



Journal Homepage: -www.journalijar.com
**INTERNATIONAL JOURNAL OF
 ADVANCED RESEARCH (IJAR)**

DOI:10.21474/IJAR01/6880
 DOI URL: <http://dx.doi.org/10.21474/IJAR01/6880>



RESEARCH ARTICLE

CONDITION OF FIRST PERMANENT MOLARS AND LEVEL OF CARIOGENIC BACTERIA IN CHILDREN.

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Manuscript Info

Manuscript History

Received: 07 February 2018
 Final Accepted: 09 March 2018
 Published: April 2018

Keywords:-

Dental Caries, First permanent molar, Lactobacilli, Streptococcus mutans, Children.

Abstract

Objective: The first permanent molars are extremely influential dental structures in maxillofacial growth and development, and in the oral health status.

Aim: was to assess the Prevalence of First Permanent Molar Caries Among 7-year old Children in Al-Qassim Province and its possible correlation with the different levels of cariogenic bacteria.

Subjects & Methods: a cross sectional analytical study design. With a total of 243 children aged 7 year old selected from different schools randomly. Clinical examination of children was conducted to assess dental caries, and saliva was collected to assess S. mutans(SM) levels, lactobacilli (LB), salivary flow, and buffering capacity of saliva.

Results: Prevalence of carious first permanent molars was high 153 (63%). No statistically significant difference revealed by chi-square test between carious first permanent molars and Ph. Statistical significant difference was found between carious first permanent molars and saliva buffer capacity. The relation between caries and SM, and LB levels was highly statistically significant at $P < 0.001$. Children with carious first permanent molars tend to have high number of SM and LB in saliva than children with sound first permanent molars.

Conclusion: The Prevalence of First Permanent Molar Caries Among 7-year old Children in Al-Qassim Province is high. Levels of SM and LB were also high, this result gives an indication that there is higher risk for those children to develop more caries in their permanent teeth in the future. Moreover, it emphasizes the importance of early intervention and educational programs which should be implemented even before the FPMs erupt.

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Introduction:-

Dental caries is a bacterial disease of the calcified tissues of the teeth characterized by demineralization of the inorganic portion and destruction of the organic substance of the tooth. It is one of the main oral health problems in both industrialized and developing countries, and it affects 60–90% of school-going children. ⁽¹⁾ The prevalence of dental caries varies from 33.7% to 90% in the child population and is increasing at a worrisome rate. ⁽²⁾ Several studies reported that dental caries levels might have risen dramatically among Saudi children during the past years. ^(3,4) The first permanent molar, which might be called the first victim due to its early involvement, forms the key to

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occlusion and its early loss due to caries can have a significant impact on the future dental health of the child. Studies have shown high frequency of occlusal caries on the first permanent molar for all age groups, concluding that the occlusal surface of first permanent molar remains the most common site for caries within a short period following its eruption.^(5,7) At least two major groups of bacteria, namely mutans streptococci (MS) and Lactobacilli (LB), are able to produce organic acids during metabolism of fermentable carbohydrates.^(7,8) Studies have shown that the subjects with active caries tend to harbor a higher number of mutans streptococci and lactobacilli in their saliva than those who are caries free.^(8,9) People with high counts of these potentially cariogenic bacteria are considered to be 'at-risk', and can be targeted for intensive oral hygiene, antimicrobial therapy and dietary counseling. Many attempts have been made recently to identify those children who are more susceptible to caries development to implement specific prevention programs for them. So we aimed to assess the Prevalence of First Permanent Molar Caries Among 7-year old Children in Al-Qassim Province and its possible correlation with the different levels of *S. mutans* (SM) & Lactobacilli (LB), salivary buffer capacity and salivary PH

Subjects and Methods:-

Ethical considerations:-

The research was conducted after it was approved from Research and ethical Committee at college of dentistry-Qassim university.

Study design:-

A cross-sectional analytical study design was used to determine the prevalence of dental caries in the FPMs. A total of 243 school children was examined from randomly selected primary school grade one. Three private & five public schools were selected in Qassim region. Necessary permission was taken from school authorities and the written informed consent was obtained from the parents before the start of the study. Inclusion criteria were, children who were permanent residents of Al Qassim and children with informed consent from parents. Exclusion criteria were, children with systemic disease, children who severely ill, children were having difficulty in opening the mouth, children who have taken antibiotics in the last month and children with orthodontic appliances.⁽¹⁰⁾ The study was carried out using a specific sequence, which consisted of: Oral Hygiene Questionnaire: Questionnaires about oral habits, and oral hygiene were distributed to the children to examine their knowledge about the importance of oral hygiene. Followed by dental Examination of teeth which was carried out under natural light using a mouth mirror and dental explorer. Disposable sterilized instruments were used. No radiographs were used. The teeth were dried using cotton rolls. Dental caries were measured using dmft and DMFT for primary and permanent teeth respectively, using the criteria of WHO.⁽¹¹⁾ Procedures for assessing salivary samples for *Streptococcus mutans*, lactobacilli, salivary buffering capacity, and salivary PH level. Four tests were done, salivary PH, salivary Buffering Capacity, *Streptococcus Mutans* level in saliva and Lactobacilli level in saliva.

Method of saliva collection:-

Saliva collection was scheduled after the clinical examination. Students were examined one at a time. During saliva collection, students were asked to comfortably sit on their chairs. Children were asked to swallow the preexisting saliva, in order to clear the mouth of any residual unstimulated saliva. After this, each student was given a standard piece of paraffin wax and asked to chew it for 5 min and the stimulated saliva is collected in a sterilized container. The CRT bacteria caries risk test (Ivoclar Vivadent) was used. It enables the simultaneous determination of the mutans streptococci and lactobacilli counts in saliva by means of selective agars. The patients were asked to chew paraffin pellets in order to transfer the bacteria from the tooth surfaces in the saliva. Saliva was then collected in a suitable container. Sodium hydrogen carbonate tablet placed in the test vial releases carbon dioxide when it comes into contact with moisture. This creates favorable conditions for bacterial growth. The agars were protected. Draught, sneezing, or coughing near the agars were avoided. Both agars, mutans-streptococcus agar and Rogosa agar, were entirely covered with saliva using a pipette without scratching the culture media. Saliva was entirely covering the agars. Holding the carrier slightly oblique was done to prevent the saliva from flowing off too quickly and favors the thorough wetting of the surface. The agar carriers were immediately placed in the test vials, which are tightly sealed. Two days of incubation in an incubator at 37° C / 99° F were sufficient to allow the bacterial colonies to grow. *S. mutans* occurred as small blue colonies with a diameter of < 1 mm on the blue agar, while Lactobacilli were detected as white colonies on the transparent agar. The comparison with the corresponding pictures in the model chart permitted the assessment of the caries risk. Counting the colonies was done after the agars were taken out from the incubator. Counts higher than 10⁵ CFU of *S. mutans* and/ or Lactobacillus per milliliter of saliva indicating a high/low risk for dental caries, were recorded. Buffering capacity of saliva: CRT buffer was used to determine the buffer capacity of saliva by means of a test strip featuring a special indicator system. Each patient was asked to chew

a paraffin pellet for 5 minutes to stimulate salivation. Then saliva is collected in a calibrated container. The collected saliva is dropped off on a special test field with Pipet. The test strips are left wet with saliva for five minutes. Then buffer capacity is determined by comparing the color of the test strips with the chart given by the company. Salivary PH determination: PH was tested using PH test strips from Maximum Wellbeing by immersing the test strip in a saliva container. The strips are left for 15 second. The PH is then measured by comparing the color of the strip with that chart given by the company.

Statistical Analysis:-

The analysis of data was carried out using Statistical Package for Social Sciences Computer Software (SPSS 21.0, Inc., Chicago, USA).

Results:-

Caries prevalence: A total of 243 patients 144 (59.3%) patients was diagnosed with carious lower first permanent molars (FPMs). While 99 (40.7%) had sound lower FPMs (Table 1). while 135 (55.6%) of the patients had caries in their upper FPMs. In addition, 108 (44.4%) had sound FPMs (Table 2). 153 (63%) patient had caries in either upper or lower FPMs or both. 90(37%) patients had sound upper and lower FPMs (Table 3).

Salivary PH level: There was no statistically significant difference between caries and salivary PH in this study. 216 of the total children had normal salivary pH level. Out of those, 81(37.5%) of them had sound teeth while 135(62.5%) with carious teeth. On the other hand, out of 27 patients9 (33.3%) with sound teeth and 18(66.7%) with carious teeth an acidic pH (Table 4).

Salivary buffering capacity: High statistically significant difference was found between carious first permanent molars and sound first permanent molars in relation to saliva buffer capacity using chi-square test at $P < 0.001$. Most children had high buffer capacity. In a total of 90 children with sound teeth, 27, 27, 36 were the number of children found with low, medium and high salivary buffer capacity respectively. In reverse to that, 27, 18, 107 were the number of children with low, medium and high salivary buffer capacity respectively (Table 5).

S. mutans in Saliva: The relation between caries and SM levels was highly statistically significant. 153 children were diagnosed with SM level more than 10^5 , 36(23%) of them were found with no carious permanent teeth, while 117 (76.5%) of those children were having caries. In reverse, results of SM levels were less than 10^5 on 90 patients, 54(60%) of them had sound permanent first molars and 36(40%) had carious permanent first molars (Table 6).

Lactobacillus level in Saliva All patients found with high level of SM had high levels of LB. results of LB in saliva are the same as that found in SM. The relation between caries and LB levels was highly statistically significant. Relation between First permanent molars and dmft: The difference between sound and carious Permanent molars and dmft* was highly statistically significant at $P < 0.05$. The mean of dmft for the carious first permanent molars was 9.47, which means that for patients with carious permanent molars, the dmft was high with a mean 9.47. On the other hand, the mean of dmft for children with sound permanent molars was 5.10. There is more susceptibility for first permanent molars to be curious if dmft is high (Table 7).

Table 1:- Frequency of carious lower first permanent molars

Carious Lower First Permanent Molars					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Sound	99	40.7	40.7	40.7
	Carious	144	59.3	59.3	100.0
	Total	243	100.0	100.0	

Table 2:- Frequency of carious upper first permanent molars

Cariou Upper First Permanent Molars					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Sound	108	44.4	44.4	44.4
	Cariou	135	55.6	55.6	100.0
	Total	243	100.0	100.0	

Table 3:-Frequency of carious first permanent molars

Cariou First Permanent Molars					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	90	37.0	37.0	37.0
	1.00	153	63.0	63.0	100.0
	Total	243	100.0	100.0	

Table 4:- Relation between first permanent molar caries and salivary PH

Crosstab					
		PH_QL		Total	
		Normal	Acidic		
Caries	.00	Count	81	9	90
		% within PH_QL	37.5%	33.3%	37.0%
	1.00	Count	135	18	153
		% within PH_QL	62.5%	66.7%	63.0%
Total		Count	216	27	243
		% within PH_QL	100.0%	100.0%	100.0%

Table 5:- Relation between first permanent molar caries and saliva buffer capacity

Chi-Square Tests						
		Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square		.179 ^a	1	.673		

Table 6:- Relation between caries and SM & LB

Caries * Saliva buffer Cross tabulation							P
		Saliva buffer			Total		
		Low	Medium	High			
Caries	Sound	Count	27	27	36	90	P<0.001*
		% within Saliva buffer	50.0%	60.0%	25.0%	37.0%	
	Cariou	Count	27	18	108	153	
		% within Saliva buffer	50.0%	40.0%	75.0%	63.0%	
Total		Count	54	45	144	243	
		% within Saliva buffer	100.0%	100.0%	100.0%	100.0%	

Crosstab

			SM		Total
			More Than 10 ⁵	Less than 10 ⁵	
Caries	.00	Count	36	54	90
		% within SM	23.5%	60.0%	37.0%
	1.00	Count	117	36	153
		% within SM	76.5%	40.0%	63.0%
Total		Count	153	90	243
		% within SM	100.0%	100.0%	100.0%

T-Test Deciduous Vs. Permeant

Table 7: Relation between caries of first permanent molars and dmft Statistically significant at $p < 0.005$

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	32.322 ^a	1	.000		

Discussion:-

The prevalence of carious first permanent molars was high (63%) for children aged 7. Similar results were found in other regions in Saudi Arabia. Comparing the results to study that was conducted in Jeddah, Saudi Arabia for primary school children, they found that with 9 years old children the prevalence of carious first molars was 67% of the 9-year-old children. They also found that as the age increases, the prevalence of caries increase.^(12, 13) Another study, done in Qassim with a sample of 3000 children 80.7% had caries in their first permanent molars.⁽¹³⁾

Relation between SM, and LB were highly statistically significant. All patients found with high level of SM had a high level of LB. and our findings were in accordance with other studies.^(14, 15) There was highly statistically significant difference between caries and SM, and LB levels. SM and LB play important roles in the development and progression of dental caries. These bacteria are found in carious teeth in high levels in our study. Same results

Group Statistics						
	Caries	N	Mean	Std. Deviation	Std. Error Mean	t-test p
Dmft	1.00	153	9.47	4.174	.337	P<0.001
	.00	90	5.10	3.226	.340	

were found in other studies.⁽¹⁴⁻¹⁷⁾

There was no statistically significant difference between caries and PH in this study; this may be because the sample that was selected for the test had not eaten anything for one hour.

The salivary buffering capacity had statistically significant correlation with the number of carious teeth. It is conceivable that salivary buffering capacity depends on the acidogenicity of bacteria; including MS. Salivary buffering capacity prevents a reduction in pH by neutralizing acid in the oral cavity after sugar intake. High buffer capacity was found in the majority of the collected sample. Same results were found in a study done for children aged 6 years.⁽¹⁶⁾ As most children had neutral PH values, it was suspected to have high buffer capacity even with carious permanent molars.⁽¹⁷⁾ Saliva buffer capacity gives more information if detected in different pH values as it changes and decreases with lower pH values, and increases when pH Value is high.^(18, 19)

Conclusion:-

The prevalence of caries in Qassim region is high. Levels of SM and LB were high; this result gives an indication that there is a higher risk for this group of children to develop more caries in their permanent teeth in the future, which emphasize the importance of early intervention, and educational programs, which should be implemented even before the FPMs eruption.

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