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Maternal perceptions and the 'disposable tooth' paradigm: A cross-sectional study on primary tooth extraction in Khartoum, Sudan ,2022

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Article

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Abstract

Background and aims: Traditional healing practices are common in Sudan and Sub-Saharan Africa. Milk tooth extraction (MTE) refers to the manual removal of primary tooth buds, typically performed on children under five years of age. This practice is believed to have a therapeutic effect for symptoms such as diarrhea, vomiting, and cough. This study aimed to determine the prevalence of MTE and to describe mothers' perceptions of this practice.

Methods: This cross-sectional study was conducted in seven teaching hospitals across Khartoum State. Mothers of children presenting to pediatric units were interviewed using a semi-structured questionnaire. The variables assessed included mothers' perceptions of MTE, whether their child had undergone MTE, and a description of the procedure.

Results: A total of 385 mothers of children under five years participated in the study. The mean age of the participants was 34.96 years (SD ±7.504), and the mean age of the children was 2.14 years (SD ±1.350). Among the children, 174 (45.2%) were females and 211 (54.8%) were males. Approximately 154 mothers (40%) endorsed the practice of MTE. Reported reasons for performing MTE included family tradition (69.4%), diarrhea (56.1%), vomiting (46.5%), and fever (37.7%). The prevalence of MTE was 18.4% (70 out of 385 children). Factors significantly associated with this practice included maternal age, maternal education level, and rural origin. No major complications related to MTE were reported.

Conclusions: Milk tooth extraction (MTE) remains a common traditional practice acknowledged by Sudanese mothers. Awareness-raising initiatives regarding the risks of MTE should be implemented through health education campaigns in primary healthcare centers and hospitals, particularly targeting women of childbearing age and healthcare practitioners.

1. Introduction

Milk Tooth Extraction (MTE) is a traditional practice in several African countries, where primary canines are believed to cause fever, diarrhea, and vomiting in children. Mothers often seek traditional healers for the removal of these "false teeth," particularly when modern medicines fail to relieve the child's symptoms [1,2]. In Uganda, this practice is locally known as 'Ebino,' while in Sudan it is referred to as 'Haifat' [3]. First reported in South Sudan, MTE involves removing primary canines using sharp instruments such as razor blades, nails, or heated needles, with less invasive forms involving herbal rubbing on the gums, as observed in Tanzania [1,3].

The practice is typically performed in children aged between 40 days and 2 years [3]. Historical accounts suggest MTE is associated with certain tribes; for instance, in Nilotic Sudan, canines were reportedly removed using iron or fishhooks among the Nuer tribe [3]. Despite its cultural roots, MTE can cause significant harm, including enamel defects, premature eruption, gum damage, impacted permanent canines, odontomas, otitis, and infections [4–6]. Case reports from Somalia and Uganda have highlighted these dental malformations as direct consequences of crude extraction methods [4,5].

The prevalence of MTE varies across regions: in Sudan, 22% of children aged 4–8 years were found to have undergone MTE [3]; in South Sudan, the prevalence reached 70% among infants admitted to a hospital in Juba [8]; while in Ethiopia, studies reported 10.9% to 58.68% prevalence [9,10]. In Tanzania and Kenya, prevalence ranges from 0.5% to 87% depending on the community and method used [1,6]. Mothers' beliefs strongly influence the practice: persistent diarrhea and fever are often attributed to tooth buds, and despite health education campaigns, many parents still resort to MTE, especially when modern medicine is perceived as ineffective [1,5,8].

Several socio-demographic factors are associated with the practice, including low maternal education, low family income, and belonging to marginalized communities [9,10,12]. The procedure is usually carried out by non-dental personnel, often middle-aged women, using crude instruments or herbal methods [1,3,6]. Immediate and long-term complications include bleeding, infection, enamel defects, missing or impacted permanent teeth, and odntomas [4–6,11].

In Sudan, data on MTE is limited, with most studies dating back decades. Observations in pediatric wards at Soba Teaching Hospital revealed children with abnormal gum swellings linked to MTE, while hospital staff often had little prior knowledge of the practice [3]. The scarcity of recent research underscores the need for updated studies to explore mothers' perceptions, the prevalence of MTE, and its associated complications. The findings of such research can inform health education initiatives, improve maternal awareness, and promote safer health-seeking behaviors to prevent the severe consequences of this practice.

2. Methodology

Study Design:

Hospital-based cross-sectional descriptive study.

Study Area:

Governmental teaching hospitals located in Khartoum state, Sudan.: Pediatric Unit of seven governmental hospitals in Khartoum locality.

Study Population:

Parents (mothers) of Sudanese children in Khartoum Locality. All caregivers with children less than 5 years old who presented to one of the selected seven governmental hospitals in Khartoum were the source population of this study.

Inclusion Criteria:

1. Parents who have at least one child below 5 years of age.

2. Parents who are of Sudanese Nationality.

3. Participants in the pediatric unit of Governmental Hospitals.

Exclusion Criteria:

1. Parents who do not understand the nature of traditional surgical practices.

2. Parents who are not residents of Sudan.

3. Parents in hospitals outside Khartoum state.

Sample Frame:

Parents of children below 5 years presenting to the pediatric unit in Khartoum Hospitals.

Sample Size:

The size was calculated by using the assumption of a 95% confidence interval, 5% degree of precision, and 10% non-response rate. The sample size was determined for each specific practice and finally, to have a possible maximum sample size, the greater number from those computed was taken as sample size.

For the practice of milk tooth extraction, 58.7% of the proportion of milk tooth extraction has been taken from a study of "Prevalence of Milk Teeth Extraction and Enabling Community Factors Among Under Five-Year-Old Children in Alle Special Woreda, SNNPR, Ethiopia, 2022: Community-Based Cross-Sectional Study; Based on Theory of Planned Behavior Model " conducted by Kusse Otayto [9].

Equation: n = (Z)*2 P(1-P) % (d)*2

Z=95%, P = 52.5 - 58.7%, d=5%

N = 385

A proportionate sample size was calculated based on the population the hospital is estimated to serve.

Sampling Selection Method:

The criteria for selecting hospitals was random ,a single hospital from each Khartoum Province, in each hospital wards the 3rd bed was selected.

Data Collection Method:

● Techniques: Data was collected by Interviews using open-ended and close-ended questions.

● Data collection tool:

A semi-structured questionnaire containing :

1. Mothers' education, family income, residence.

2. Milk-tooth extraction, reason for procedure, number of children performed on, instrument of operation, operational personnel, environment of operation.

3. Attitude of mother, beneficence of traditional practice, subject of operation, reasons, place of practice, schedule children.

● Data collection procedure: Data was collected by ten trained general practitioners and medical students from caregivers with children under the age of 5 in an interviewer-administered questionnaire supervised by D.A.

Data was checked daily for consistency during data collection.

Data Quality Control:

To ensure data quality, the data collectors and supervisor underwent intensive one-day training on the study objectives, data collection procedures, and interview techniques prior to the commencement of data collection. The questionnaire was translated into the local language to ensure clarity and cultural appropriateness. A pre-test was conducted among 20 eligible caregivers (5% of the total sample size) at Soba Teaching Hospital, which was not included in the final study sample. Based on the findings of the pre-test, modifications were made to the questionnaire by adding relevant variables and response options. The internal consistency of the tool was assessed using Cronbach's alpha coefficient, which demonstrated good reliability ($\alpha = 0.82$).

Data Management and Analysis:

Data was entered and edited using the Kobo toolbox by each data collector and then exported into SPSS version 21 for analysis. Descriptive measures of statistics like the frequency with percentage, mean with standard deviation, and median with interquartile range were used to describe the socio-demographic characteristics and the practice of milk tooth extraction.

Odds Ratio (OR), 95% CI, and P-value were used to assess the strength of association and statistical significance ($p < 0.05$). To check the model goodness of fit Hosmer and Lemeshow test was used. Data collected was cleaned, entered and analyzed using the IBM® SPSS version 20 statistical package. Frequency runs were done for further editing and cleansing of the e-data. Frequency distribution tables were constructed and cross tabulations were done to examine relationships between categorical variables. Chi-square was used to test for relationships between categorical variables. All levels of significance were set at $p < 0.05$.

Ethical Concern:

Ethical clearance was granted from the ethical committee of the Department of Community Medicine, Faculty of Medicine, University of Khartoum and the Ministry of Health at Khartoum state. Written

consent was obtained from all the participants

3. Results

1. Socio-demographic characteristics

A total of 385 mothers who had children less than five years were included with a response rate of 100%. The mean age of participant caregivers was 34.96 years (SD ± 7.504). The mean age of children was 2.14 years (SD ± 1.350). Out of the 385 children, 171 (45.2%) were females and 211 (54.8%) were males. The majority of respondents, 338 (87.8%) permanently reside in Khartoum city. Regarding the mother's educational status, 142 (37%) attended primary school. As for the household's monthly income, 163 (42.3%) was ≤ 50,000 Sudanese pounds (51.72 USD dollars) **(Table 1).**

2. Mothers' Perception of Milk Tooth Extraction

Out of the 385 mothers, 363 (94.3) had heard of the practice of milk tooth extraction (MTE) in children. The majority of mothers 188 (48.8%) believed in MTE as a treatment for diarrhea in children under five. 145 (37.7%) thought the presence of milk teeth in children to be harmful, and 113 (29.4%) disagreed. 154 participants (40%) believed in the benefits of MTE. When asked about reasons for performing MTE in children under five, the most common was the practice being in the family tradition n=267 (69.4%), Followed by the child's complaint of diarrhea n= 216 (56.1%) or vomiting n=179 (46.5%), fever n=145 (37.7%) and other reasons n= 42 (10.9%) **(Table 2).**

3. Practice of Milk Tooth Extraction

About 18.4% of the participants (70 out of 385) practiced MTE on their children before five years of age (figure 103) while 44 (11.4%) of mothers intended to perform MTE on their children. The mean age of children when MTE was done was 1.22 years. MTE was commonly done below the age of 12 months, n= 58 (82.9%). There was no statistically significant difference between males and females subjected to MTE. The main decider for the practice was the grandmother, n= 22 (30.1%). The practice was most performed by a traditional healer, n= 37 (52.9%). The most used instruments were burnt coal, n= 24 (34.3%) or a curved heated object, n= 12 (17.1%). Many mothers weren't aware of the instrument used, n= 14 (20%). **(Table 3)**

The procedure costs many mothers, n= 17 (24.3%) > 5,000 Sudanese pounds (8.62 US Dollars). The majority of mothers believed that their children's health had improved following the operation, n= 58 (82.9%)**. (Table 3)**

4. Characteristics of children underwent milk-tooth extraction (MTE)

Most children (82.9%, n = 58) underwent milk-tooth extraction at 1 year of age, with fewer children at 2 years (17.1%, n = 12) and 3 years (1.4%, n = 1). The procedure was predominantly performed by traditional healers (52.9%, n = 37), followed by older women in the community (28.6%, n = 20), mothers or

relatives (12.9%, n = 9), medical assistants (11.4%, n = 8), and other performers (5.7%, n = 4). Most children experienced no complications (81.4%, n = 57), while minor complications included fever (17.1%, n = 12), bleeding (5.7%, n = 4), and other complications (4.3%, n = 3). The majority of mothers reported that their child improved after the procedure (88.6%, n = 62), whereas a smaller proportion observed improvement despite complications (11.4%, n = 8). Following the procedure, reported adverse events were fever, bleeding, teething problem, secondary infection, n= 19 (25.7%). The majority of mothers breastfed their children immediately following MTE, n=49 (70%). Some traditional healers prescribed pharmaceutical medicine for the children, n=15 (21.4%) while 2.3% of children were treated with herbal medicine (n=9). **(Table 4)**

5. Factors associated with MTE practice (Chi-square analysis)

Chi-square analysis revealed that several factors were significantly associated with the practice of milk-tooth extraction (MTE). Mothers' education level was significantly associated with MTE (χ^2 = [df = 1], p = 0.045), indicating that maternal education may influence the likelihood of performing MTE. Children from rural areas, both in North Kordofan (p = 0.005) and Khartoum (p = 0.001), were more likely to undergo MTE compared to those from urban areas. Maternal age was also significantly associated with MTE practice (p = 0.031), suggesting that older or younger mothers may differ in their attitudes toward this traditional procedure. In contrast, family income (p = 0.415), child's sex (p = 0.138), and child's age (p = 0.730) were not significantly associated with MTE, indicating no statistical effect of these variables on the practice. **(Table 5)**

Table 1. Socio-demographic characteristics of study participants (N = 385)

Table 1A. Maternal characteristics (N = 385)

Variable	Category	Frequency (n)	Percentage (%)
Mother's age (years)	15–20	27	7.0
	20–30	173	44.9
	30–40	152	39.5
	≥40	33	8.6
Mother's education	Illiterate	53	13.8
	Traditional (Khalwa)	45	11.7
	Primary school	142	37.0
	Secondary school	97	25.3
	Higher education	47	12.2

Table 1B. Child characteristics (N = 385)

Variable	Category	Frequency (n)	Percentage (%)
Child's age (years)	≤1 year	174	45.2
	2 years	85	22.1
	3 years	60	15.6
	4 years	35	9.1
	5 years	31	8.1
Child's sex	Male	211	54.8
	Female	174	45.2

Table 1C. Socioeconomic and geographic characteristics (N = 385)

Variable	Category	Frequency (n)	Percentage (%)
Residence	Khartoum city	170	44.1
	Omdurman	84	21.8
	Bahri	83	21.5
	Rural	47	12.2
Region of origin	Northern Sudan	43	11.2
	Eastern Sudan	21	5.5
	Central Sudan	153	39.7
	Southern Sudan	98	25.5
	Western Sudan	69	17.9
Monthly family income (SDG)	≤50,000	163	42.4
	50,000–100,000	128	33.3
	100,000–150,000	72	18.8
	≥150,000	21	5.5

Table 2. Awareness and beliefs about MTE (N = 385)

Variable	Category	Frequency (n)	Percentage (%)
Heard of MTE	Yes	363	94.3
	No	22	5.7
Reasons for performing MTE	Family tradition	267	69.4
	Diarrhea	216	56.1
	Vomiting	179	46.5
	Fever	145	37.7
	Other	42	10.9
MTE is treatment for diarrhoea	Yes	188	48.8
	No	93	24.2
	Not sure	87	22.6
Milk teeth are harmful	Yes	148	38.5
	No	117	30.4
	Not sure	104	27.0
Belief in benefit of MTE	Yes	154	40.0
	No	229	59.5

Table 3. Practice of MTE among participants (N = 385)

Variable	Category	Frequency (n)	Percentage (%)
Child underwent MTE	Yes	70	18.4
	No	315	81.6
Intention to perform MTE	Yes	44	15.4
	No	225	58.4
	Not sure	16	4.2

Table 4. Characteristics of children who underwent MTE (n = 70)

Variable	Category	Frequency (n)	Percentage (%)
Age at MTE	1 year	58	82.9
	2 years	12	17.1
	3 years	1	1.4
Performer	Traditional healer	37	52.9
	Older woman	20	28.6
	Mother/relative	9	12.9
	Medical assistant	8	11.4
	Other	4	5.7
Complications	None	57	81.4
	Fever	12	17.1
	Bleeding	4	5.7
	Others	3	4.3
Belief child improved	Yes	62	88.6
	Yes, but complication occurred	8	11.4

Table 5. Factors associated with MTE practice (Chi-square analysis)

Variable	df	p-value
Mother’s education	1	0.045
Rural origin (North Kordofan)	1	0.005
Rural origin (Khartoum)	1	0.001
Mother’s age	3	0.031
Family income	3	0.415
Child’s sex	1	0.138
Child’s age	5	0.730

4. Discussion

This study aimed to assess mothers’ perceptions of milk teeth extraction (MTE), determine the proportion of affected children, identify associated risk factors, and describe procedural characteristics and complications among children under five years attending Khartoum Teaching Hospitals.

The prevalence of MTE in this study was 18.4%. This finding is comparable to a previous study conducted among school children in Khartoum, which reported a prevalence of 22%. The slight reduction observed in the present study may reflect temporal changes, improvements in healthcare access, and increased availability of health information within Khartoum State. In contrast, the prevalence reported in a recent Ethiopian study (58.68%) was substantially higher. Such variability may be explained by differences in cultural norms, traditional beliefs, community awareness, and timing of data collection. Although the Ethiopian government has implemented interventions to combat the practice, persistence may reflect deeply rooted sociocultural factors.

Despite high awareness of MTE, less than half of the mothers believed in its benefits. Family tradition emerged as the predominant reason for performing the procedure, followed by diarrhea, fever, and vomiting. These findings are consistent with earlier literature. The persistence of such beliefs may be linked to the reliance on traditional healers or community elders as primary healthcare providers in many rural African settings. In this context, IOM is often perceived as a treatment for gastrointestinal symptoms attributed to unerupted “false teeth” described as worms. This highlights the critical need for sustained and culturally sensitive health education interventions [16].

Regarding the procedural characteristics, the majority of children underwent MTE during infancy, particularly within the first year of life, which aligns with previous studies describing this period as the peak age for the practice [17]. The procedure was most commonly performed by an elderly woman who received payment, reflecting the entrenched traditional and informal nature of the intervention. Burnt coal and sharp instruments were the most frequently reported tools, findings that mirror earlier research [18]. However, some mothers were unable to identify the instruments used, possibly because they were not present during the procedure.

Although most caregivers reported no observed complications, previous evidence indicates that children subjected to MTE are significantly more likely to develop enamel defects, with some studies demonstrating a 3.4-fold increase compared to non-exposed children [3].This discrepancy may be explained by delayed manifestation of dental abnormalities and difficulties in attributing teething problems to prior trauma. Additionally, some enamel defects may be misinterpreted as dental caries, contributing to uncertainty regarding the underlying cause. Intergenerational normalization of the practice may further obscure its recognition as harmful.

Traditional postoperative management frequently included herbal remedies such as Acacia, which is locally believed to have antimicrobial, anti-inflammatory, and analgesic properties [13]. However, while such remedies may provide symptomatic relief, they do not prevent structural damage to developing tooth buds and therefore cannot mitigate the risk of enamel hypoplasia or long-term dental abnormalities [17]. Interestingly, some traditional practitioners reportedly prescribed pharmaceutical medications postoperatively, potentially to control pain or reduce infection risk, suggesting partial integration of biomedical approaches within traditional frameworks.

Although MTE is often perceived as a benign cultural practice, it may delay or replace evidence-based treatment for common childhood illnesses such as diarrhea and fever [19]. Maternal perception therefore plays a central role in sustaining the practice. Addressing these beliefs through strengthened community education, engagement of traditional leaders, and reinforcement of child health programs is essential for sustainable reduction of IOM.

5. Strengths and Limitations

This study shed light on a widely spread practice among the Sudanese population attending healthcare facilities and pioneered in documenting the perception of mothers of IOM children along with accompanying complications and how they managed them. However, several limitations still exist as IOM is precipitated by multiple factors and these results cannot be generalized for other areas such as the rural areas of the country.

6. Conclusion

Our research revealed a relatively elevated prevalence of Milk Tooth Extraction (MTE). Numerous mothers hold misguided beliefs regarding MTE in children, viewing it as a beneficial traditional practice. Symptoms of common childhood illnesses among those under five were incorrectly attributed to the MTE. Factors such as maternal age, educational attainment, and rural background were linked to this practice. While no significant complications were detected, it is crucial to recognize that any unsterilized procedure performed on a child under five poses a substantial risk to their health.

7. Recommendations

To address the traditional practice of Milk Tooth Extraction (MTE), it is advisable to provide health education highlighting the negative consequences of IOM on the child's health and quality of life. Therefore, it is critical to advocate and raise awareness among parents, healthcare professionals, community leaders and traditional healers. Further research is recommended to understand the motivations behind such practices and to identify local and associated factors. Miles and Ololo suggest that collaborative programs for re-training and reshaping the practices of these practitioners are more likely to effectively reduce morbidity than attempts to suppress their work [14]. Baba & Kay proposed a substantial educational campaign encouraging the Sudanese population to consult competent authorities for health issues [15]. Established health facilities can counteract these practices through effective management, showcasing the superiority of their treatment methods. It is recommended to implement intensive health education on the causes, treatment, and prevention of fevers and diarrhea to parents and the community. This, coupled with the effective management of these diseases by health facilities, can counteract the beliefs that prompt individuals to seek treatment from traditional healers. A multi-disciplinary approach involving dental and medical professionals is advised to discourage these harmful practices. Lastly, to tackle IOM, Anjum et. al provided a guided management flowchart of suspected or confirmed IOM cases and developed a data collection tool can be used for any suspected

case of IOM, filled by a healthcare professional for documentation, or for survey purposes that can be added IOM database.

Declarations

Ethics approval and consent to participate

This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the Ethics Review Committee of the Faculty of Dentistry, University of Khartoum, Khartoum, Sudan . Written informed consent was obtained from all participating mothers prior to data collection. Participation was voluntary, and confidentiality of all collected information was strictly maintained. No personal identifiers were recorded in the data collection forms.

Consent to participate

Written informed consent was obtained from all participating mothers prior to enrolment in the study. The purpose of the study, procedures, potential benefits, and the voluntary nature of participation were clearly explained to each participant. Mothers were informed of their right to refuse participation or withdraw from the study at any time without any consequences to their child's medical care. Confidentiality and anonymity of the collected data were strictly maintained throughout the research process.

Consent for publication

Not applicable. No individual person's identifiable data are included in this manuscript.

Availability of data and materials

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Conflict of Interests

There is no conflict of interest on

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

D A : contributed to study design, data collection, and manuscript drafting.

D I : contributed to data collection and data entry.

Z A : assisted in literature review and manuscript preparation.

I M : contributed to data analysis and interpretation of results.

N T : assisted in methodology development and data supervision.

R B : participated in data collection and revision of the manuscript.

D S : contributed to literature review and critical revision.

A S : in statistical analysis and interpretation.

Z M : contributed to literature review and critical revision

H M : contributed to manuscript editing and final revision, critically revised the manuscript, and approved the final version for submission. All authors read and approved the final manuscript.

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