

Review Article

Oral Health and Occlusion among in Moknine Preschool Children (Aged 3-5), Tunisia

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Abstract

Many studies reported the importance of the deciduous dentition and its rich pathology. A close relationship was also noted between occlusion in deciduous and in permanent dentitions. A literature review reported that the flush terminal plane relationship was accepted as the norm in the complete deciduous dentition, but some authors did not support this view.

Aim: The purpose of this study conducted in Tunisian preschoolers was to assess the oral health and the occlusal patterns in primary dentition.

Material and methods: The study consisted of a cross sectional survey covering 392 preschool children; 197 females (50.3%) and 195 males (49.7%) aged from 3 to 5 years in the kindergarten of Moknine (Tunisia). Oral examination was carried out in order to assess the oral health status and the occlusion characteristics.

Results: Dental caries affected 140 children (35.7%). A mean dmft of 1.12 ± 1.97 was noted with 426 decayed teeth (mean 1.10 ± 1.0), five-missed (mean 0.01 ± 0.8) and 9 filled (mean 0.01 ± 0.05); the Significant Caries Index value (SiC) was about 5.57 ± 2.26 dmft. Among 326 children in deciduous dentition, 68.7% presented spaced teeth. The dental eruption was earlier in girls. The prevalence of malocclusion was about 24.7% and the flush plane was the most frequent type of terminal molar relationship in deciduous dentition, followed by the mesial step than the distal step with 81%, 15% and 4% respectively.

Conclusion: The present paper gave an outline onto oral health status and occlusal patterns in Tunisian preschool children. The spaced dentition seemed more frequent than closed dentition and the flush plane was the most frequent type of terminal molar relationship in deciduous dentition.

Keywords

- Deciduous dentition
- Dental occlusion
- Dental caries
- Preschool children
- Tunisia

INTRODUCTION

A literature review reported that, besides its aesthetic and psychological function, deciduous dentition plays a significant role in development of speech, jaws growth's stimulation and maintenance of space for permanent dentition [1]. However, it is exposed to a rich and varied pathologies like tooth decay, trauma and anomalies of number, size and structure. Published papers also revealed that occlusion in deciduous dentition are often closely related to that in permanent dentition. The careful examination of occlusal features in children often gives an idea about the future occlusion in permanent dentition. The follow-up and the early management of slight malocclusion in children will therefore prevent the occurrence of malocclusion in permanent dentition [2]. Since the papers of Chapman (1935) [3] and later Baume (1950) [4], many epidemiological studies have been carried out to investigate the occlusal features in the

deciduous dentition. It is generally agreed through these papers that the flush terminal plane relationship was accepted as the norm in the complete deciduous dentition [3,5-8]. However many authors did not support this view and concluded that the mesial step, rather than the flush terminal plane, was the most commonly observed terminal plane relationship [9,10]. Unfortunately, such studies were rare in Tunisia as in many of developing countries, so the aim of this investigation, conducted in Tunisian preschool children was to collect and analyze data about oral health status and the occlusal features in deciduous dentition.

MATERIAL AND METHODS**Study design**

This was a cross sectional survey covering a representative preschool children sample aged from three to five years in the kindergarten of Moknine (East of Tunisia).

Ethical approval

The aim and the methodology of the study obtained the ethical approval and the authorizations by the educational and the health authorities; the parents were well informed and had given their written agreement. During the survey, children with oral diseases were referred to our paediatric dentistry department for free management according to the directives of the Tunisian National Program of Oral Health.

Sampling

Our representative sample was selected by a stratified cluster random sampling procedure. First, of 42 kindergartens stratified by district, 11 were randomly selected. Secondly, 36 children were collected in each institution. The needed sample size that depends, According to the WHO, on precision (4%) and the prevalence of oral morbidity (60%) were about 300 Children.

Sampling procedure was executed by considering the following criteria of inclusion: -No dental anomalies of number (agenesis or supernumerary teeth) - No malocclusion (teeth version) because of premature loss of deciduous teeth.

Methods

A session for oral hygiene education was performed in the first contact with children. During the next meeting, a clinical examination was carried out, according to the World Health Organization (WHO) criteria [11], to detect oral affections. Children were examined in a classroom, under daylight, with the usual dental examining instruments (dental mirror, explorer and tongue depressor); no radiographs were taken. The same investigator performed all examinations in order to avoid "inter-examiner reliability" bias. Data were recorded in a modified WHO oral health assessment form [11]. The family income was assessed from the profession of the parents. Besides the frequency of daily tooth brushing, the oral hygiene was evaluated by the simplified Oral Hygiene Index (OHI-S) described by Greene and Vermillion (1964) [12]. The scores were classified into three levels: [0-1] Good oral hygiene; [1-2] fair; [2-3] Poor. The caries experience was also assessed according to WHO criteria. The decayed (d), missing (m) and filled (f) teeth index (dmft) was determined with the significant caries index (SiC). According to Bratthall [13], the SiC index was calculated by "considering the mean dmft values of the one-third of the individuals with the highest caries score". In addition, the occlusion characteristics in deciduous dentition were recorded; notably physiologic spacing teeth and terminal molar plane, which describes the relationship, in the vertical plane of the maxillary and mandibular second primary molar. As previously defined by Baume, in the flush terminal plane, "the distal surfaces of upper and lower primary second molars lie in the same vertical plane". While in the mesial step plane, "the distal surface of the lower primary second molar is mesial to that of the upper primary second molar" and in the distal step plane, "the distal surface of the lower primary second molar is distal to that of the upper primary second molar" [4]. As regards malocclusion assessment, the Dental Aesthetic Index (DAI) introduced by WHO in 1997 [11] seemed not indicated to be used in primary dentition. The occlusal index (WHO 1987) [14] was more adapted. Its three categories are defined as follow: [Normal] "absence of

occlusal alterations"; [Slight malocclusion] "when one or more teeth presented disturbance of position like rotation ; or slight crowding; or spacing harming regular alignment"; [Moderate to severe malocclusion] "when there was an unacceptable effect on facial appearance; or a significant reduction in masticatory function or phonetic problems."

Processing data

The Statistical Package for the Social Sciences SPSS® Software, version 20.0, was used for data processing and statistical analysis. The Pearson chi-squared test was calculated to compare the different percentages and type I error risk was set at 5% level of significance.

RESULTS

As shown in Table 1, the sample included 392 children; 197 females (50.3%) and 195 males (49.7%). The gender ratio was 1.005 and the mean age of participants was 4.36 ± 0.7 years. The majority of them had a middle family's income (55.5%). With respect to the teeth brushing and the oral hygiene, we noted that of the children involved in the survey, 316 had a toothbrush (80%), but only 265 (67.6%) used it twice a day in average (1.93 ± 2.49 times a day). These rates seemed overestimated because only 27.3% of children had a good oral hygiene.

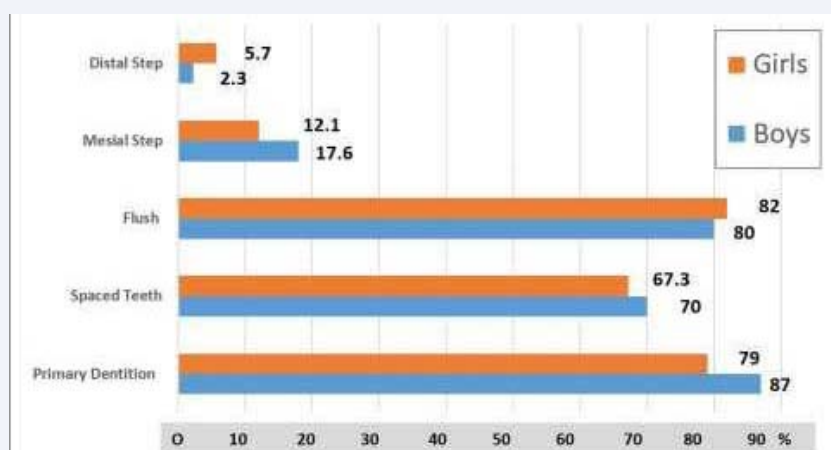
A significant statistical relation was observed between the rate of tooth brush possession with family income; in fact, this rate was lower in children from lower income family ($\chi^2 = 12.53$, $p < 0.001$). No significant relation was observed between the rate of tooth brush possession with age or with gender ($p > 0.05$). In addition, there was not a difference of oral hygiene according to age or according to gender (Table 2). The findings related to the caries experience showed that 140 children (35.7%) were affected. This prevalence varied with oral hygiene, 50% of affected children had a poor oral hygiene ($\chi^2 = 17.06$, $p < 0.01$). In the present study, the mean dmft scores were 426 decayed teeth (mean 1.10 ± 1.0), five missed (mean 0.01 ± 0.8) and nine filled (mean 0.01 ± 0.05) giving overall 440 affected teeth and mean dmft of 1.12 ± 1.97 . The significant caries index value (SiC) was about 5.57 ± 2.26 and concerned 45 children (12.8%) with dmft > 3 . No significant difference was found by age, gender and family income between children above and below 3 dmft (Table 2). Besides, the findings also showed that 326 children (83.1%) had a deciduous dentition. This percentage was lower in girls than in boys ($\chi^2 = 6.9$, $p < 0.01$) with 89.5% and 93.6% respectively (Figure 1) and decreased logically with age ($\chi^2 = 62.13$, $p < 0.000$) (Figure 2). Concerning occlusal patterns, results revealed that of children in deciduous dentition, 68.7% presented spaced teeth, while 81% of them had a flush terminal molar relationship, 15% had mesial step and 4% had a distal step (Figure 2). Asymmetrical (right/left) molar relationship was noted in 12% of cases. No significant difference was noted in these occlusal patterns by age and gender. The prevalence of malocclusion was about 24.7%, with only 13.3% children presenting moderate to severe malocclusion and needing orthodontic follow up. The analysis revealed that malocclusion was less frequent in children with spaced teeth ($\chi^2 = 39.04$, $p < 0.000$) and in children presenting flush molar relationship ($\chi^2 = 21.6$, $p < 0.001$) but malocclusion was more frequent in children with dental caries ($\chi^2 = 13.16$, $p < 0.01$).

Table 1: Sample characteristics by age, gender and family income.

	N [%]	Age by year [%]			Family income [%]		
		3	4	5	Modest	Mean	Easy
Boys	195 [49.7]	12.3	37.4	50.2	39	53.8	7.2
Girls	197 [50.3]	16.2	31.4	52.2	29.4	57	13.6
Total	392	14.3	34.4	51.3	34.1	55.5	10.5

Table 2: Oral hygiene and caries experience.

		Bad oral hygiene [%]	Dental caries [%]	Mean d [SD]	Mean m [SD]	Mean f [SD]	Mean dmft [SD]	Mean SiC [SD]
Gender	Boys	15.4	34.4	1.13 [1.04]	0.01 [0.01]	0.01 [0.04]	1.15 [0.57]	5.86 [4.2]
Age [Y]	Girls	14.2	37	1.07 [0.9]	0.01 [0.03]	0.01 [0.02]	1.09 [1.02]	5.46 [4.1]
	3	14.3	28.6	0.75 [0.06]	0 [0.03]	0 [0.23]	0.75 [0.23]	4.6 [5.1]
	4	14.1	33.3	1.08 [0.87]	0.01 [0.03]	0 [0.03]	1.09 [1.0]	5.75 [4.5]
	5	15.4	37.8	1.18 [0.2]	0.01 [0.02]	0.05 [0.02]	1.24 [0.26]	5.65 [3.2]
	Total		14.8	35.7	1.10 [1.0]	0.01 [0.8]	0.01 [0.05]	1.12 [0.02]

**Figure 1** Occlusal patterns by gender in primary dentition.

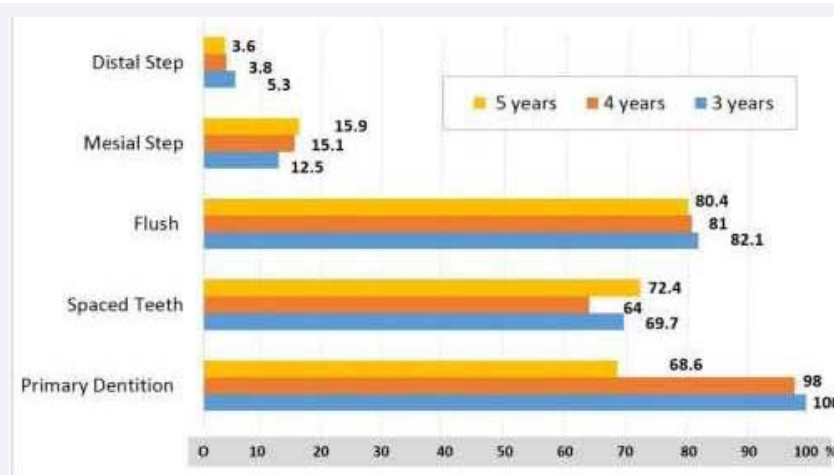
DISCUSSION

This study has assessed the oral health of Tunisian preschool children and their occlusal features. Dental caries was the most prevalent disease in our sample. Its prevalence (35.7%) was similar to that reported by Maatouk [6] (36%), it was lower than those revealed by Abid [15] (56%) in the last Tunisian national survey which investigated 670 six-year-old school children and by Henkuzena [1] whose study, conducted in Latvia to 638 children 2-6-year-old, reported that 48% of them were affected. The dmft index, which increased with age, revealed a very high “d” component while its “f” component, a conservative care indicator, was very low revealing a very important need for restorative treatment in preschoolers that may suggest a lack of motivation

among practitioners and parents towards appropriate care for primary dentition, high costs and difficult access to health care. Many studies pointed out that besides the comparison with literature data, SiC index is a reliable tool used to assess the caries risk and to identify the group of at risk children who showed caries level significantly higher than a general population [16,17,18]. In our sample the SiC index value (5.57) was almost equivalent to that revealed by Städtler in 516 Austrian children 6-year-olds [16] (6.1); while it was higher (8.1) in a study carried out by Adewakun in Eastern Trinidad for 6-year-olds children [17]. The figure is also worse, as reported by Namal [18], in 542 Turkish children, five-six years old (7.75); however it was better in Australia for 6 years old children with SiC index about 4.7 [19].

Table 3: An analysis of studies related to deciduous second molars relationship.

Authors	Year	Origin	Age [Y]	N	% class frequency		
					Mesial step	Flush terminal plane	Distal step
Baume [4]	1950	Europe	3-4.5	30	14	76	10
Farsi [23]	1996	Saudi Arabia	3-5	520	12	80	8
Maatouk [6]	2002	Tunisia	3-5	1226	28.9	50.2	5.2
Abu Alhaja [9]	2003	Jordan	2.5-6	1048	48	37	4
Keski [7]	2003	Finland	4-7.8	952	19.1	47.8	33.1
Anderson [10]	2006	American	2.1-5.2	189	89	6	5
Sukhia [8]	2009	Pakistan	2.8-5.5	78	23.6	63.2	13.2
Bhayaa [5]	2012	India	4-6	1000	36	52.5	8.4
Hedge [25]	2012	India	3-5	200	50	49	1
Our study	2014	Tunisia	3-5	392	15	81	4

**Figure 2** Occlusal patterns by age.

Even, if these comparisons are not statistically valid because of disparities of the studied samples, our findings highlighted that a community-based strategies should be adapted where the oral health goal is to increase the proportion of caries free 6 year-olds. We should therefore use SiC index to target at-risk groups for the introduction of reinforced prevention actions. Besides, this index permits an appropriate use of resources by indicating the prevention measures for children who really need them [20]. In our sample, Health promotion programs to stimulate tooth brushing and healthy dietary habits are strongly needed especially in Children at high risk. It is interesting to note, on another hand, that more girls than boys were in mixed dentition, which revealed that dental eruption was earlier in girls as generally shown in literature [21]; Shaweesh had previously reported in a study, which involved 2672 Jordanian children 4 to 16 years old that even in permanent dentition, teeth emerge sooner in girls [22].

The published studies, about occlusal patterns in the deciduous dentition, reported large differences in their results. According to Farsi, these observed variations may depend on

ethnicity, hereditary variations or a different methodology and sample composition so the comparisons between them are not reliable [23].

Concerning spaced teeth, the present study confirmed that this phenomenon is common with a percentage of 68.7% while the study of Mahmoodian conducted in 248 Iranian children aged from 4 to 5 years revealed a clearly upper frequency of these physiologic spaces with 90%; No significant difference was found according to gender [24]. The absence of these spaces can be an expression of future discrepancies between jaw and tooth size in permanent dentition [9]. Moreover, many studies reported that the deciduous molar relationship could be the best indication for the future permanent molar occlusion [2,3,9,10]. They showed that the flush terminal plane relationship progressed in the permanent dentition to a Class I molar relationship in 56% of cases and to Class II in 44%. Distal step molar relationship leads often to Class II molar relationship in permanent dentition while mesial step progressed in a greater probability for a Class I molar relationship and a lesser probability of a Class II molar relationship [2,5]. In our study, the flush terminal plane was the

most frequent molar relationship with a very high percentage (81%); these findings are very close to those reported by Baume in 1905 and by Farsi among 520 Saudi Arabian's children 3-5-year-old [23]. Farsi's study revealed that 80 % of these children presented a flush molar relationship, 12 % had a mesial step and 8 % a distal step. In the same way, Bhayya [5] revealed that of 1000 Indian children 4-6-year-old, 52.5% had a flush terminal plane, whereas 36% had a mesial step and 8.4% showed a distal step. Finally, Maatouk [6], Keski-Nisula [7] and Sukhia [8] also reported the ascendancy of the flush molar relationship with 50.2 %, 47.8% and 63.2 % respectively (Table 3).

However, these findings contrasted with those reported in Abu Alhajja study which was conducted in 1048 Jordanian children (2.5 to 6 years old): this study revealed that the mesial step molar relationship was a predominant type of molar relationship (48%) followed by the flush relationship (37 %) and finally the distal step (4 %) [9]. these results were consolidated by those reported by Anderson in 189 African American children where 89% of them exhibited a mesial step terminal plane [10]. In another study carried out by Hedge in Udaipur (India) on 200 children 3-5-year-old, findings revealed almost equal rates between the flush terminal plan (49 %) and the mesial step (50 %) [25] (Table 3). The prevalence of malocclusion in our sample (24.7%) was lower than those revealed by Abid in the last Tunisian national survey [15]; and in Maatouk's study [6] with 37% and 31% respectively. Carvalho [26] noted a prevalence of 46% in a study involving 1069 Brazilian children aged from five to six years, whereas Keski-Nisula reported a higher frequency (68%) in 953 Finnish children 4.0 to 7.8 years old [7]. As Frazão et al. [27], previously reported in 2004, our study suggested that severity of malocclusion was significantly associated with dental caries but not with gender or ethnic group. In fact, malocclusion has long been accepted as a risk factor for dental caries because of increased food and plaque accumulation in areas of crowding. It is evident, on another hand that a precocious too the extraction due to dental caries can lead to a space loss and malocclusion. However, Hafez et al., concluded in their systematic review study that there are no high-quality studies to resolve the possible association between dental crowding and caries [28].

Our study also revealed relatively low needs for orthodontic follow up (13.3%); some authors reported that the crowding in deciduous or mixed dentition is often passing and settles spontaneously during the implementation of the permanent dentition if the leeway space is well used. In the mixed dentition, early interceptive treatment of some slight malocclusions can be successful, what reduces significantly the need for orthodontic treatment in the permanent dentition according to King [29]. Finally several limitations of this paper must be taken into consideration; the major one was the subjectivity of some information given by the children or their educators like daily tooth brushing frequency. Another limitation was due to some difficulties in observing occlusion characteristics in the conditions of this survey.

CONCLUSION

The present paper gave an outline onto the oral health status, the occlusal patterns and malocclusion in the deciduous dentition in Tunisian children. Findings revealed a poor oral hygiene and a

high dental caries experience with a high needs for restorative treatment. The spaced dentition was more frequent than closed dentition and the flush plane was the most frequent type of terminal molar relationship in deciduous dentition.

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