RESEARCH ARTICLE

Prevalence of Abscesses Associated with Carious Primary Teeth in Preschool Children and its Association with Age, Gender, Location, and Parent's Education and Social Class: An Observational Study

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Abstract

Aim: The aim of the study is to find out the prevalence of periapical abscesses within carious primary teeth. Tooth abscesses in preschool children are a source of extra attention and worry for parents. Untreated carious primary teeth have a high chance of developing into a periapical abscess.

Study design: The study design adopted was an analytical observational study.

Materials and methods: Children (n = 300) of which 56.7% males, and 43.3% females were evaluated for prevalence of abscesses associated with carious primary teeth. Teeth were examined by the WHO criteria of caries detection[1] and abscesses associated with carious teeth were observed based on clinical signs and symptoms. Statistical analysis of data was done by Z-test with the help of SPSS 16 version.

Results: Prevalence of abscesses in anterior and posterior carious primary teeth was highest at the age of 3–5 years, respectively. No significant difference was observed between the prevalence of abscesses and genders. A significant difference ($Z = 2.15$, $p < 0.05$), ($Z = 4.17$, $p < 0.001$) was observed in prevalence of abscesses of anterior and posterior carious primary teeth among urban and rural populations respectively. If parents are graduates, the development of tooth abscesses in carious primary anterior and posterior teeth was significantly reduced. The social class of parents also significantly affects the development of tooth abscesses in carious primary anterior and posterior teeth.

Conclusion: In the study, 30% abscess prevalence within carious primary teeth of preschool children was observed. Carious primary posterior teeth are two times more prone to develop abscesses as compared to carious primary anterior teeth. Social class and the education status of parents also affect the prevalence of abscesses.

Clinical significance: Data on abscesses prevalence in primary teeth helps Government to plan preventive, interceptive, restorative, and preventive educational programs at the school level.

Keywords: Carious primary tooth, Parental education, Social class, Tooth abscess.

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Introduction

Primary teeth are prone to caries due to poorly mineralized structures. Carious lesions of primary teeth are rapidly progressive, widespread, and eventually infect the pulp. This may lead to irreversible pulpitis and pulpal necrosis.

Pathogens of the infected pulp may leak out to the periapical area, leading to the development of an acute periapical abscess. If an acute periapical abscess persists for a long time, it may convert to a chronic abscess and consequential results formation of sinus/cellulite or Ludwig's angina. The development of clinical signs and symptoms of a disease depends upon the balance between host reaction and the virulence and number of pathogens. The primary carious teeth considered for the study had toothache with soft swelling, gingival sulcus drainage, sinus formation, periapical involvement, and tooth-related cellulite.

Once caries formation begins on the primary teeth, its progression depends upon the amount of consumption of sweets, snacks, junk food, oral hygiene as well as parental awareness about the importance of preserving their children's teeth.[2] Lack of awareness, negative parental attitude, parents' ignorance toward caries preventive programs, and unawareness about the consequences of poor oral hygiene play an important role in the development of untreated dental caries into abscesses. Only 4% of parents had knowledge about primary teeth and 82% of parents considered primary teeth as not important, which might be due to culture-based opinions.[3] Untreated dental abscesses may lead to premature loss of primary teeth. This results in dysfunction of chewing and occlusion, loss of dental spaces, aesthetic problems, and ultimately leads to jaw anomalies and psychological trauma to the child. When oral pathogens come into contact with periapical tissues and succedaneous tooth buds through root canal infections, this may result in the development of morphological and structural

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malformation. This study analyzes the effects of age, gender, location, parental education, and social class on the prevalence of abscesses within carious primary teeth.

Materials and Methods

Children (n = 300) aged between 3 and 6 years (56.7% males and 43.3% females) were evaluated for prevalence of abscesses within carious primary teeth. Caries examination was conducted by the WHO method of caries detection, using a plain mouth mirror, probe and tweezers with cotton pellets to clean the tooth surface. Under natural light, each tooth surface was scored independently by a single qualified examiner and data was recorded. A standard questionnaire was prepared for age, gender, location, and parental education based on the memory of parents. The parent's social class of the participating children was recorded as per Modified BG Prasad's socioeconomic classification, 2018.[4] It is an income-based scale, and therefore, constant updates are required to take inflation and depreciation of the rupee into account. The consumer price index (CPI) is used to calculate updated income categories at any given point of time. History, signs, and symptoms were correlated with each other along with IOPA X-ray findings to make the final diagnosis.

Inclusion Criteria

Tooth with a history of pain and carious exposures statuses such as near exposure or frank exposure of pulp with pain, gingival swelling, pus discharge from the periapical region, sulcus or radiolucency at furcation of primary posterior teeth, and cellulite in relation to a carious primary tooth, were included in the study.

Exclusion Criteria

Children suffering from systemic diseases, special care needs children, and children with erupted permanent teeth and missing primary teeth were excluded from the study.

Ethical clearance was obtained from the institution and signed written consent was obtained from the parents of the participating children. Children's ages were measured in years, and for those children whose age was in years and months, then months were merged with the nearest round-off number.[5] Statistical analyses were done by Z test with the help of SPSS version 16 software.

Results

Table 1 shows the prevalence of abscesses within carious primary anterior teeth and its association with age, gender, and patient location. Prevalence of abscesses in anterior primary carious teeth was 17.6%, 9.6%, 8.5%, and 5.2% at the ages of 3, 4, 5, and 6 years, respectively. Among age groups of 3–6 years, there was a significant difference in the prevalence of abscesses ($Z = 2.39$, $p < 0.05$). A total of 10% of carious anterior primary teeth had developed into periapical abscesses.

The prevalence of abscesses in carious primary teeth in males and females was 10.6% and 9.2%, respectively. There was slightly greater predilection of abscess formation in carious anterior primary teeth in males than females. No significant difference in the prevalence of abscesses was observed between males and females ($Z = 0.39$, $p > 0.05$).

Prevalence of abscesses in carious primary teeth in urban and rural areas was 15.7% and 7.7%, respectively. A significant difference

Table 1: Prevalence of abscess in carious primary anterior teeth and its association with age, gender, and patient's location

	Prevalence of abscess within carious anterior primary teeth and its association with age				
Age	3 years	4 years	5 years	6 years	Total
Prevalence of abscesses (total % within age)	17.6	9.4	8.5	5.2	10
Absence of abscess (total % within age)	82.4	90.4	91.5	94.8	90
Total	100	100	100	100	100
	• $Z = 2.39$, $p < 0.05$ (between 3 and 6 years). • $Z = 1.96$, $p > 0.05$ (between 3 and 4 years and 3–5 years).				
	Prevalence of abscess within carious anterior primary teeth and its association with genders				
Genders	Male		Female		Total
Prevalence of abscesses (total % within genders)	10.6		9.2		10
Absence of abscess (total % within genders)	89.4		90.8		90
Total	100		100		100
	$Z = 0.39$, $p > 0.05$ (between male and female)				
Patient's location	Prevalence of abscess in carious primary anterior teeth and its association with patient's location				
	Urban		Rural		Total
Prevalence of abscesses (total % within patient's location)	15.7		7.7		10
Absence of abscess (total % within patient's location)	84.3		92.4		90
Total	100		100		100
	$Z = 2.15$, $p < 0.05$ (between urban and rural)				

was observed in the prevalence of periapical abscesses in urban and rural populations (Z = 2.15, $p < 0.05$).

Table 2 shows the prevalence of abscesses within carious primary anterior teeth and its association with parents' education and social class. Among evaluated carious anterior teeth, 29% of abscesses were present in those children whose father had a history of high school education. Prevalence of abscesses of 11.9% and 7.5% within carious anterior teeth were observed in those patients whose fathers had a history of intermediate and graduate respectively. Surprisingly (0%) abscess prevalence was reported in those children whose fathers were illiterates or postgraduates. A significant difference was observed in the prevalence of abscesses within carious primary anterior teeth and father education level; high school and intermediate (Z = 2.20, $p < 0.05$), high school and graduate (Z = 3.43, $p < 0.001$), respectively.

Prevalence of abscesses in carious primary anterior teeth and their association with the mother's education was evaluated. 13%, 2.8%, 21.9%, 6%, and 5.9% abscess prevalence was observed in those children whose mother's education was illiterate, high school, intermediate, and graduate, respectively. A significant difference in the prevalence of abscesses within carious primary anterior teeth was observed, in those children whose mother's education was high school and intermediate (Z = 2.59, $p < 0.05$).

The prevalence of abscesses in carious anterior primary teeth and its association with parental social class were studied. Abscess prevalence of 4.7%, 11.3%, 16.1%, and 15.4% was observed in the upper class, upper-middle-class, middle class, and lower middle class respectively. A significant difference was observed in the prevalence of abscesses in carious anterior primary teeth and parents' social classes belong to upper class and middle class

Table 2: Prevalence of abscess in carious primary anterior teeth and its association with parent's education and social class

	Father's education vs prevalence of abscess within carious primary anterior teeth					
Father's education level	Illiterate	High school	Intermediate	Graduate	Postgraduate	Total
Total % of abscess within carious primary anterior teeth of preschool children (prevalence of abscesses)	00	29	11.9	7.5	00	10
Total % of abscess within carious primary anterior teeth of preschool children (absence of abscess)	100	71.0	88.1	92.5	100	90
Total	100	100	100	100	100	100

- Z = 2.20, $p < 0.05$ (between high school and intermediate).
- Z < 1.96, p = >0.05 (between intermediate and graduate).
- Z = 3.43, $p < 0.001$ (between high school and graduate).

Mothers' education level	*Mother's education vs prevalence of abscess in association with carious primary anterior teeth*					Total
Total % of abscess within carious primary anterior teeth of preschool children (prevalence of abscesses)	13	2.8	21.9	06	5.9	10
Total % within carious primary anterior teeth of preschool children (absence of abscess)	87	97.2	78.1	94	94.1	990
Total	100	100	100	100	100	100

- Z = 1.53, $p > 0.05$ (between illiterate and high school).
- Z = 1.52, $p > 0.05$ (between intermediate and postgraduate).
- Z = 2.59, $p < 0.01$ (between high school and intermediate).

	Social class vs prevalence of abscess within carious primary anterior teeth					
Social class	Upper class	Upper middle class	Middle class	Lower middle class	Lower class	Total
Total % of abscess within carious primary anterior teeth of preschool children (prevalence of abscesses)	4.7	11.3	16.1	15.4	00	10
Total % within carious primary anterior teeth of preschool children (absence of abscess)	95.3	88.7	83.9	84.6	100	90
Total	100	100	100	100	100	100

- Z = 2.45, $p < 0.05$ (between upper class and middle class).
- Z = 1.54, $p > 0.05$ (between upper class and lower middle class).

Table 3: Prevalence of abscess in carious primary posterior teeth and its association with age, genders and patient's location

	Prevalence of abscess within carious posterior primary teeth and its association with age				
Age	3 years	4 years	5 years	6 years	Total
Prevalence of abscesses (total % within age)	8.8	21.9	24.4	23.4	20
Absence of abscess total % within age	91.2	78.1	75.6	76.6	80
Total	100	100	100	100	100
	• Z = 2.14, $p < 0.059$ (between 3 and 4 years). • Z = 2.51, $p < 0.05$ (between 3 and 5 years). • Z = 2.35, $p < 0.05$ (between 3 and 6 years).				
	Prevalence of abscess within carious posterior primary teeth and its association with genders				
Genders	Male		Female		Total
Prevalence of abscesses (total % within genders)	20		20		20
Absence of abscess total % within genders	80		80		80
Total	100		100		100
	Z = 00, $p = 1$ (between male and female)				
Patient's location	*Prevalence of abscess in carious primary posterior teeth and its association with patient's location*				
	Urban		Rural		Total
Prevalence of abscesses (total % within patient's location)	38.8		13.7		20
Absence of abscess total % within patient's location	65.2		86.3		80
Total	100		100		100
	Z = 4.17, $p < 0.001$ (between urban and rural)				

Table 4: Prevalence of abscess in carious primary posterior teeth and its association with parent's education and social class

	Father's education vs prevalence of abscess within carious primary posterior teeth					
Father's education level	Illiterate	High School	Intermediate	Graduate	Postgraduate	Total
Total % of abscess within carious primary posterior teeth of preschool children (prevalence of abscesses)	57.1	32.3	29.9	11.6	9.7	20
Total % of abscess within carious primary posterior teeth of preschool children (absence of abscess)	42.9	67.7	70.2	88.4	90.3	80
Total	100	100	100	100	100	100
• Z = 1.23, $p < 0.05$ (between illiterate and high school). • Z = 2.93, $p < 0.01$ (between illiterate and postgraduate). • Z = 2.18, $p < 0.05$ (between high school and postgraduate). • Z = 2.90, $p < 0.01$ (between high school and graduate). • Z = 3.42, $p < 0.001$ (between illiterate and graduate). • Z=1.49, $p > 0.05$ (between illiterate and intermediate).						
Mother's education level	*Mother's education vs prevalence of abscess within carious primary posterior teeth*					Total
Total % of abscess within carious primary posterior teeth of preschool children (prevalence of abscesses)	47.8	33.3	26	8.6	29.4	20
Total % of abscess within carious primary posterior teeth of preschool children (absence of abscess)	52.2	66.7	74	91.4	70.6	80

(Contd...)

Table 4: (*Contd...*)

Total	100	100	100	100	100	100

- Z = 1.97, $p < 0.05$ (between illiterate and intermediate), Z = 5.08, $p < 0.001$ (between illiterate and graduate).
- Z = 3.29, $p < 0.001$ (between high school and graduate), Z = 3.49, $p < 0.001$ (between intermediate and graduate).
- Z = 2.63, $p < 0.01$ (between graduate and postgraduate), Z = 1.76, $p > 0.05$ (between illiterate and postgraduate).

Social class vs prevalence of abscess within carious primary posterior teeth

Social class	Upper class	Upper middle class	Middle class	Lower middle class	Lower class	Total
Total % within teeth social class (prevalence of abscesses)	10.4	22.6	28.6	38.5	00	20
Total % within social class (absence of abscess)	89.6	77.4	71.4	61.5	100	80
Total	100	100	100	100	100	100

- Z = 2.46, $p < 0.05$ (between upper and upper middle class), Z = 2.96, $p < 0.01$ (between upper and middle class).
- Z = 1.27, $p > 0.05$ (between upper middle and lower middle class), Z = 2.80, $p < 0.01$ (between upper class and lower middle class).

(Z = 2.45, $p < 0.05$). But no significant correlation was observed in the prevalence of abscesses in carious anterior primary teeth of children whose parent's belonged to the upper class and lower middle class (Z = 1.54, $p > 0.05$). No abscesses were reported within the studied lower class populations. This might be due to healthier/natural raw food habits, better immunity, and lesser availability of food items containing refined sugar in their daily lives.

Table 3 shows the prevalence of abscesses in carious primary posterior teeth and its association with age, gender, and patient location. Abscess prevalence in carious primary posterior teeth was 8.8%, 21.9%, 24.4%, and 23.4% at the ages of 3, 4, 5, and 6 years, respectively. A significant difference was observed in prevalence of abscesses within carious primary posterior teeth and in the study group of ages 3 and 4 years (Z = 2.14, $p < 0.059$), 3 and 5 years (Z = 2.51, $p < 0.05$), as well as 3 and 6 years (Z = 2.35, $p < 0.05$), respectively. A total of 20% of the studied carious primary posterior teeth were abscessed.

No significant difference was observed in the prevalence of abscesses within carious primary posterior teeth and genders. Both males and females had equal chances of developing abscesses in carious primary posterior teeth (Z = 00, $p = 1$).

The prevalence of abscesses in carious primary posterior teeth was 34.8%, and 13.7% in urban and rural populations, respectively. A highly significant difference was observed in prevalence of abscesses in carious primary posterior teeth of urban and rural populations (Z = 4.17, $p < 0.001$).

Table 4 shows the prevalence of abscesses within carious primary posterior teeth and its association with parents' education and social class. Prevalence of abscesses in carious primary posterior teeth was 77.1%, 32.3%, 29.8%, 11.6%, and 9.7% respectively in those children whose fathers were illiterate, high school, intermediate, graduate, and postgraduate, respectively.

A significant difference was observed in prevalence of abscesses within carious primary posterior teeth of preschool children whose father's education was illiterate and postgraduate (Z = 2.93, $p < 0.01$), high school and postgraduate (Z = 2.18, $p < 0.05$), illiterate and graduate (Z = 3.42, $p < 0.001$), high school and graduate (Z = 2.90, $p < 0.01$). But, no significant difference was observed in prevalence of abscesses in carious primary posterior teeth in the participating children whose father's education was illiterate and high school (Z = 1.23, $p > 0.05$), illiterate and intermediate (Z = 1.49, $p > 0.05$), respectively.

Prevalence of abscesses in carious primary posterior teeth was 47.8%, 33.3%, 26%, 8.6%, and 29.4% in the participating children whose mother's education was illiterate, high school, intermediate, graduate, and postgraduate, respectively.

A significant difference was observed in prevalence of abscesses within carious primary posterior teeth of preschool children whose mother's education was illiterate and graduate (Z = 5.08, $p < 0.001$), intermediate and graduate (Z = 3.49, $p < 0.001$), high school and graduate (Z = 3.29, $p < 0.001$), graduate and postgraduate (Z = 2.63, $p < 0.01$) and illiterate and intermediate (Z = 1.97, $p < 0.05$), respectively. But surprisingly there was no significant difference between the prevalence of abscesses in carious primary posterior teeth of the participating children whose mothers were illiterate and postgraduate (Z = 1.76, $p > 0.05$).

Prevalence of abscesses in carious primary posterior teeth and its correlation with Social class parents was studied. Prevalence of abscesses in carious primary posterior teeth was 10.4%, 22.6%, 28.6%, 38.5%, and 0% in those children whose parents belonged to upper class, upper-middle-class, middle class, lower-middle-class, and lower class, respectively.

A significant correlation of social class and prevalence of abscesses within carious primary posterior teeth was observed in the upper class and upper-middle class (Z = 2.46, $p < 0.05$), upper class and middle class (Z = 2.96, $p < 0.01$), and upper class and lower middle class (Z = 2.80, $p < 0.01$). But surprisingly no significant correlation was found in the prevalence of abscesses between the upper middle class and lower middle class (Z = 1.27, $p > 0.05$).

Discussion

Dental caries is the most common noncommunicable oral disease of childhood.[6] Untreated dental caries have a significant impact on general health, quality of life, behavior,[7] children's psychological and physical development, and their educational performance.[5] In this study, preschool children were evaluated for prevalence of abscesses in carious primary teeth and factors that might affect the development of abscesses like age, gender, location, parent's education, and social class.

Prevalence of abscesses in carious primary anterior teeth was highest at the age of 3 years followed by the ages of 4, 5, and 6 years. Ten percent of carious anterior primary teeth were affected with abscesses whereas in posterior carious primary teeth, the prevalence of abscesses was highest at the age of 5 years followed by the ages of 6, 4, and 3 years. Twenty percent of carious posterior primary teeth were affected with abscesses. Thus, a total of 30% of carious primary teeth were abscessed in preschool children. The prevalence of abscesses in carious anterior primary teeth was slightly higher in males than females. Whereas carious primary

posterior teeth had equal chances of developing abscesses in males and females ($p = 1$, Z = 00).

The location of patients played an important role in the prevalence of abscesses in carious primary teeth. In our study, the prevalence of abscesses in anterior and posterior primary teeth was 15.7%, and 34.8% in the urban population, respectively, and 7.7% and 13.7% in the rural population, respectively.

As per the recorded data, the father's education affected the prevalence of abscesses in carious primary posterior teeth. In accordance with the father's education, the prevalence of abscesses in carious anterior primary teeth was much less than the prevalence of abscesses in carious primary posterior teeth. The ratio of abscess prevalence in carious primary anterior and posterior teeth was 00:57.1, 29:32.3, 11.9:29.8, 7.5:11.6, and 00:9.7 in those patients whose father's education level was illiterate, high school, intermediate, graduate, and postgraduate, respectively.

Prevalence of abscesses in carious primary anterior teeth was in decreasing order in those children whose father's education was high school to the postgraduates, and surprisingly no abscesses were reported in those children whose fathers were illiterate. The prevalence of abscesses in carious primary posterior teeth was reduced as the father's education level increased.

Prevalence of abscesses in carious anterior primary teeth was decreased when the mother's education moved from illiterate to high school, further prevalence of abscesses surprisingly increased when the mother's education was intermediate. A further drastic fall in the prevalence of abscesses in carious anterior primary teeth was observed when the mother's education was graduate or postgraduate. Minimal abscesses prevalence within carious primary anterior teeth seen when mother's education either high school or postgraduate. The ratio of abscess prevalence in carious primary anterior and posterior teeth was 13:47.8, 2.8:33.3, 21.9:26, 6:8.6, and 5.9:29.4 in those patients whose mother's education level was illiterate, high school, intermediate, graduate, and postgraduate, respectively. A significant difference was observed in the prevalence of abscesses in carious primary posterior teeth and all mothers' education levels studied except when the mother's education was illiterate or postgraduate. Minimum prevalence of abscesses in carious posterior teeth was observed when mothers' education was graduate followed by intermediate, postgraduate, high school, and illiterate.

Prevalence of abscess formation in carious primary anterior teeth was surprisingly nil in lower classes and gradually increased from upper class (4.7%) to upper-middle-class (11.3%), with almost an equal percentage of prevalence of abscesses in the middle class (16.1%) and the lower middle class (15.4%). Whereas the percentage of prevalence of abscesses in carious primary posterior teeth in association with social class surprisingly gradually increased from upper class up to lower middle class but surprisingly nil abscesses were reported in the lower class.

A high level of parents' education, knowledge, and belonging to the upper class of society does not guarantee good oral hygiene practice and the oral health status of their children. This knowledge should be put into practice and inculcated in children's behavior in daily lives.

Conclusion

Prevalence of abscesses in carious primary teeth was evaluated and the following conclusions were inferred.

- Prevalence of abscesses in carious primary anterior and posterior teeth in preschool children was from highest to lowest 3 years >4 years >5 years >6 years, and 5 years >6 years >4 years >3 years, respectively.
- Thirty percent abscess prevalence (10% anterior + 20% posterior) within carious primary teeth was observed with almost equal sex predilection.
- Abscess prevalence in anterior primary teeth was in decreasing order when the father's education moved from high school to graduation, but surprisingly no abscesses were observed in those children whose fathers were illiterate or postgraduate. Minimal abscess prevalence was observed within carious anterior teeth when the mother's education was high school and postgraduate, respectively.
- Abscess prevalence in posterior primary teeth was in decreasing order when the father's education moved from high school to postgraduate, but surprisingly maximum abscesses were observed in those children whose fathers were illiterate. Abscess prevalence in posterior primary teeth was in decreasing order when the mother's education moved from illiterate to graduate, but surprisingly further increase in abscess prevalence was seen when the mother's education was postgraduate.
- Abscess prevalence in carious primary anterior and posterior teeth was surprisingly nil in participating children who belong to the lower class. Abscess prevalence in carious primary anterior and posterior teeth with the social class was as follows:
  - Middle class > Lower middle class > upper middle class > upper class > Lower class (for primary anterior teeth).
  - Lower middle class > middle class > upper middle class > upper class > Lower class (for primary posterior teeth).

Clinical Significance

Prevalence of abscesses in primary teeth reveals data for the government to plan, preventive, interceptive, restorative, and needs educational preventive programs as well as pediatric dentists required at the community level to resolve the issues.

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