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The prevalence of dental caries among Schoolchildren in a sample of schools in Ajdabiya City; A cross-sectional study

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Original Research Article

Abstract

Background: Dental caries is an infectious microbiological disease of the teeth that results in localized dissolution and destruction of the calcified dental tissues. It remains one of the most prevalent pathological conditions among children in most countries. Preventive measures are the cornerstone of successful treatment for dental caries in children.

Aims: The aim of this study is to determine the prevalence of caries among schoolchildren in the city of Ajdabiya and to lay the foundation for future awareness and educational programs on oral and dental health. These initiatives aim to prevent early tooth loss resulting from dental caries.

Methods: This observational cross-sectional study was conducted among 690 schoolchildren (both female and male) in six randomly selected government schools in Ajdabiya city, located in north-eastern Libya. A clinical examination was performed on the children. If caries were detected, a mark was placed next to the symbol representing the affected tooth on a designated recording sheet, according to the age groups targeted in the study. Data were analyzed using SPSS version 25.

Results: The prevalence of dental caries among the study population was high, at 84%, with the highest rates observed among 9- and 10-year-old children—95% and 94%, respectively.

Conclusions: Dental caries is considered a highly prevalent public health problem among children worldwide. This study highlights a high prevalence of dental caries among schoolchildren in Ajdabiya city, correlating with the mixed dentition stage—a phase in which permanent teeth have erupted while primary teeth are still present.

key words: Dental caries, infectious, microbiologic, Ajdabiya, prevalence, educational programs, cross-sectional study, mixed dentition.

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Introduction:

Dental caries is an infectious disease [1] caused by acidophilic bacteria capable of producing a sufficiently acidic environment (pH below 5.5) [2] as a by-product of fermenting food residues accumulated on the tooth surface. This acidic environment leads to the demineralization of the tooth structure. Four essential factors must be present simultaneously for dental caries to develop: cariogenic bacteria, a susceptible tooth surface, a source of fermentable carbohydrates (especially sugar-containing foods) to support bacterial growth, and adequate time for the bacteria to metabolize these carbohydrates and produce acid.

Several bacterial species are implicated in the formation of dental caries, with Streptococcus mutans being the most common cause. S. salivarius and Actinomyces species have been associated with root caries, while Lactobacillus species are often involved in fissure caries [3].

The lack of health education and preventive measures in schools contributes to the high prevalence of dental caries, negatively impacting children's overall health. If left untreated, caries can cause localized pain, infection, early loss of primary teeth, malocclusion, and speech disorders. Additionally, improper chewing of food can lead to digestive problems and poor absorption of essential vitamins and minerals necessary for a child's growth and health, ultimately affecting academic performance.

Material and Methods:

A cross-sectional study was conducted among a representative sample of schoolchildren aged 7 to 15 years from six randomly selected government

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schools in Ajdabiya city. The study involved four dentists and three dental assistants and was part of a medical awareness campaign carried out by the Diabetes Clinic Center in Ajdabiya in March 2024. Permission and approval for the study were obtained from the center's manager and the city's education office.

Before the dental examinations began, classroom teachers were informed of all relevant details regarding the study through an official letter sent from the health center administration to the administrations of the participating schools. The children were informed that their teeth would be examined, and participation was entirely voluntary.

Dental examinations were conducted on 690 children across the six schools. Age information was obtained directly from the students. The clinical examinations were performed using a mouth mirror and probe under natural daylight, with each child seated in an ordinary chair with a backrest. Cases of caries were recorded during the examinations. Following the assessments, the medical team educated the children about the severity of dental caries and its impact on general health. They also demonstrated proper toothbrushing techniques and discussed foods that are harmful or beneficial to oral and dental health as part of the awareness campaign. The collected data were categorized into subgroups based on the children's ages, and statistical analysis was subsequently performed.

Results:

Table (1) shows the prevalence of dental caries among the study sample according to the children's age. The overall caries prevalence was high at 84% (n =

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579). The highest caries prevalence was recorded among 9-year-old children at 95% (n=83), while among 14-year-old children, the prevalence was 64.7% (n=34).

Table.(1): The prevalence of dental caries according to the age of children

Age	Number of children examined	Percent of total group	Number of children with Dental caries	Prevalence
7 years	87	12.6%	72	83 %
8years	132	19.1%	120	91%
9years	83	12.1 %	79	95 %
10years	65	9.4%	61	94 %
11year	80	11.6%	66	82.5%
12year	112	16.2%	82	73.2%
13year	51	7.4%	39	76.5 %
14year	34	4.9%	22	64.7 %
15year	46	6.7%	38	82.6 %
Total	690	100%	579	84%

Table (2) shows the prevalence of dental caries in the primary and permanent teeth according to the palmer tooth Numbering system, which numbers permanent teeth from 1to 8 and primary teeth from A to E . The table reveals that the highest prevalence of dental caries was found in primary and permanent molars (D,E and 6), which rates 48%, 44% and 55%, respectively.

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Table.(2): The number and prevalence of caries in primary and permanent teeth according to the age and tooth classification.

Age In years	Number Of children with dental caries	frequency of dental caries in primary and permanent teeth, categorized by tooth type											
		A	B	C	D	E	1	2	3	4	5	6	7
7	72	18	16	24	65	48						7	
8	120	13	12	24	94	81						31	1
9	79	7	7	19	53	45	2	1		5	3	33	
10	61	1		9	36	39	1		2	1	4	41	1
11	66			4	11	19		1		5	13	50	6
12	82			6	16	17	2	2	4	1	9	68	8
13	39				1	5			1	1	9	38	3
14	22				1	1	3	3	5	5	5	19	6
15	38					1	1	1	2	3	10	33	13
%	84%	7%	6%	15%	48%	44%	2%	1%	2%	4%	9%	55%	7%
Total	579	39	35	86	277	256	9	8	14	21	53	320	38

Explanation of symbols in the table 2:

A: Primary central incisors.

B: primary lateral incisors .

C: primary canine.

D and E: primary molars.

1 and 2: permanent central and lateral incisors.

3: permanent canine.

4 and 5: permanent premolars.

6 and 7 : permanent molars.

Empty square : No caries frequency in this tooth type among this age group.

%: The prevalence of dental caries.

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Discussion:

The carious process involves metabolic activity within the dental biofilm. Diet plays a significant role in this process, as bacteria in the biofilm ferment suitable dietary carbohydrate substrates to produce acid, causing the plaque pH to drop within 1–3 minutes. Unfortunately, the plaque remains acidic for an extended period, taking 30–60 minutes to return to its normal pH of approximately 7 [4]. It is believed that the lower incidence of dental caries in areas with fluoridated water is due to fluoride's continuous environmental effect on the teeth, reducing enamel solubility and promoting remineralization. Moreover, optimal fluoride exposure during tooth development positively influences the structure of developing teeth [5].

The prevalence of dental caries among schoolchildren varies significantly across different geographic locations in Libya. A cross-sectional study conducted in Benghazi in 2020 among 791 children aged 12 years from 36 elementary schools found a caries prevalence of 57.8% [6]. Another study in Tripoli (2021) investigated caries prevalence and associated factors among 1,934 schoolchildren aged 6 to 12 years. The results showed a prevalence of 78% among first-grade students (6–7 years, n = 1,000) and 48.2% among second-grade students (11–12 years, n = 934) [7]. In Misurata, a cross-sectional study of 322 children aged 3–13 years revealed that 75% of children aged 3–6 years had decayed primary teeth, while only 16.5% of those aged 7–13 years were affected [8]. Additionally, a study conducted in Masallata between October 2018 and May 2019 among 340 children aged 6–12 years found that

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the prevalence of dental caries was 63.5%, with 36.5% showing no signs of caries [9]. In Sebha, a city in southern Libya, a study among 572 schoolchildren aged 6 to 14 years reported a dental caries prevalence of 77.27% [10].

Globally, dental caries remains a common health issue. A cross-sectional study in Damascus, Syria, among 1,500 children aged 8–12 years reported a prevalence of 79.1% [11]. In Egypt, a study involving 369 children aged 3–18 years found a prevalence of 74% [12]. Another study in Riyadh, Saudi Arabia, among 578 primary school children aged 6–8 years from 12 schools showed that 83% had dental caries [13]. In Huizhou city, China, a study conducted from March to May 2022 among children aged 3–5 years reported a prevalence of 73% [14].

In this study, the prevalence of dental caries was 84%. As shown in Table 1, the highest prevalence was among children aged 9 years (95%), while the lowest was among those aged 14 years (64.7%). These findings suggest a need to focus on children in this age group by providing training and raising awareness about oral hygiene, as well as implementing preventive measures to reduce caries rates. Furthermore, investigating the causes of dental caries within school settings and increasing the frequency of annual awareness campaigns are crucial and beneficial steps.

According to Table (2), the primary molars and the first permanent molars exhibited the highest prevalence of dental caries. This is attributed to their deep anatomical grooves and pits, which promote food stagnation and increase the risk of caries development—especially in the absence of proper oral hygiene.

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During the transitional years (ages 7 to 13), many children experience the eruption of all four first permanent molars and the exfoliation of primary central and lateral incisors [15]. Consequently, the occlusal surfaces of permanent molars are particularly susceptible to caries during this period due to their posterior location in the dental arch, which often makes brushing difficult for children. Additionally, the immature enamel surface of newly erupted permanent molars increases their vulnerability to cariogenic bacterial invasion [16]

The Recommendation:

This study demonstrated a high prevalence of dental caries among schoolchildren in Ajdabiya city. Therefore, it is essential to implement periodic oral health education programs throughout the year, alongside regular dental examinations in schools to detect untreated carious lesions early and reduce the overall prevalence of dental caries. Early preventive measures should also be prioritized, such as the application of fissure sealants and fluoride varnishes—particularly for children with active coronal or root caries—ideally administered twice a year.

Additionally,providing educational materials and training teachers to incorporate oral health education into the school curriculum would be highly beneficial. Encouraging children to follow a healthy diet and reduce their sugar intake also plays a crucial role in maintaining good oral health. Moreover, parents or caregivers should brush their children's teeth until the children are capable of doing so independently and should continue to supervise and assist with brushing at least twice daily.

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Conclusion:

Dental caries and their sequelae can affect children's physical growth, self-esteem, and social development due to missing, discolored, or damaged teeth. The objective of this study was to collect and provide baseline data on the prevalence of caries, which will serve as a foundation for evaluating future school-based oral health programs.

Furthermore, these findings highlight the need for targeted oral health interventions and educational programs to reduce the burden of dental caries among schoolchildren in Ajdabiya, ultimately improving their overall health and well-being

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