investigators determined, independently, the facticity (information or misinformation), type of media (album/photo or video/Instagram TV), sentiment (positive, neutral, or negative), author's occupation (dentist/non-dentist), and type of profile (commercial or personal).

Due to the difficulties in recognizing the subjacent aims of Instagram users, we considered misinformation an umbrella concept that embraces false, incorrect, or misleading information published with or without the intention to deceive or cause harm [Wang et al., 2019]. The independent investigators analyzed all content regarding the lack of scientific evidence to indicate that using an amber necklace is considered a superstitious health belief. In this sense, posts that contra-indicated the use of the amulet by presenting explicit counter-arguments against its possible benefits were categorized as information. Conversely, posts that indicated potential benefits related to its use were classified as misinformation.

The posts were manually categorized based on their sentiment, with positive, neutral, or negative categories. Overall, posts that reported promising results or recommended using the amber necklace were classified as positive, while posts expressing doubts or curiosity were considered neutral. On the other hand, negative posts contained warnings about the potential

dangers of using the accessory on babies or mentioned the lack of scientific evidence supporting its supposed benefits.

Time of publication and interaction metrics

The time of publication (days) that a post was made available on the Web was calculated based on its publication date until September 28, 2021 (date of collection). Total interaction is the sum of all reactions, shares, and comments received by post. Additionally, the overperforming score measures the diffusion performance of a post relative to the interaction of the last 100 posts on the same account at the same time. The algorithm excludes the top and bottom 25% of posts and calculates the average number of interactions for the remaining middle 50% of posts during different time intervals, such as 15 minutes old, 60 minutes old, and 5 hours old, etc. When the account uploaded a new post, the platform compares its metrics with the calculated average and applied the corresponding weights from each dashboard to the obtained difference.

Variables

For statistical analysis, total interaction and overperforming scores were normalized by the time of publication of posts (days). Then, categorical variables were dichotomized as follows: total interaction (< 0.36 or ≥ 0.36), overperforming score (< 1.36 or ≥ 1.36), facticity (information or misinformation), type of media (album/photo or video/Instagram TV), sentiment (positive or neutral/negative), author's occupation (dentist or non-dentist), and types of profiles (commercial or personal). The continuous variables were dichotomized according to their median values. Since previous studies have suggested a correlation between positive emotions and increased engagement rates among social media users [Klassen et al., 2018], the positive sentiment was considered as a separate category in our analysis.

Statistical analysis

Data were analyzed with the Statistical Package for Social Science (version 25.0; SPSS, Chicago, USA), as follows:

1. The ICC was applied to assess the absolute inter-examiner agreement for the analysis of human-based sentiment and identification of misinformation;
2. Mann-Whitney U test was applied for the comparison of variable groups about interaction metrics, regarding the non-normal distribution of data previously detected by the Kolmogorov-Smirnov test;
3. Chi-square test was performed to evaluate differences in the distribution of dichotomized total interaction, overperforming score, facticity, type of media, human-based sentiment, and author's occupation about the type of profile;
4. Multiple binary logistic regression models were conducted to determine the association of dichotomized variables with total interaction and overperforming scores, regarding confounding factors. Only factors with Wald statistics with $P < 0.20$ in prior simple analyses were included in the models.

For all analyses, P values < 0.05 were considered significant.

Results

Overall, 773 posts were collected using the search strategy. After removing duplicates and reposts, 424 posts were considered for the analysis. In general, the posts were predominantly commercial (247, 58.3%), created by non-dentists (416, 98.1%), and published as album/photo (414, 97.6%), expressing a positive sentiment (339, 80.0%), and containing misinformation (338, 79.9%).

Table 1 presents the comparison of central tendency measures of dichotomized variable groups regarding total interaction and overperforming scores (per number of days from publication). A significantly higher total interaction was noted with posts on video/Instagram TV ($P = 0.015$) and posts shared by dentists ($P = 0.009$). In addition, significantly higher overperforming scores were observed in posts on album/photo ($P = 0.003$) and from personal profiles ($P < 0.001$).

Table 2 summarizes the distribution of total interaction, overperforming score, facticity, type of media, human-based sentiment, and author's occupation. Posts from personal profiles were more frequently related to higher total interaction ($P < 0.001$) and overperforming scores ($P = 0.047$). Also, posts from commercial profiles were more frequently published by non-dentists ($P < 0.001$) and related to misinformation and positive sentiment.

Table 3 displays the multiple logistic regression models for total interaction and overperforming scores. Total interaction was positively associated with the personal profile (odds ratio [OR] = 19.78; $P < 0.001$) and posts created as video/Instagram TV (OR = 14.20; $P = 0.017$). Also, the overperforming score was positively associated with the personal profile (OR = 1.48; $P < 0.047$).

Discussion

To the best of our knowledge, this is the first evidence of the interaction of Instagram users with Brazilian Portuguese amber necklace-related posts to prevent teething. Most posts were commercial, created by non-dentists, and published as album/photo, expressing a positive sentiment and containing misinformation. While the personal profile was a predictive factor for higher total interaction and overperforming score, the identification of videos was a predictive factor only for higher total interaction. Additionally, higher overperforming scores were observed among posts on album/photo. Besides that, posts from commercial profiles were more frequently created by non-dentists and related to misinformation and positive sentiment. This result can be explained by the fact that commercial profiles tend to publish merchandise posts, inducing the consumption of the amulet by positive sentiment, avoiding the mention of the risks involved with its use. In this sense, it was observed that total interaction was positively associated with personal profiles and posts created as video/Instagram TV. Also, the overperforming score was positively associated with the personal profile.

Commercial profiles and individuals without dental expertise shared most posts analyzed in this study. This highlights the impact that digital influencers can have on people's perceptions of health products [Pechmann and Catlin, 2016]. Companies often leverage social media to advertise their products through personal profiles [Zarei et al., 2020]. In recent years, social media has become a hub for communication, decision-making, and shopping, which makes it easier for users to connect with influencers who share similar interests and ideas [Ecker et al., 2022]. This phenomenon has given rise to influencer marketing, a strategy that involves collaboration between companies and social media influencers who hold sway over potential customers [Haenlein et al., 2020]. Digital influencers provide personal opinions and information that can make their followers feel more connected to them and the products they promote [Ki et al., 2020].

Despite scientific evidence that suggests no release of succinic acid from amber beads on human skin [Nissen et al., 2019], some people and influencers on the Instagram claim to have positive experiences using the amber necklace and insist that it works. However, studies have not yet provided evidence for the anti-inflammatory properties of succinic acid [Nissen et al., 2019].

The publications created via video/Instagram TV received a higher number of interactions, which is likely due to the fast acquisition of new content since videos can provide a large amount of information in a short period. Additionally, videos engage multiple senses, including sight and sound, which makes learning more effective and increases information retention [Mayer, 2022]. In contrast, photos with captions or simple text articles require reading and, thus, more time and concentration. Videos can be watched anywhere without requiring the viewer's full attention to the screen, allowing for the transmission of information with less effort. Image-sharing platforms such as Instagram are being widely used to exchange health information. The identification of characteristics of amber necklace-related misinformation on social media has the potential to inform targeted interventions and help the increment of correct

information. These findings suggest the need for professionals to discuss health information online with patients and highlight an opportunity to disseminate safe alternatives for managing teething.

In a comprehensive analysis, most of the posts analyzed in this study contain misinformation, which can harm people consuming this content or even influence their health decision-making process [Basch and MacLean, 2019; Kim, 2022]. However, the findings also demonstrated that posts created by dentists received a higher total interaction score, indicating a positive influence of those professionals on the audience. Hence, dental professionals could use social media platforms to offer health education to the public and create posts highlighting the risks and ineffectiveness of amber necklaces. Science communication through social media is currently being neglected, but it could be a high-return, low-risk outreach tool that healthcare professionals can utilize to raise awareness gradually, without attacking patients' existing beliefs.

More than 40% of contemporary patients report that social media affects their health decisions [Agarwala et al., 2019]. Information and scientific literacy are associated with lower vulnerability to misinformation but have a lower probability of being shared by the general public [Keselman et al., 2021]. A recent study showed that people who were reported to be the most likely to share misinformation are those who believed the shared content to be correct [Buchanan, 2020].

The amber necklace is marketed as a quick solution to a temporary problem, promising to alleviate the symptoms associated with tooth eruption that usually subside on their own within a few days [Nemezio et al., 2017]. Nevertheless, this creates an illusion of causality where parents attribute the improvement of symptoms to the succinic acid present in Baltic amber [Torres et al., 2020]. It is important to note that using this accessory carries risks, such as choking and strangulation, as previously reported in children [Soudek and McLaughlin, 2018].

Currently, there are virtually no limits to obtaining medical information; however, healthcare professionals may not be using communication channels to their full potential in providing crucial information to patients. Therefore, it is the responsibility of the scientific community to ensure that high-quality information is disseminated and made accessible to the public. Pediatric dentists have a particular role to play in educating and empowering families and children to access evidence-based materials and address misconceptions. Professionals can contribute to the dissemination of high-quality information by publishing evidence-based materials that are easily understandable and accessible to the general public. Efforts should be made to improve search engine and social media experiences.

This study has some limitations that must be considered when interpreting the results. For instance, the identities and demographic characteristics of Instagram users were undefined, and it is impossible to confirm whether all interactions with posts were made by parents, caregivers, or relatives directly interested in preventing teething in their babies or children.

Conclusion

Despite health organizations' warnings and the lack of scientific evidence to support its effectiveness, amber necklace-related Instagram posts for teething prevention are popular in Brazil. This suggests that parents are concerned about their children's discomfort during tooth eruption and are interested in alternative and natural remedies for its symptoms. However, the abundance of information on social media raises many questions among the population. Dentists should inform people about the potential dangers of using this accessory and promote safer alternatives for managing teething, which typically resolves on its own without the need for treatment.

Acknowledgments

None to declare.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

This work was supported by *blinded to peer review*.

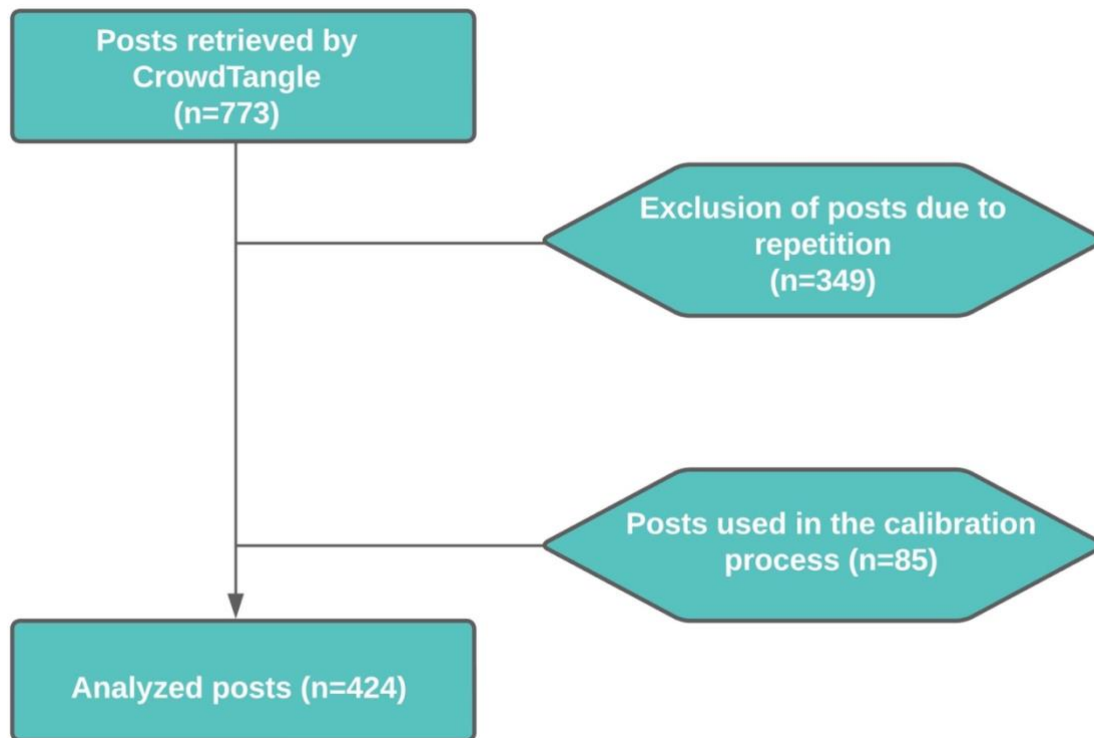


Figure 1. Flowchart on the selection of posts for analysis

Table 1. Comparison of the mean (\pm SD) and medians (IQR) of total interaction and overperforming score (per number of days from publication) regarding dichotomized variable groups (Mann-Whitney U test, $P < 0.05$)

	Total interaction		P	Overperforming score		P
	Mean (\pm SD)	Median (IQR)		Mean (\pm SD)	Median (IQR)	
Facticity			0.090			0.105
<i>Information</i>	3.00 (\pm 9.73)	0.71 (1.81)		-0.31 (\pm 5.45)	1.04 (5.00)	
<i>Misinformation</i>	4.76 (\pm 44.99)	0.32 (1.15)		1.16 (\pm 6.36)	1.40 (5.00)	
Type of media			0.015*			0.003*
<i>Album/Photo</i>	4.40 (\pm 40.88)	0.35 (1.18)		1.00 (\pm 6.11)	1.40 (5.00)	
<i>Video/Instagram TV</i>	4.25 (\pm 3.72)	4.24 (7.95)		-4.76 (\pm 8.17)	-2.17 (10.00)	
Sentiment			0.090			0.093
<i>Neutral/Negative</i>	3.27 (\pm 10.00)	0.70 (1.84)		-0.31 (\pm 5.48)	1.05 (5.00)	
<i>Positive</i>	4.68 (\pm 44.91)	0.32 (1.13)		1.16 (\pm 6.36)	1.40 (5.00)	
Author's occupation			0.009*			0.553
<i>Dentist</i>	9.05 (\pm 20.16)	1.36 (0)		0.19 (\pm 2.93)	0.02 (5.00)	
<i>Non-dentist</i>	4.31 (\pm 40.69)	0.35 (1.18)		0.88 (\pm 6.26)	1.36 (5.00)	
Type of profile			0.061			<0.001*
<i>Personal</i>	9.79 (\pm 62.20)	1.25 (2.88)		0.82 (\pm 6.11)	1.48 (4.00)	
<i>Commercial</i>	0.54 (\pm 1.52)	0.12 (0.35)		0.90 (\pm 6.30)	1.11 (5.00)	

*indicate significant differences

SD = Standart Deviation

IQR = Interquartile Range

Table 2. Distribution of dichotomized variable groups according to type of profile (Pearson Chi-square test, $P < 0.05$)

		Type of Profile		P
		Personal	Commercial	
Total interaction	<0.36	25 (14.1%)	186 (75.3%)	$<0.001^*$
	≥ 0.36	152 (85.9%)	61 (24.7%)	
Overperforming score	<1.36	78 (44.1%)	133 (53.8%)	0.047*
	≥ 1.36	99 (55.9%)	114 (46.2%)	
Facticity	<i>Information</i>	54 (30.5%)	32 (13.0%)	$<0.001^*$
	<i>Misinformation</i>	123 (69.5%)	215 (87.0%)	
Type of media	<i>Album/Photo</i>	172 (97.2%)	242 (98.0%)	0.592
	<i>Video/Instagram TV</i>	5 (2.8%)	5 (2.0%)	
Sentiment	<i>Neutral/Negative</i>	53 (29.9%)	32 (13.0%)	$<0.001^*$
	<i>Positive</i>	124 (70.1%)	215 (87.0%)	
Author's occupation	<i>Dentist</i>	8 (4.5%)	0 (0%)	$<0.001^*$
	<i>Non-dentist</i>	169 (95.5%)	247 (100%)	

*indicate significant differences

Table 3. Multiple logistics regression models show the association of total interaction and overperforming score with different factors

	B	S.E.	Wald	P	OR (95% CI)
<i>Total interaction</i>					
Type of profile (Personal)	2.98	0.27	119.93	<0.001*	19.78 (11.60-33.73)
Sentiment (Positive)	0.16	0.33	0.25	0.614	0.85 (0.45-1.60)
Type of media (Video/Instagram TV)	2.65	1.11	5.68	0.017*	14.20 (1.60-125.74)
<i>Overperforming Score</i>					
Type of profile (Personal)	0.39	0.2	3.93	0.047*	1.48 (0.46-1.00)

B = Unstandardized coefficient

S.E. = Standard error

OR = Odds ratio

*indicates significant differences

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2.2 ARTICLE 2

Glimpsing Amber's Power: Instagram Users' Teething Insights - A Qualitative Study[†]

ABSTRACT

Background: The global interest in using amber necklaces for teething control has increased, indicating widespread belief in its effects.

Aim: This study aimed to explore the opinions, perceptions, and experiences of Instagram users regarding Brazilian Portuguese posts about using amber necklaces to prevent teething symptoms.

Design: 509 comments from the top 5 Brazilian Portuguese Instagram posts with the highest engagement on the amber necklace's teething prevention were analyzed. An investigator performed thematic content analysis coding emergent themes in nodes and subnodes using NVivo 12 Plus. The results were visualized through conceptual maps, hierarchy charts, cluster analysis, word clouds, and word trees.

Results: All 5 posts emphasized the benefits of amber necklaces. The comments divided in 9 nodes and 77 subnodes revealed an abundance of positive testimonials about the amulet's efficacy, with users recommending its use for others and expressing interest in acquiring it for their babies. Some comments expressed skepticism, citing alternatives, the need for more information, and concerns about inefficacy and risks.

Conclusion: Brazilian Instagram users displayed overwhelmingly positive opinions and experiences with amber necklaces, contributing to the growing interest in this amulet, despite previous studies questioning its anti-inflammatory effects and pointing its risks of injuries.

Key Words: Primary dentition, Behavior, Tooth eruption, eHealth, Telehealth

[†] The article presented in this Thesis was written according to the **International Journal of Paediatric Dentistry (IJPd)** instructions and guidelines for article submission.

1. INTRODUCTION

Health information dissemination has long been the purview of health professionals and the scientific community ¹; however, the advent of digital media has significantly expanded the accessibility of health-related information, providing users with a myriad of websites to research and gather insights into diverse health issues ^{2,3}.

This digital landscape presents both positive and negative ramifications. On the positive side, it has democratized health education ⁴ and empowered individuals to make informed decisions about their health. Conversely, it has also engendered challenges for the lay user in discerning accurate information from misinformation or falsehoods ⁵, as some individuals may lack critical thinking skills and indiscriminately trust the sources they encounter.

In a parallel trend, social media platforms have emerged as popular channels for seeking health information among the general public ^{6,7}. Within these digital realms, people connect based on shared interests, values, and goals, fostering exchanges of experiences and insights ⁸. From interpersonal communications with friends and family to staying abreast of trends and exploring new subjects, social media plays a significant role in the lives of Brazilians, as evidenced by a 2022 survey where approximately 32.6% of online community respondents in Brazil identified Instagram as their favorite social platform ⁹.

Information disseminated on social media, such as Instagram, holds the potential to address diverse topics of interest. This includes posts encompassing product promotions, testimonials from previous experiences, as well as complaints and compliments ^{10,11}. Such publications have the ability to target specific social groups, deliberately crafted by their authors to resonate with their intended audience ¹². Consequently, two primary categories of posts can be observed: those with the intent of promoting and vending products and those centered on sharing personal experiences.

Within this context, the emergence of Baltic Amber in social media has occurred through the dissemination efforts of digital influencers. Stories recounted by these influencers reach their followers, leveraging personal experiences to engage their audience ¹³. Consequently, these interactions contribute to the dissemination of the product itself, regardless of the accuracy of the information shared ¹⁴.

The assimilation of this information by users is directly influenced by their beliefs and past health experiences, significantly impacting their decision-making processes concerning their own health or that of others ¹⁵. Of particular interest is the rising popularity of Baltic amber jewelry, touted as a "natural homeopathic healing source" ¹⁶. The purported ability of succinic acid within the amber to alleviate the discomfort of tooth eruption in babies has drawn attention

¹⁷. A study highlighted a global surge in Google searches related to the use of amber necklaces, indicative of individuals' willingness to believe in the potential efficacy in managing teething symptoms ¹⁸.

Research exploring the implementation of technology to monitor health behaviors holds paramount importance in mitigating oral health disparities among diverse populations. Nevertheless, a noticeable void persists in the realm of digital studies that scrutinize user comments on social media platforms, notably Instagram, pertaining to the utilization of amber necklaces. This investigative approach presents an invaluable opportunity to glean insights into the opinions, perceptions, and impressions of prospective consumers concerning the amulet's efficacy in real-life, interactive settings aimed at teething prevention.

Therefore, the present study seeks to evaluate the comments of Instagram users regarding information about the use of amber necklaces in preventing tooth eruption symptoms. Specifically, it aims to explore how social networks directly influence belief systems, decisions, and health behaviors within the context of this particular health trend.

2. MATERIALS AND METHODS

The authors followed the recommendations of the consolidated criteria for reporting qualitative research (COREQ) ²⁰.

2.1 Ethics

Approval from the institutional review board of the Council of Ethics in Human Research of the respective institution was not sought for this study. This decision was based on the understanding that federal regulations do not apply to research using publicly available data that does not involve human subjects.

2.2 Study Design

A retrospective digital study was undertaken to analyze Brazilian Portuguese comments related to amber necklace content found in Instagram. The selection of top 5 posts with the highest engagement was executed through specific search strategies implemented in CrowdTangle™. Comments containing relevant content were evaluated by a trained independent investigator (APS). Comments were coded according to respective emergent themes (nodes) and subthemes (subnodes) about the use of amber necklace to prevent teething. Subsequently, these findings were subsequently represented through conceptual maps, hierarchy charts, cluster analysis, word clouds, and word trees.

2.3 Sample selection

The selection of top 5 posts with the highest engagement was executed through specific search strategies implemented in the web scraping tool CrowdTangle™ (version 2023, Meta Inc., Menlo Park, USA). It allows the examination of several social media metrics, including posts, data, profile information, and performance scores associated with particular keywords in distinct periods and languages, permitting the ranking of posts by specific interaction metrics. The access to CrowdTangle™ is restricted to authorized entities, such as qualified organizations such as universities and researchers. Our research team was given permission to access this platform solely for the investigation of misinformation in Dentistry.

This study selected only posts on Instagram produced in Brazilian Portuguese by authors located in Brazil. They were retrieved using a search strategy developed by the combination of 10 terms: "colar de âmbar" OR "colar de ambar" OR "âmbar báltico" OR "colar de dentição" OR #ambarbaltico OR #colardeambarbaltico OR #colardeambar AND (dentição OR dente OR dentes). The keywords were determined through exploratory analysis of terms and hashtags to ensure the maximum recovery of data on Instagram.

Following, only identified posts with enabled commenting functionality were considered in this analysis. In cases where comments were disabled, the comments from the subsequent post were included instead. The sample size of comments was defined by the sum of 20% of comments of each one of 5 posts, which corresponded to a proportion of 1:5 of the sample. Only comments containing written text in Brazilian Portuguese were extracted to be included in the dataset, while those composed exclusively of emojis or mentions were excluded. In addition, advertisements, sweepstakes, chain letters, and consecutive repeated comments were filtered and removed from the dataset.

2.4 Content analysis

Content analysis is a research tool used to determine the presence of words, themes, or concepts in qualitative data. By employing content analysis, researchers are able to quantify and analyze the occurrence, meanings, and relationships of such terms. Consequently, they can make inferences about the messages conveyed in the texts, the author(s), the intended audience, and even the cultural and temporal context in which the text was created.

Initially, each comment received a number code after the pound sign (#) that indicate its appearance in descending order, regarding the posts from the highest to the lowest engagement and the comments from the most to the least recent one. The thematic content analysis of the posts was conducted by a trained and calibrated investigator (APS) based on the grounded

theory approach, where conceptual structures related to the study's theme emerge from the collection of posts, as opposed to using pre-established concepts. This analysis comprised the phase of systematizing initial ideas based on the theoretical framework, with the establishment of indicators for interpreting the collected information. It involved constructing coding operations, considering text segments as units of records (comments), which were thematically grouped into initial, intermediate, and final categories, adhering to the principles of mutual exclusion (between categories), homogeneity (within categories), relevance to the conveyed message (non-distortion), fertility (for inferences), and objectivity (comprehensibility and clarity) (20).

Subsequently, the phase of result treatment, inference, and interpretation was carried out, which is described in detail below.

2.5 Data Analysis

Data analysis was performed utilizing NVivo® 12 Plus software (QSR International, Melbourne, Australia)²¹. The recorded contents underwent thorough examination, followed by the development of a list of codes based on specific topics (for detailed information, refer to the results section). Thematic nodes and subnodes emerged from the aggregation of significant textual passages coded similarly. These findings were subsequently represented through conceptual maps, hierarchy charts, cluster analysis, word clouds, and word trees.

The conceptual map was constructed to organize the diverse ideas and concepts arising from the comments on Instagram posts. Meanwhile, the hierarchy chart depicted the ranking of the number of comments associated with each created node, with the size of each rectangle corresponding to the number of references encompassed. Importantly, the interpretation of the visual representation should be in relative terms rather than absolute numbers. Furthermore, the cluster analysis was conducted based on the similarity of words found in subnodes.

To generate the word cloud, the most frequently occurring terms within the comments from the investigated posts were taken into account. A preprocessing of the dataset was performed to exclude 'stopwords,' such as conjunctions, prepositions, and interjections, ensuring the relevance of the content. The clustering process further grouped similar words, including verb conjugations, plural forms, and synonyms, thereby condensing the information and facilitating the examination of the content's nature as conveyed by users in their comments. In the word cloud, the font size of each word corresponds to its frequency of appearance in the comments.

Lastly, word trees were created using the most frequently occurring words with five or more letters from the scrutinized comments within evaluated nodes. This analysis aimed to reveal the predominant themes employed by Instagram users when composing their comments.

3. RESULTS

3.1 Sample characteristics

The study's final sample encompassed 509 comments derived from five posts that prominently promoted the benefits of amber necklaces. In total, six different posts were considered for the analysis, since the fourth most popular post did not have the comment section activated, rendering it unsuitable for analysis. As a result, this post was excluded, and the analysis was conducted on the remaining five posts. All posts advocated the positive effects of amber necklaces.

To ensure a comprehensive representation of each post, the objective was to collect approximately 20% of the comments from each of the five posts. However, during the selection process, certain posts failed to meet this 20% collection target. Despite evaluating all comments on these posts, the number of collected comments still fell short of the intended threshold.

In total, the researchers managed to gather 509 comments from the evaluated posts. The number of comments per post ranged from a minimum of 22 to a maximum of 265, reflecting the varying levels of engagement and interaction among users on the platform.

3.2 Conceptual map

The map comprised nine distinct nodes, each denoted by their respective attributes. These nodes were designated as 'recommendation of use', 'knowledge', 'acquisition', 'testimonials of efficacy', 'needs of additional information', 'ineffectiveness', 'risks', 'product characteristics', and 'recommendation of alternatives'. A total of 39 primary subnodes emanated from these nine nodes. Additionally, 40 secondary subnodes were derived from the following primary subnodes: 'other uses in children', 'teething control', 'other uses in adults', 'efficacy', 'accidents', 'prevention', and 'searches', as illustrated in Figure 1. The comprehensive outcomes of each node are hereby presented for examination.

3.2.1 Recommendation of use

This node was constructed based on comments that directly advocated for the purchase or use of the amber necklace. These comments contained explicit recommendations or endorsements regarding the accessory's benefits. An exemplary statement representative of this node is as

follows: *"I have been using it on my baby since she was 2 months old. Now she's almost 4 months old and already has 2 teeth coming in. I highly recommend it; it improves sleep, vaccine reactions, and now even helps with teething"* (Comment #5).

3.2.2 Knowledge

Comments incorporated into this node reflect users' pre-existing knowledge pertaining to the amber necklace. These comments include accounts of prior experiences, awareness of the necklace's benefits, or references to technical information. An illustrative example of this node is: *"My grandson has been wearing it since birth. He is now 2 years old, and his teeth come in without him feeling anything"* (Comment #114).

3.2.3 Acquisition

The formation of this node was guided by comments indicating the intention to purchase the amber necklace. Such comments expressed the users' intent to acquire the accessory as a solution to their own or their child's specific issues. A representative comment of this node reads: *"I already knew about some of its benefits for babies, but I didn't know about it for adults. I'm going to buy one for myself because I suffer from colic and headaches every month, in fact, I'm suffering from it right now. I think this post was a lifesaver"* (Comment #113).

3.2.4 Needs of additional information

This node encompasses comments where users seek further information about the product, including specific queries about the necklace, clarifications about its benefits, or instructions on its proper usage. An illustrative comment from this node is: *"Do the bracelet and the necklace have the same effect?"* (Comment #392).

3.2.5 Ineffectiveness

The comments in this node reflect instances where the accessory was reported to be ineffective. Such comments may include negative personal experiences, comparisons with other options, doubts regarding its scientific basis, or accounts of no observable effects. Expressions such as "it's a lie" and "it doesn't work" have guided the construction of this node. An example of this node is: *"Mine used Amber and it didn't work at all. It made no difference, and I wasted my money for nothing"* (Comment #482).

3.2.6 *Risks*

The formation of this node was guided by comments containing warnings about the risks associated with using the necklace, particularly for babies. These comments include alerts about potential choking hazards, risks of strangulation, potential allergies, and accidental ingestion. A representative comment from this node reads: "*The fear of risking strangulation outweighs the desire to put it on my baby*" (Comment #104).

3.2.7 *Product characteristics*

This category comprises comments discussing the physical attributes of the product. It includes user contributions describing the necklace's appearance, comparisons with similar products, and technical specifications of the accessory itself. An illustrative comment from this category is: "*What color is your necklace, Jade (the author's post)?*" (Comment #57).

Testimonials of efficacy

In this category, comments describing testimonials of the amber necklace's effectiveness are included. These comments address positive experiences, accounts of symptom relief, enumeration of therapeutic benefits, and fulfillment of the promised solutions. An exemplar comment of this node reads: "*My son used to drool a lot because of his teeth, but after I bought the amber, he stopped putting his hands in his mouth and drooling. He never had any reaction after using it. There was a time when he went almost a week without wearing it, and he started getting a fever. I gave him medication to relieve it, but the fever returned once the effect of the medication wore off. I realized that a tooth was coming in, so I thought, 'I'll use the Amber again.' Two days after I put it back on, the fever disappeared. The tooth is now growing, and there have been no reactions again. It's the best discovery*" (Comment #120).

3.2.8 *Recommendation of alternatives*

This node incorporates comments where users propose alternative solutions to alleviate the discomfort caused by teething in babies. These suggestions may include natural remedies, recommendations for substitute products, traditional care options, or technical guideline-based solutions. An exemplar comment of this node is: "*I give her a cold teether and cold water, but only now that both teeth are coming out and just after turning one year old this week, two more teeth are coming out, and she had a fever in the first few days and a lack of appetite*" (Comment #497).

3.3 Hierarchy charts

The most prevalent themes identified in the comments, listed in descending order of frequency, were as follows: i) 'recommendation of use', ii) 'knowledge', iii) 'acquisition', iv) 'testimonials of efficacy', v) 'needs of additional information', vi) 'risks', vii) 'ineffectiveness', viii) 'product characteristics', and ix) 'recommendation of alternatives'.

A substantial portion of the comments centered on the node 'recommendation of use', followed closely by those associated with the node 'knowledge'. Combined, these two nodes accounted for the majority of the comments analyzed (n=308). The 'recommendation of use' node encompasses the subnodes 'sharing information' (n=160) and 'sharing experience' (n=22). The 'knowledge' node was further categorized into four subnodes, ranked as follows: 'previously known' (n=85), 'interesting information' (n=62), 'understanding functions and uses' (n=18), and 'previously unknown' (n= 5). The remaining comments were distributed among the other nodes (Figure 2).

3.4 Cluster analysis

Two primary clusters were identified. Cluster 1 comprised a diverse range of subnodes, including 'color', 'trend', 'cold water and teether', 'fever control', 'age indication', 'polishing of beads', 'previously unknown', 'actions', 'understanding functions and uses', 'interesting information', 'previously known', 'sharing information', 'plans', 'stimulation', 'efficacy', 'unspecific', 'searches', 'rechargeable', 'safe use', 'necklace or bracelet', 'authenticity', 'waterproof', 'chamomile-containing products', 'warnings', 'accidents', 'false beliefs', 'lack of scientific evidence', 'negative experience', 'general uses', 'other uses in adults', 'other uses in children', 'sharing experience', 'teething control', and 'testimonials of efficacy'. On the other hand, cluster 2 encompassed a small number of subnodes, namely 'mysticism', 'prevention', 'allergy', 'fluoride toothpaste', 'dipyrone', 'function', and 'intactness', as depicted in Figure 3.

3.5 Word cloud

The top five words prominently featured in the word cloud are 'necklace', 'wear', 'look', 'teeth', and 'baby', as depicted in Figure 4. Additionally, words closely related to the theme, which appeared with considerable frequency, include 'buy', 'have', 'months', 'amber', 'love', 'will', and 'teething', all of which rank among the top 20 most frequently repeated words.

The word cloud aptly reflects the anticipated terms related to the posts' theme, including 'necklace', 'amber', 'baby', 'teeth', and 'teething'.

3.6 Word tree

The word 'necklace' emerged as the most frequently used term across the nodes 'needs of additional information', 'product characteristics', 'knowledge', 'ineffectiveness', 'recommendation of use', and 'risks'. Conversely, the words 'buy', 'chamomile', and 'much' were the most prevalent in the nodes 'acquisition', 'recommendation of alternatives', and 'testimonials of efficacy', respectively. The outcomes of these analyses are presented in Figure 5.

4. DISCUSSION

This study represents the pioneering investigation into the comments of Instagram users with concerning posts about the use of amber necklace as a teething symptom preventive measure, with a particular focus on highly interactive posts. The findings of this research offer several crucial insights. Firstly, they underscore the influential role of social media ^{22, 23} as a platform where users actively share health-related information within their networks, thereby reaching diverse audiences ²⁴⁻²⁶. Notably, the 'recommendation of use' node showcases individuals disseminating information by endorsing necklace usage based on personal experiences or shared knowledge. In contrast, the nodes 'risks' and 'ineffectiveness' receive substantially fewer comments, with negative connotations being less prevalent in the word cloud.

Remarkably, the 'acquisition' node garners a substantial number of comments, substantiating the efficacy of influencer-driven health product advertising on social networks ²⁷. Notably, the term 'buy' ranks among the top 10 most frequently used words, indicating consumers' inclination to purchase products that promise to alleviate health problems ²⁸. Additionally, it appears that most users are inclined to share relevant information within their circles, irrespective of their specific knowledge ^{29, 30}. Of particular interest is the prominence of the 'sharing information' subnode over the 'sharing experience' subnode, suggesting a high dissemination potential among users. This phenomenon is particularly significant concerning health issues related to children, which prompt individuals to seek solutions ^{31, 32}.

It is evident that positive experiences wield a more significant influence than negative ones in disseminating information about amber necklaces. Consequently, the propagation of successful outcomes seems to outweigh the dissemination of counterindications ³³. This trend aligns with the placebo effect and natural symptom resolution commonly observed during tooth eruption. For instance, most of the babies experience relief from teething discomfort within 8 days through their physiological response ^{34, 35}, often attributing this improvement to the use of amber. Similar phenomena have been observed with alternative treatments during the COVID-19 pandemic, where positive effects were amplified, leading individuals to adopt alternative

solutions without seeking medical advice ³³. Consequently, perceived benefits tend to overshadow potential risks, prompting individuals to take risks in pursuit of potential remedies ³⁶.

The present study also reveals that the amber necklace remains relatively novel to many Instagram users, as evidenced by comments categorized under the 'knowledge' node (n=146). Notably, this node exhibits a nearly equal distribution between users who were already aware of the accessory ('previously known' subnode, n=85) and those who were unfamiliar with it ('interesting information' subnode, n=62). This finding implies that the notion of preventive oral health care for infants is still relatively limited, with most parents primarily seeking dental visits for curative rather than preventive purposes ³⁷. Consequently, many parents turn to the internet to explore solutions for oral health-related issues their children may experience, leading them to discover the concept of the amber necklace.

A notable driving force behind users seeking alternative treatments lies in their beliefs and lack of trust in traditional methods. On various online communication platforms, there exists a growing trend of denying scientific authority ³⁸. Driven by inconsistent assumptions, some individuals reject established scientific knowledge in favor of what they personally find more plausible, reinforcing existing beliefs and past health experiences ^{39, 40}. Discrediting traditional science can lead users to challenge the positions of authorities or institutions ⁴¹, and when done through social media, this challenge can reach a wide audience, undermining otherwise legitimate institutions with inappropriate and unscientific arguments ^{42, 43}.

Moreover, users frequently seek solutions to their problems from trusted individuals or influencers within their social circles ^{44, 45}, with the halo effect playing a fundamental role in how people seek and assimilate information ^{46, 47}. These findings also shed light on how purchase desire is manifested, with people often influenced by others to acquire health-related products ⁴⁸ without necessarily seeking detailed technical information about them ⁴⁹. This behavior is evident in the significant number of comments in the 'acquisition' node, surpassing the number of comments in the 'needs of additional information' node. While the dissemination of products through social networks proves effective and helps identify specific market niches ⁵⁰, concerns arise about the possibility of manipulating information and results in advertising by the authors of these posts ⁵¹. The proliferation of posts about the amber necklace on the internet without adequate moderation and constant interactions on social media contribute to the spread of false and incorrect information about the product. Consequently, regulatory authorities should focus on disseminating accurate information about tooth eruption and its effects on infants' oral health.

Notwithstanding, studies like this one offer valuable insights into how users interact with health information, providing a deeper understanding of belief systems, decision-making processes, and health behaviors among parents and caregivers. As a result, education and policies for preventing misinformation can be designed with a focus on social media platforms like Instagram.

However, it is essential to acknowledge certain limitations in this methodology when interpreting the results. Firstly, the comment sample collected from Instagram, a rapidly changing and volatile social network, may not always fully represent the broader user base. Secondly, the sample size of comments may be limited to the posts that advocate to the use of the amber to prevent teething, potentially failing to capture the perspectives of all users on the platform. Finally, the study's scope is confined to users who have access to and actively use the internet and social media platforms, possibly excluding those who do not engage with these tools.

In conclusion, Brazilian Instagram users overwhelmingly express positive opinions and experiences regarding amber necklaces, contributing to the growing interest in this amulet, despite prior studies questioning its anti-inflammatory effects and warning about the risk of injuries. These findings emphasize the necessity for pediatric dentists to address the management of infants and provide guidance to parents and caregivers on medical visits, underscoring the relevance of this study in understanding patients' needs. Collaboration between health professionals and influencers with wide reach is crucial to ensure the dissemination of accurate and reliable health information to as many people as possible.

Why this paper is important to pediatric dentists?

This study demonstrates that there is considerable interest in information about the amber necklace as a reliever of tooth eruption symptoms. Pediatric dentists should find solutions to inform their patients about the risks of this accessory, promoting more effective methods to deal with the discomfort of teething in infants.

Acknowledgments

None to declare.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

This work was supported by *blinded to peer review*.

FIGURES LEGENDS

Figure 1. Conceptual map illustrating the intricate interplay of ideas and concepts derived from the comments found in Instagram posts pertaining to amber necklaces. The map comprises nine primary nodes, each representing distinct attributes, from which a total of 39 primary subnodes and 40 secondary subnodes have emerged, offering further elucidation and classification of the identified concepts.

Figure 2. Hierarchy chart illustrating the identified subnodes with more than 10 references. The numbers on the image correspond to the following subnode labels: 1. sharing experience; 2. understanding functions and uses; 3. false beliefs; 4. negative experience; 5. accidents; 6. recommendation of alternatives.

Figure 3. Cluster analysis of subnodes based on word similarity. The items have been grouped into clusters according to their semantic similarities.

Figure 4. Word cloud representing the relative frequency of word occurrence within the comments. The font size of each word corresponds to its prominence in the comments, indicating the varying levels of occurrence for the different terms.

Figure 2. Word tree of the term “necklace”.

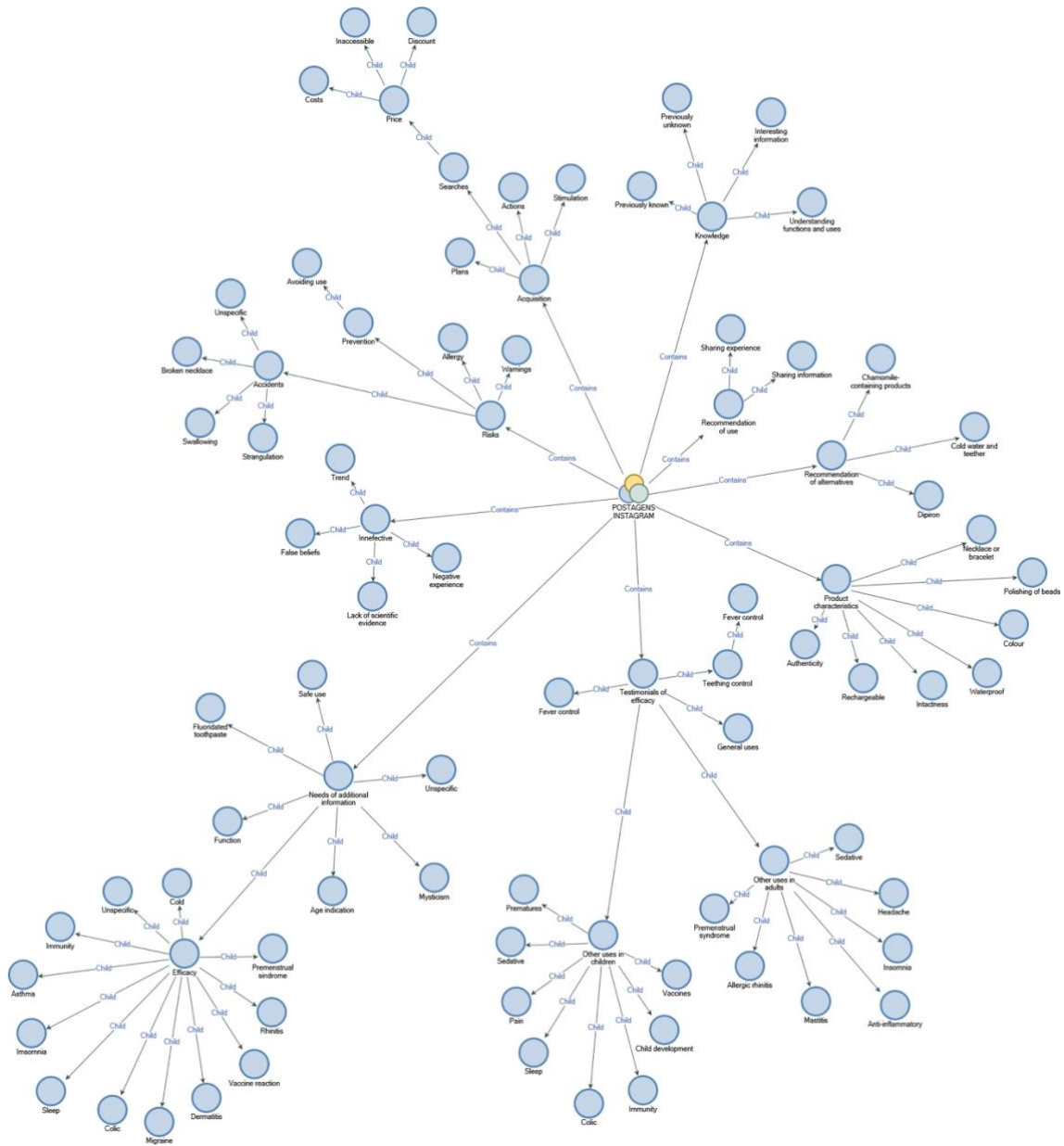


Figure 1

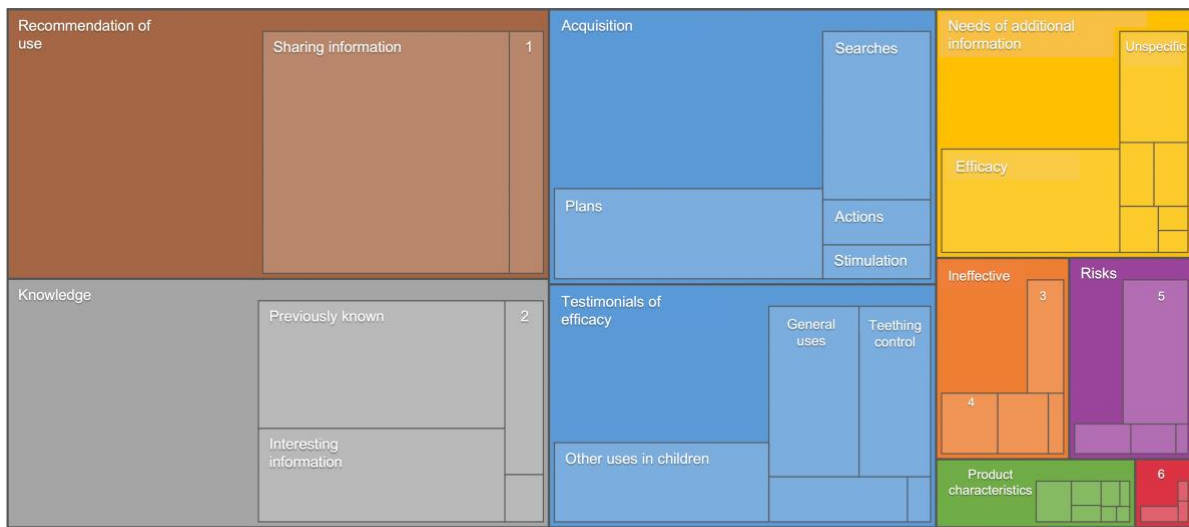


Figure 2

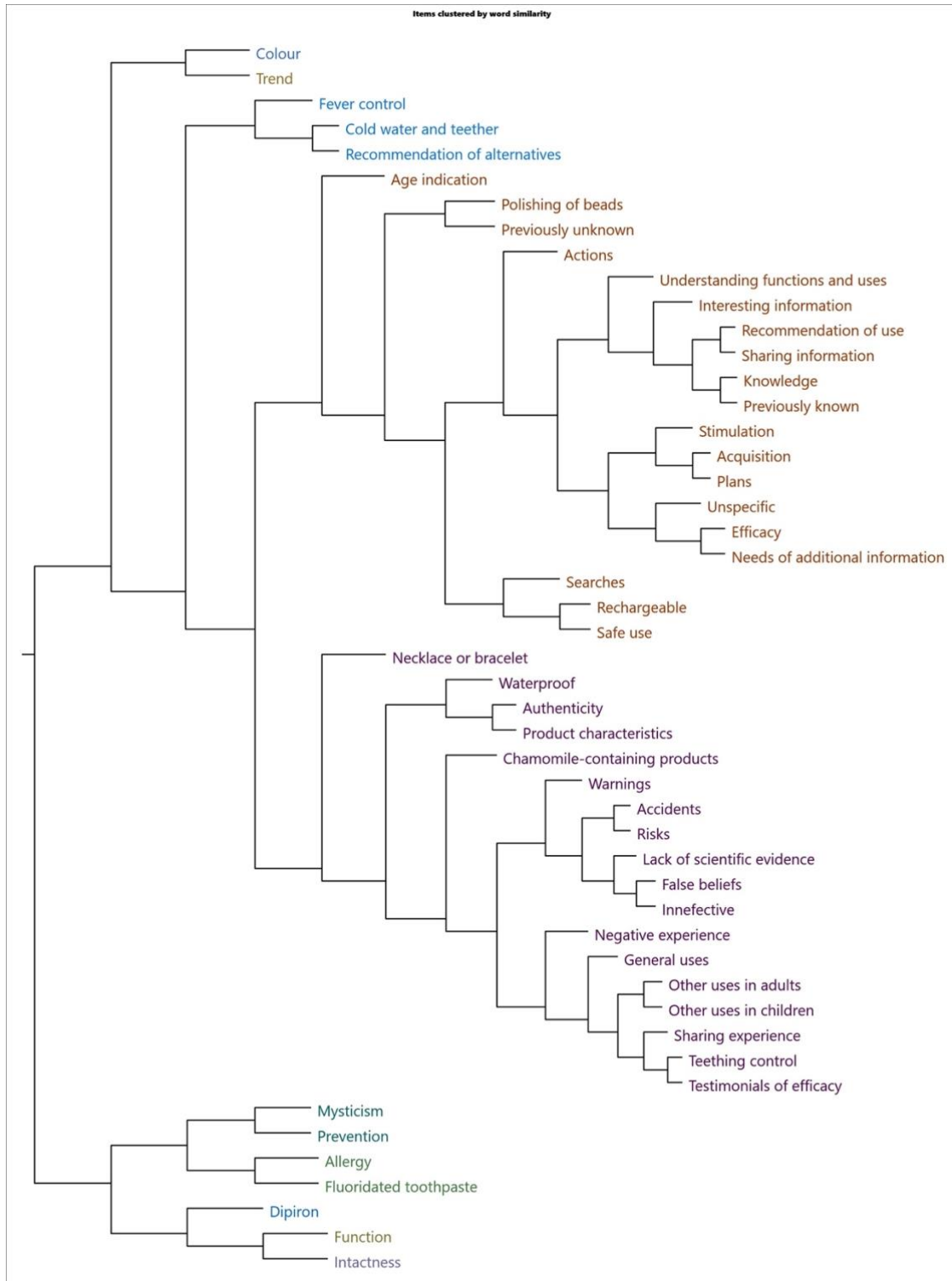


Figure 3

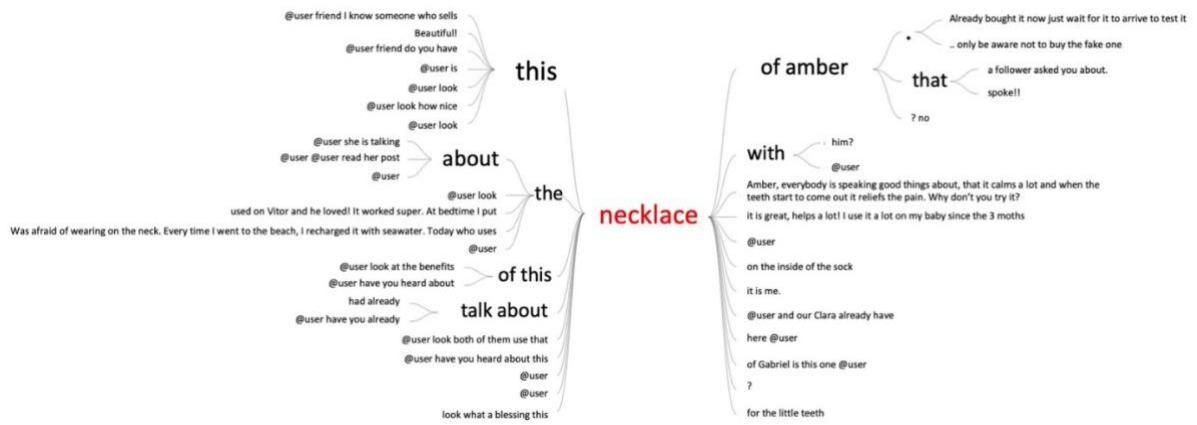


Figure 3

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3 DISCUSSION

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This chapter presents five noteworthy considerations based on the aforementioned manuscripts:

Firstly, a recent trend has emerged where businesses are shifting their promotional strategies by engaging in "influencer marketing." Rather than relying solely on their commercial accounts, they now offer goods and services to digital influencers in exchange for promotions on their social media profiles. In the context of this study, the role of these influencers is to promote the consumption of amber necklaces, focusing on positive sentiments and omitting any mention of potential risks associated with wearing the accessory.

Secondly, an observation of user behavior, particularly the intention to purchase, reveals a substantial prevalence in the comments analyzed, surpassing other categories. This underscores the effectiveness of advertising by digital influencers and underscores consumers' inclination to purchase products that promise to alleviate health problems.

Thirdly, a significant portion of internet users demonstrate a strong tendency to share information they find relevant within their social circles, regardless of their prior knowledge of the subject matter, such as tooth eruption. This indicates a high potential for the dissemination of information and knowledge among users on the social network under evaluation.

Furthermore, the increasing number of posts concerning the amber necklace on the internet without proper moderation by regulatory authorities, coupled with continuous user interactions on social media, contributes to the dissemination of false and inaccurate information about the product. To address this issue, regulatory authorities should prioritize providing accurate information on tooth eruption and its effects on the oral health of babies.

These findings highlight the importance of pediatric dentists adopting more suitable and optimal approaches to managing infants' oral health and providing better guidance to parents and caregivers. This study emphasizes the relevance of understanding patients' needs and those around them. Collaborative efforts between health professionals and digital influencers with extensive reach are crucial in ensuring the dissemination of accurate and reliable health information to the widest audience possible.

4 CONCLUSION

4 CONCLUSION

Based on the obtained results, the following conclusions can be drawn:

- Publications made on social media have a direct impact on the health behaviors of Brazilian users. Factors such as the type of media (video/IGTV) and profiles (personal) significantly influence higher levels of user interaction with Brazilian Portuguese amber necklace-related posts on Instagram. Notably, posts related to the amber necklace garner substantial engagement, including likes and comments. However, it is essential to recognize that social media users may efficiently disseminate information, but this dissemination is not always accurate or previously verified.
- Parents express concerns about the discomfort experienced during tooth eruption and show a strong interest in seeking alternative and natural methods to alleviate these symptoms, with a notable connection to the amber necklace. Users' interest seems directly linked to the perceived benefit of using the product: relief from teething discomfort in babies, despite previous studies demonstrating the implausibility of the collar's anti-inflammatory effect.
- The vast amount of information circulating on social networks gives rise to various worries among users. In this context, dentists play a critical role in health education, raising awareness among the population about the potential dangers associated with the amber necklace. Additionally, dental professionals should emphasize safer alternatives for managing possible discomfort during tooth eruption, clarify the natural resolution of these symptoms, and educate on the lack of necessity for specific treatments.
- To address misinformation and enhance health education, targeted policies can be designed with a focus on social media platforms like Instagram, which have proven to be highly efficient channels for disseminating health-related information.

These conclusions underscore the significance of social media as a potent medium that influences health-related behaviors and information dissemination. They also emphasize the importance of informed health practices, accurate education, and prevention strategies to ensure the well-being of individuals relying on information from these platforms.

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