

Does toxic stress impact paediatric dental procedures? An integrative review

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Highlights

Invasive paediatric dental procedures can produce a stressful situation in young children.

The topic of toxic stress is relevant and should be included in paediatric dentistry research and clinical trials.

Paediatric dentistry needs to recognize and diagnose toxic stress as an aggravating factor in child health.

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Abstract

Toxic stress is defined as strong, repetitive stress with prolonged activation, without the child having the support of an adult caregiver. It is plausible that invasive and complex paediatric interventions produce or contribute to the development of toxic stress. This article aims to evaluate, discuss and synthesize the association between toxic stress and paediatric dental clinical practice through an integrative review of studies published in several databases. The results of this study allow us to state that this subject is little explored in the dental literature and, therefore, that it is essential to encourage clinical studies and specific research. The expansion of these studies will provide health professionals with scientific evidence regarding the implementation of proper clinical practice, thus reducing or even eliminating the development of toxic stress.

Keywords: Adverse Childhood Experiences; Anxiety; Child; Pediatric Dentistry

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INTRODUCTION

Stress is a relevant condition in the overall development of the human body and influences the tolerability of future adverse situations, the acquisition of habits and behaviours, and the learning and development of brain architecture and neural systems.^{1,2}

Stress is classified into three levels based on the biological responses of the body and is dependent on the duration and intensity that the individual is exposed to the stressor factor. Thus, stress can be positive, tolerable, or toxic.^{3,4}

Positive stress occurs when an experience is brief and mild, and the affected individual can return to normal standards in an acceptable time. Stress is characterized as tolerable when an individual experiences stressors for a sustainable period of time that are capable of increasing the risk of impaired brain architecture. Toxic stress is defined as intense and continuous stress that can cause irreversible damage to the neuropsychomotor development of an individual, increasing the risk of organic diseases throughout the life cycle.^{5,6}

Given that brain development occurs in early childhood, with the consequent construction of habits and development of learning to address adverse or unfavourable situations, strong scientific evidence has shown that persistent, toxic stress in early childhood produces changes in the body biology and behaviour of children.^{1,2,6} All these changes affect the overall health of children, causing immune system impairments, increases in inflammatory markers, and impacts on oral health.⁷⁻¹¹ In addition, previous studies¹²⁻¹⁴ reported that family factors, such as maternal or paternal stress, can lead to the development of parafunctional oral habits such as finger sucking and bruxism, caries lesions and other oral disorders. Scientific evidence^{5,7,11,12,13,14,15} has indicated that children with previous potentially stressful experiences in paediatric dental procedures, manifested uncooperative behavior in relation to those who didn't suffer negative experiences. Furthermore, is reasonable to infer a strong association between a child's young age, negative dental experiences, toxic stress, and uncooperative behavior.¹⁶⁻¹⁹ Thus, it is necessary

to identify and discuss the impact that toxic stress has on the oral health of and dental procedures in children.

METHODS

Study design

This study is an integrative review, which consists of locating, interpreting and synthesizing the volume of scientific evidence produced on a subject, which in this case is the relationship between toxic stress and paediatric dentistry procedures. For this, the following steps were undertaken: identification of the theme and design of the guiding question: "Which is the toxic stress influence in paediatric dentistry?", establishment of inclusion and exclusion criteria for the articles, gathering of data from the articles, analysis and interpretation of the results and synthesis of the content. This study was based on steps proposed by Hermont et al.²¹

Search strategies

The literature review was performed by three reviewers, based on active searches for information contained in the following databases: PubMed, SciELO, ProQuest and Lilacs (Bireme's databases). The selection of articles was based on health descriptors (Decs.), combined with the Boolean operators "and" and "or", based on the relevance of the articles. The descriptors "Childhood stress", "Toxic stress", "Resilience", "Developmental origins", "Family paediatrics" and "Psychological adaptation" combined with "Paediatric dentistry" and with the Boolean operators "and" and "or" were used for the searches in the databases used.

Search filters were selected to explore more relevant and recent studies (01/2011 to 01/2021) and exclude bibliographic productions represented by books, monographs and theses. Therefore, the remaining studies were clinical trials, meta-analysis, randomized controlled trials, and systematic reviews.

Eligibility criteria of the articles

The articles selected for the study were evaluated based on their relevance to the guiding question

of this study. Articles were selected by reading the titles, abstracts and eventually the full text of articles that met the inclusion and exclusion criteria. The inclusion criteria were the study correlation between toxic stress and paediatric dentistry. While the exclusion criteria were the opposite of this, when the study approached only

one of them or when it didn't do a correlation between them. This process was performed by the researchers in a critical and independent manner. Disagreements between the researchers were resolved by consensus and ultimately by the research supervisor, with the goal of reducing bias.

Selection of publications and data extraction

The remaining articles were organized in a spreadsheet on Google Sheets, the titles were analysed, and duplicates were excluded. Next, articles whose titles did not fit the study were excluded; and finally, those that did not fit the study objective were excluded. After this filtering process, the articles were read and judged based on their information presented and topics covered.

RESULTS

The active search in the various databases retrieved 128 articles. As the articles came from different databases, filtering and exclusion of duplicates was performed – 11 studies – resulting in 117 studies. After this, the articles relevant to the study were selected based on the titles, among which 30 articles were selected. Subsequently, the abstracts of those studies were analysed individually, and among the 30 studies, 9 were designated for full reading. All the articles elected for the research addressed the early childhood population. Among the articles cited for full reading, 2 studies fully covered the focus of the research, which is toxic stress and child dental care (Flowchart 1). All articles found were published in English (Table 1).

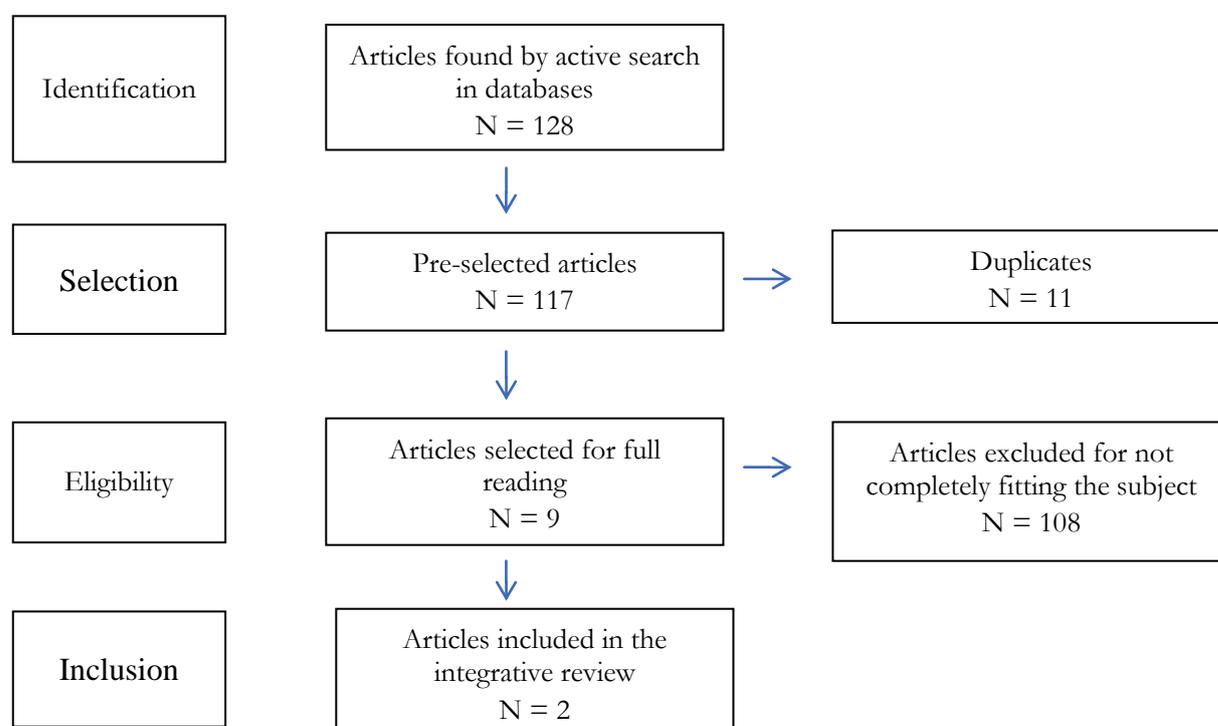


Figure 1. Flowchart of selection and filtering of scientific articles

Table 1. Selected articles

Author	Title	Main subject studied	Journal	Language	Month/year
Bright et al.	Adverse childhood experiences and dental health in children and adolescents	Association between social stressors and oral health	Community Dentistry and Oral Epidemiology	English	June/2015
Long	Stress and economic hardship: the impact on children and parents	How economic difficulties, parent depression and other stressors influence general and oral health throughout life and the implications for paediatric dentistry	Paediatric dentistry	English	April/2014

Considering the number of articles initially identified and especially those submitted to all selection steps, it is reasonable to conclude that there is a small number of publications and production of knowledge on this subject. Thus, there is a need for research on this subject to expand the literature and share knowledge about toxic stress and its impact on children undergoing paediatric dentistry procedures.

DISCUSSION

Contemporary paediatric care is not restricted to the contexts of the diagnosis and treatment of oral pathologies, and the need to know all the environments in which children live and develop, such as family, school and society, is necessary.^{5,21}

The interpretation of a child's growth and development is extremely important in understanding the expectation of a healthy life, from early childhood to adulthood. Scientific evidence^{3,17} has shown that the infant brain begins developing during the foetal period and that the various brain zones expand and modulate with extreme ease until the end of early childhood, hence the importance of experiences during this period, including dental procedures, as this resilience makes the brain sensitive to chemical changes. Thus, neural damage caused in this life cycle, although not physically visible, leads to permanent changes in brain structure and function.^{3,15}

These hypertrophic changes generate hyperactivity in these areas, consequently stimulating the degree of anxiety in the child. The cerebral amygdala is an important physiological factor involved in the stress response; due to the cascade effect of stress, in the amygdala, there is an increase in the concentration of cortisol, which is a biomarker of responses to stressful experiences.^{22,23}

In paediatric dentistry, it is recognized that invasive and complex clinical interventions may cause situations of stress. In addition, invasive procedures can cause pain, whose presence increases cortisol levels. We emphasize that in the first years of a child's life, levels of anxiety are naturally higher, given that cognitive and emotional development is immature at these ages in relation to that in older children.^{1,2}

For all these reasons, it is essential for paediatric dentists to master and manage the care of children regarding pain control, differentiating the types of crying, behavioural control techniques and time needed for procedures.^{13,15}

Pain can be controlled with appropriate anaesthetic techniques. Crying can be the result of pain or fear, and behavioural assessment methods can be used to make such differentiations.¹⁶ Another important parameter is the time children spend undergoing procedures; importantly, the time required for the cortisol level to peak is twenty to thirty minutes after a stress stimulus.

Thus, the evolution of patient behaviour combined with a good clinical sense will indicate the continuity or suspension (when possible) of a clinical intervention.

Evidently, children subjected to toxic stress become more resistant to paediatric dental procedures, given the high degree of anxiety and fear. To facilitate the management of these patients, it is advisable to measure the degree of anxiety using a behavioural assessment method.¹⁶⁻¹⁸ One of the established techniques for controlling anxiety is "talking, showing and doing", which consists of introducing children to elements of the dental office, verbally explaining the procedures to be performed and demonstrating the procedures through visual, auditory and tactile ways.¹³ The patient modelling technique is another alternative and consists of an introductory consultation to become familiar with the office, followed by a consultation for a preventive procedure and ending with the most complex procedures. Studies indicate that this pattern of care tends to reduce stress and anxiety.^{17,18,24}

We emphasize the importance of paediatric dentists understanding the characteristics of the family nucleus as part of the care of children, given that families can have a supportive function or can aggravate toxic stress conditions. In addition, studies indicate that children who belong to minority groups or ethnic groups and who suffer any type of racism, lack educational opportunities and experience residential segregation experience an exacerbation of this stress process.^{15,25} Thus, paediatric dentists must recognize, protect and even neutralize the negative impacts resulting from oral diseases on children, especially those of a young age, who require continued treatment that poses a potential to cause toxic stress.^{3,15}

Knowledge of these theories and clinical criteria will allow paediatric dentists to work at positive and tolerable stress levels by eliminating the toxic stress induced by clinical procedures, reducing the emotional cost, and neutralizing the negative impacts on the development and health of children.

CONCLUSIONS

Toxic stress, which is widely described and discussed in paediatric medicine, has not been given the same prominence in the dental literature. However, the literature on dental specialties, notably paediatric dentistry, indicate high degrees of anxiety and fear that impact and limit clinical procedures.

It is reasonable to infer that such facts are consequences of underdiagnosed toxic stress in child patients, possibly due to dental professionals misunderstanding the subject. Thus, it is important to produce research and clinical studies on toxic stress and its impact on paediatric dentistry to guide dentists in identifying psychosocial stressors, such as low family income, low education, family structure, racism, neglect and maltreatment, among others, which should be considered in the health of children.

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