



Nigerian Parents' Awareness and Practices on Tetracycline Use in Children and Oral Side Effects

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Abstract

Objective: Misuse of antibiotics, including tetracycline, is prevalent in developing countries, posing risks to children's oral health. This study aimed to explore tetracycline use in children and parental awareness and practice of its oral side effects.

Materials and Methods: A cross-sectional study involving 267 parents/caregivers was conducted. Participants completed a semi-structured questionnaire that collected data on socio-demographic characteristics, knowledge, attitude, and practice of antibiotic use, as well as knowledge of the oral implications of tetracycline use. Data were analyzed to identify associations between socio-demographic characteristics, tetracycline use, knowledge of adverse effects, and awareness of oral adverse effects.

Results: A total of 267 respondents participated in the study. Among them, 23.6% were aged 31–35 years, 71.5% were female, 78.3% had a tertiary level of education, 88.0% were married, and 48.3% were skilled workers. About 39.3% of respondents reported using tetracycline in children, with most usage being self-prescribed (64.2%). Only 122 respondents (45.7%) received information about tetracycline use, with friends and family being the primary information source (37.2%). While the majority of respondents (62.2%) knew that using tetracycline in children led to adverse events, less than half cited tooth discoloration (34.1%) as an adverse effect. Significant associations were found between the level of education ($p=0.007$), occupation ($p=0.009$), and tetracycline use.

Conclusion: This study highlights poor knowledge, practice and misuse of antibiotics and tetracycline in children, with inadequate parental/caregiver awareness of oral side effects. Education and awareness campaigns are crucial to promote responsible antibiotic use, focusing on appropriate antibiotic use, potential oral adverse effects and medical supervision.

Keywords: Adverse effects, children, knowledge, parents, tetracycline-use

Introduction

Tetracycline is a broad-spectrum antibiotic used to treat various infections, but its use in children is cautious due to risks of permanent tooth stains and other side effects. [1,2] Pregnancy and childhood are critical periods where tetracycline use is approached with caution due to its potential to cause permanent tooth discoloration and other

adverse effects. [1,2] Tetracycline use during tooth development can cause irreversible discoloration. [3–7] Misuse and overuse of antibiotics are prevalent in developing countries, accelerating antimicrobial resistance and limiting treatment options. [8,9] In Nigeria, self-medication and misuse of antibiotics are common, and parents lack knowledge about proper use and potential adverse effects in children, contributing to public health risks. [10]

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The American Academy of Pediatrics recommends reserving tetracycline use in children for infections where benefits outweigh risks.[11] Tetracycline use during tooth development can cause irreversible discoloration, leading to emotional distress and psychosocial problems.[3,12] Educating patients and the public about proper medication adherence is crucial to mitigate these risks.[12] This study aims to explore tetracycline use in children and parental awareness of its oral effects, addressing a critical knowledge gap.[5–7,12] The findings will inform parent education strategies and policymakers, promoting responsible use and mitigating adverse health consequences, emphasizing the risks of antibiotic misuse and potential harm to children's health.[13] Additionally, this study aims to inform policymakers, providing insights for stricter regulations on prescription-only medications, promoting responsible use, and mitigating adverse health consequences.

By investigating tetracycline use and awareness, this study seeks to contribute meaningfully to improving public health outcomes in Nigeria and beyond. The alarming rate of antibiotic misuse in Nigeria justifies this study, highlighting the need for targeted education and stricter regulations to promote responsible antibiotic use and mitigate adverse health consequences.[14,15]

Materials and Methods

Study design

This was a cross-sectional study. It investigated the use of tetracycline in children and parental/caregiver awareness of its oral side effects.

Study participants

Adults accompanying children to the dental outpatient clinic at the University of Benin Teaching Hospital were recruited.

Sample size

Using Cochran's formula, a sample size of 241 was calculated, based on a 95% confidence level, 5% error margin, and 19.5% prevalence of awareness from a previous study.[16,17] The calculated sample size was adjusted to account for attrition, giving a total sample size of 267.

Sampling procedure

Parents who brought their children to the pediatric dental clinic and provided informed consent were included.

Data collection

A self-administered, semi-structured questionnaire gathered data on:

1. Socio-demographic characteristics
2. Knowledge of antibiotics and usage
3. Attitude and practice of antibiotic use
4. Knowledge of oral implications of tetracycline use

Data analysis

IBM SPSS version 26.0 was used for analysis. Descriptive statistics summarized socio-demographic characteristics. Inferential statistics, such as the chi-square test, were employed to examine associations between socio-demographic characteristics and tetracycline use, knowledge of adverse effects, and awareness of oral adverse effects. Results were presented in tables and charts, with a significance level of $p < 0.05$ and a 95% confidence interval.

Ethical considerations

Ethical approval was obtained from the University of Benin Teaching Hospital Ethical and Research Committee. Informed consent was obtained from participants, ensuring confidentiality and anonymity.

Results

Socio-demographics

A total of 267 Nigerian parents responded to the survey, with a mean age of 40.48 ± 8.6 years. The most represented age group was 31–35 years (23.6%). The majority of participants were female (71.5%), married (88.0%), and had a tertiary level of education (78.3%), while skilled workers comprised 48.3% (Table 1).

Tetracycline use and perceptions

Only 42.7% believed tetracycline could cure infections in children, while 51.7% thought it could treat dysentery and diarrhea; however, 19.5% disagreed. A total of 60.7% thought children could abuse tetracycline, and 39.3% reported using tetracycline in children, with 64.2% not obtaining a doctor's prescription. The frequency and duration of use varied widely (Figs. 1, 2). There was a significant association between the level of education and tetracycline use ($p = 0.007$) and between occupation and tetracycline use ($p = 0.009$). However, there were no significant associations with age, gender, or marital status and tetracycline use. Specifically, a higher proportion of unskilled workers (55.6%) and semi-skilled workers (50.0%) reported using tetracycline in children (Table 2).

Reasons for tetracycline use

The primary reason for tetracycline use in children was to treat dysentery and diarrhea (83.6%), while the least

Table 1. Sociodemographic characteristics of the respondents

Characteristics	Frequency	Percent	CI
Age group			
≤30 years	22	8.2	5.2–11.6
31–35 years	63	23.6	18.7–28.5
36–40 years	59	22.1	17.2–27.3
41–45 years	59	22.1	17.2–27.3
46–50 years	39	14.6	10.5–19.1
>50 years	25	9.4	6.0–12.7
Gender			
Male	76	28.5	23.2–34.5
Female	191	71.5	65.5–76.8
Level of education			
Primary	14	5.2	2.6–8.2
Secondary	44	16.5	12.0–21.0
Tertiary	209	78.3	73.0–83.1
Marital status			
Single	32	12.0	8.2–16.1
Married	235	88.0	83.9–91.8
Occupation			
Professional	47	17.6	13.1–22.1
Skilled worker	129	48.3	42.7–54.3
Semi-skilled worker	18	6.7	4.1–10.1
Unskilled worker	63	23.6	18.7–28.5
Dependent	10	3.7	1.5–6.4
Total	267	100.0	

CI: Confidence interval

common reason was to treat cough (3.7%). There was a significant association between the level of education and reasons for use ($p=0.05$), showing a decrease in tetracycline use as the level of education increased.

Information sources

There was poor knowledge among respondents regarding the dose and duration of tetracycline (Figs. 1, 2). The primary sources of information and prescriptions for tetracycline use were friends and family (37.2%), doctors (26.2%), and pharmacists (24.1%).

Adverse effects and awareness of oral adverse effects

Only 62.2% believed tetracycline use could cause adverse events, and the most commonly cited were tooth discoloration (34.1%), nausea (25.5%), and vomiting (16.5%). Additionally, only 37.8% were aware of oral adverse effects. A statistically significant association was documented between the level of education and awareness ($p=0.01$) and between occupation and awareness ($p=0.001$) of tetracycline use (Table 3).

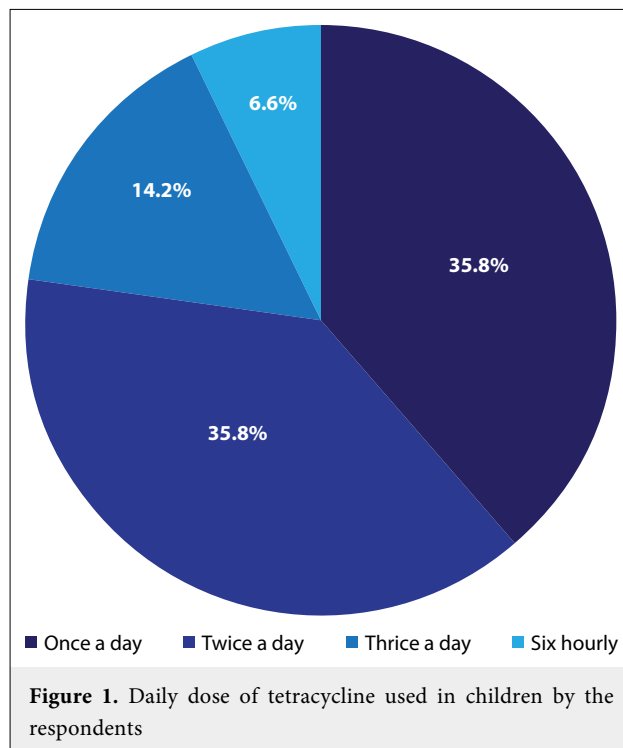


Figure 1. Daily dose of tetracycline used in children by the respondents

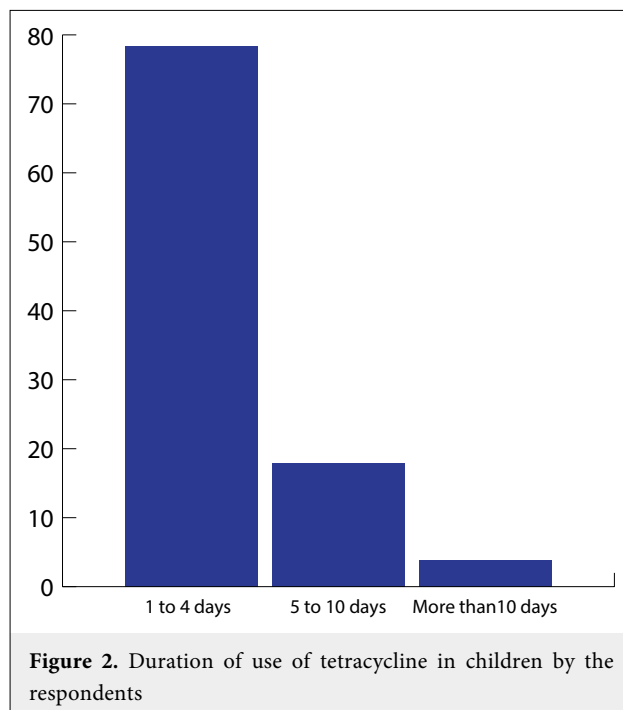


Figure 2. Duration of use of tetracycline in children by the respondents

Safety perceptions

Concerning the safety of tetracyclines, 41.9% were unsure about their safety, 24.3% were confident in their safety, and 33.7% were certain they were not safe for children. The majority (63.7%) believed tetracycline was not safe for use during pregnancy, while 97.4% had never advised a pregnant woman to use it.

Table 2. Association between socio-demographic characteristics and use of tetracycline in children

Characteristics	Use of tetracycline in children				Total	
	Yes		No			
	n	%	n	%	n	%
Level of education					p=0.007	
Primary	9	64.3	5	35.7	14	100.0
Secondary	24	54.5	20	45.5	44	100.0
Tertiary	72	34.4	137	65.6	209	100.0
Age group					p=0.53	
≤30 years	9	40.9	13	59.1	22	100.0
31–35 years	19	30.2	44	69.8	63	100.0
36–40 years	25	42.4	34	57.6	59	100.0
41–45 years	22	37.3	37	62.7	59	100.0
46–50 years	18	46.2	21	53.8	39	100.0
>50 years	12	48.0	13	52.0	25	100.0
Gender					p=0.25	
Male	34	44.7	42	55.3	76	100.0
Female	71	37.2	120	62.8	191	100.0
Occupation					p=0.009	
Professional	11	23.4	36	76.6	47	100.0
Skilled worker	47	36.4	82	63.6	129	100.0
Semi-skilled worker	9	50.0	9	50.0	18	100.0
Unskilled worker	35	55.6	28	44.4	63	100.0
Dependent	3	30.0	7	70.0	10	100.0
Marital status					p=0.35	
Single	15	46.9	17	53.1	32	100.0
Married	90	38.3	145	61.7	235	100.0
Total	105	39.3	162	60.7	267	100.0

Discussion

This study investigated Nigerian parents' awareness and practices regarding tetracycline use in children and its oral side effects. The findings revealed a limited understanding of tetracycline's effectiveness in treating childhood infections, with many parents overestimating its capabilities. Concerns about misuse and adverse effects were prevalent, with tooth discoloration, nausea, and vomiting being the most commonly mentioned side effects. The study highlighted the need for education and awareness campaigns to promote responsible antibiotic use, improve knowledge about potential oral adverse effects, and reduce the risk of antibiotic resistance.

The sociodemographic characteristics of the respondents showed parents between 24–76 years, with a

mean age of 40.48 ± 8.6 years. The 31–35-year-old age group formed the bulk of parents seeking dental care for their children, and females comprised 71.5% of the respondents, 88% of whom were married. This is consistent with previous reports,[18–20] which also state that mothers are more likely to present with their children.[21] This finding aligns with the views of researchers who argue that mothers and women can play a vital role in maintaining children's oral health if they possess the necessary knowledge.[22] Thus, it may be important to target females and mothers during oral health awareness or promotion campaigns.

At least 78.3% of this study population had a tertiary level of education. Level of education and occupation are significant predictors of awareness about oral adverse effects. This study found a significant association

Table 3. Association between sociodemographic characteristics, knowledge of side effects and tetracycline use in children

Characteristics	Presence of side effects of tetracycline use in children				Total				Knowledge of tetracycline use in children				Total		
	Yes		No		n	%	n	%	Yes		No		n	%	
	n	%	n	%					n	%	n	%			
Level of education															
Primary	8	57.1	6	42.9	14	100.0	3	21.4	11	78.6			14	100.0	p=0.01
Secondary	23	52.3	21	47.7	44	100.0	9	20.5	35	79.5			44	100.0	
Tertiary	135	64.6	74	35.4	209	100.0	89	42.6	120	57.4			209	100.0	
Age group															p=0.007
≤30 years	15	68.2	7	31.8	22	100.0	10	45.5	12	54.5			22	100.0	
31–35 years	47	74.6	16	25.4	63	100.0	31	49.2	32	50.8			63	100.0	
36–40 years	36	61.0	23	39.0	59	100.0	23	39.0	36	61.0			59	100.0	
41–45 years	25	42.4	34	57.6	59	100.0	10	16.9	49	83.1			59	100.0	
46–50 years	26	66.7	13	33.3	39	100.0	15	38.5	24	61.5			39	100.0	
>50 years	17	68.0	8	32.0	25	100.0	12	48.0	13	52.0			25	100.0	
Gender															p=0.73
Male	48	63.2	28	36.8	76	100.0	30	39.5	46	60.5			76	100.0	
Female	118	61.8	73	38.2	191	100.0	71	37.2	120	62.8			191	100.0	
Occupation															p=0.001
Professional	35	74.5	12	25.5	47	100.0	29	61.7	18	38.3			47	100.0	
Skilled worker	80	62.0	49	38.0	129	100.0	46	35.7	83	64.3			129	100.0	
Semi-skilled worker	7	38.9	11	61.1	18	100.0	2	11.1	16	88.9			18	100.0	
Unskilled worker	39	61.9	24	38.1	63	100.0	19	30.2	44	69.8			63	100.0	
Dependent	5	50.0	5	50.0	10	100.0	5	50.0	5	50.0			10	100.0	
Marital status															p=0.54
Single	26	81.3	6	18.8	32	100.0	17	53.1	15	46.9			32	100.0	
Married	140	59.6	95	40.4	235	100.0	84	35.7	151	64.3			235	100.0	
Total	166	62.2	101	37.8	267	100.0	101	35.7	162	60.7			267	100.0	

between the level of education and awareness of oral adverse effects, with individuals with higher education levels possessing greater knowledge, which is comparable with a previous report[20] and also supported by other research stating that education is a significant predictor of health-seeking behavior.[23,24] The occupation distribution, comprising mostly skilled workers (48.3%), professionals (17.6%), and unskilled workers (23.6%), provides insight into the respondents' socioeconomic status. This is in line with studies highlighting occupation as a determinant of health outcomes.[25–27] Occupation also played a crucial role, with healthcare professionals being more likely to be aware of potential oral adverse effects due to their occupation-specific education and training.[17,28]

With these results, comprising mostly females, married individuals, and participants with tertiary levels of education, one would expect a higher level of awareness regarding antibiotic use. However, the results indicate significant misconceptions about tetracycline effectiveness and safety. These findings have important implications for public health education and awareness campaigns, which should prioritize targeting individuals at all levels of education, both professionals and non-professionals, to improve knowledge about antibiotic use and its potential consequences.

Respondents demonstrated a limited understanding of tetracycline's effectiveness in treating childhood infections, with 83.6% indicating its use for treating dysentery and diarrhea. This is consistent with previous findings,[17] indicating a significant knowledge gap. This ambiguity may stem from inadequate knowledge or misinformation about appropriate antibiotic use.[29,30] This finding suggests that parents may rely on tetracyclines as a broad-spectrum solution rather than understanding its specific application. These misconceptions and lack of knowledge about antibiotics can lead to inappropriate use,[31] with 60.7% of respondents agreeing that self-prescription and misuse are possible, which could contribute to antibiotic resistance.

The findings emphasize the need for interventions and education to improve knowledge and understanding of antibiotic use among parents and caregivers, especially regarding children, ensuring appropriate use and reducing the risk of antibiotic resistance.[19] Another disturbing trend was friends and family (37.2%) being the primary source of information for tetracycline use, followed by doctors and pharmacists (26.2% and 24.1%, respectively).

A significant proportion of respondents (39.3%) had used tetracycline in children, which is particularly concerning given the potential risks associated with antibiotic misuse and its restriction for use in children under 8 years of age due to the risk of permanent tooth discoloration.[32] Furthermore, the majority (64.2%) of those who used tetracycline in children did so without a doctor's prescription, highlighting a dangerous trend and a potential lack of medical supervision and guidance.[11] The variability in daily dosage and duration of tetracycline use among respondents, as reported in a previous study,[17] is also noteworthy. Healthcare professionals should emphasize the importance of proper dosing, duration, and medical supervision to prevent misuse and potential harm.[21]

The majority of respondents (62.2%) expressed concern about the safety of tetracycline in children, citing potential adverse events. The most commonly mentioned side effects—tooth discoloration (34.1%), nausea (25.5%), and vomiting (16.5%)—align with established risks associated with tetracycline use in children.[33,34] The concern about tooth discoloration, a well-documented risk in children under eight years of age, may be driving respondents' perceptions.[2,35,36]

While it is encouraging that respondents are aware of potential adverse effects, this highlights the need for healthcare providers to engage in open discussions with parents and caregivers about the benefits and risks of antibiotic use, including tetracycline, to ensure responsible use and minimize harm. A notable proportion of respondents (37.8%) were aware of oral adverse effects associated with tetracycline use in children, exceeding the previously reported 20%.[17] This finding highlights a significant concern among parents and caregivers about the safety of this antibiotic.

The high prevalence of tooth discoloration (90.1%) as the most common oral adverse effect aligns with previous studies, which have consistently shown that tetracycline use in children can lead to permanent tooth discoloration.[2,37,38] This is particularly alarming, as tooth discoloration can have long-lasting aesthetic and psychological impacts on children, potentially persisting into adulthood.[39,40]

Respondents exhibited varying levels of certainty regarding the safety of tetracycline, with 41.9% unsure of its safety, compared to 24.3% who were sure, and 33.7% who believed it was unsafe for pediatric use. The reason for this may stem from a lack of clear guidelines or education on tetracycline use in chil-

dren. In contrast, a clear majority (63.7%) believed tetracycline is contraindicated during pregnancy, aligning with previous reports and guidelines from the American College of Obstetricians and Gynecologists (ACOG) and the Centers for Disease Control and Prevention (CDC).[33,34,41] The cautious approach to prescribing tetracycline during pregnancy is likely due to the risks of fetal harm, tooth discoloration, and the emphasis on avoiding self-medication during pregnancy.[17] Notably, an overwhelming majority (97.4%) of respondents reported never advising pregnant women to use tetracycline, indicating that healthcare providers are aware of the potential risks and are exercising caution when prescribing this antibiotic during pregnancy.

Overall, the findings emphasize the need for education and awareness campaigns to promote responsible use of antibiotics, improve knowledge about potential oral adverse effects, and reduce the risk of antibiotic resistance.

Conclusion

This study highlights poor knowledge, practice, and misuse of antibiotics and tetracycline in children, with inadequate parental/caregiver awareness of oral side effects. There is a need for education and awareness campaigns to promote responsible antibiotic use among parents and caregivers, particularly regarding tetracycline use in children. The significant knowledge gaps and misconceptions identified in this study highlight the potential for misuse and contribute to the growing concern of antibiotic resistance.

Healthcare professionals should emphasize the risks associated with tetracycline use in children, particularly the potential for permanent tooth discoloration. A multidisciplinary approach is essential to promote responsible antibiotic use, reduce resistance, and ensure the safe and effective use of antibiotics in children. Policymakers should enforce prescription requirements and regulate antibiotic sales to prevent misuse. By addressing these knowledge gaps and promoting responsible antibiotic use, we can safeguard the health and well-being of Nigerian children and contribute to a global effort to combat antibiotic resistance.

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