

(RESEARCH ARTICLE)



## Absent six-year-old tooth: no prosthetic treatment and periodontal impact

Lauricia Gaël Lalanirina <sup>1, \*</sup>, Dally sylvestre <sup>2</sup>, Hasina Harimanana Ralaiavy <sup>2</sup>, Albertine Razanadraisoa <sup>1</sup>, valentina volahasina Andrianasolo <sup>1</sup>, Simone Alson Rakoto <sup>2</sup> and Emmanuel Fanja Liantsoa Ralaiarimanana <sup>1</sup>

<sup>1</sup> Department of Dental Prosthetics, Institute of Tropical Odonto-Stomatology of Madagascar, University of Mahajanga – Madagascar.

<sup>2</sup> Department of Periodontics, Institute of Tropical Odonto-Stomatology of Madagascar, University of Mahajanga, Madagascar.

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### Abstract

The six-year tooth or definitive first molar is a key tooth in the growth of the jawbone and skeleton. However, it is more prone to decay, leading to its early and often uncompensated loss. The aim of this study was to describe the factors that lead to prosthetic treatment and to identify its periodontal impact.

This is a prospective, cross-sectional descriptive study of 400 subjects attending the Kintana dispensary and the private dental practice in Antanambao Ambalavato, Mahajanga from May 2022 to October 2023. All subjects aged 18 with at least one missing permanent first molar compensated or not by a prosthesis and willing to be surveyed were included. Those who had an additional edentulous area were excluded.

The sample comprised 36.8% of women and 63.2% men. Ninety-five percent of respondents (95%) had at least one missing, uncompensated six-year-old tooth. Factors cited were financial means and refusal of a removable prosthesis (32.6%), neglect of oral health (32.6%) and lack of knowledge (31.6%). Among non-prosthesis wearers, 34% had gingivitis and 18.4% had periodontitis. The occurrence of periodontal disease was correlated very significantly with non-compensation for missing teeth ( $p=0.003$ ).

Uncompensated edentulism, even if it's a single tooth, can lead to serious periodontal diseases, which can cause the onset or worsening of general diseases.

**Keywords:** Permanent first molar; Edentulism; Prosthesis; Periodontal disease

### 1. Introduction

The six-year-old tooth is the first permanent molar to appear in a child at the age of six, located behind the temporary dentition. It forms a pillar of occlusion in the sagittal and vertical directions, and plays a key role in the maturation of orofacial functions [1]. According to the literature, the first permanent molar is the most frequently decayed tooth. Immaturity, anatomical and physiological particularities, poor manual dexterity, confusion about the nature of this tooth and the particularly carbohydrate-rich diet at the age of 6, combined with inadequate oral hygiene makes the first molar prone to decay [2, 3].

In developing countries, dental extraction is the main reason for oral consultations when faced with a painful decayed tooth and the permanent first molar is not spared from this attitude. According to a study in the city of Dakar, in 2019, 12% of children aged ten and over had at least one mandibular first molar to be extracted or already extracted and 4.4%

\*Corresponding author: Lauricia Gaël Lalanirina

in the maxilla [4]. In Tunisia, at the age of 12, the number of missing first molars was 42 teeth, rising to 72 teeth by the age of 15 [5]. In Sambava, Madagascar, 60% of six-year-old teeth were missing due to caries in subjects aged 15 to 18 [6].

Furthermore, loss of the first permanent molars (FPM) is thought to cause a lingual version of the mandibular incisors with an increase in overhang and incisor overlap [7]. This can lead to occlusal problems with repercussions on the temporomandibular joints, resulting in muscle fatigue [8].

Premature extractions of FPMs lead to significant local growth disturbances, with the formation of diastemas and bone and structural changes that have repercussions on the alveolar and basal bone. The result is an imbalance that affects the growth of the maxilla and even the facial skeleton. Moreover, unilateral mastication leads to muscular imbalance and sometimes affecting the development of the mandibular condyles, which may have an abnormal morphology. Mandibular kinetics may also be impaired [9].

We have seen that FPM is of utmost importance, especially when it is premature and uncompensated as it can have harmful repercussions on adjacent structures, hence the importance of considering prosthetic rehabilitation. Despite the evolution and variety of prosthetic treatment solutions available to manage single-tooth edentulism, we still find patients who have a missing six-year-old tooth but are not wearing a prosthesis. This led us to undertake this study, the aim of which was to describe the factors involved in abstinence from prosthetic treatment and to identify its periodontal impact.

## 2. Material and methods

- Study site: Kintana Dispensary and Tanambaoambalavato Private Dental Practice.
- Type of study: cross-sectional prospective, descriptive study
- Study period: May 2022 – October 2023
- Study population: all patients aged 18 and over with at least one missing permanent first molar who came to the Kintana dispensary and dental practice, Tanambao ambalavato Mahajanga.
- Inclusion criteria: Patients aged 18 and over with at least one missing permanent first molar whether or not compensated by a prosthesis and who agree to be surveyed.
- Exclusion criteria: all patients who met the inclusion criteria but had one or more other edentulism areas in the mouth and who had difficulty communicating were excluded.
- Conflict of interest: none
- sample size: our sample size consisted of 400 patients

The sample size was calculated from the formula

$$n = \frac{z^2 \times p(1 - p)}{p^2}$$

With z: confidence interval at 1.96, corresponding to a confidence level of 95%.

P = prevalence of missing six-year-old teeth, which was 60% according to a 2017 study [6]

$$n = \frac{(1.96)^2 \times 0.6(1 - 0.6)}{(0.05)^2} = 368.7$$

We decided to have a sample size of n= 400 to ensure the representativeness of the study

### 2.1. Data collection method

The survey was conducted in two stages: firstly a socio-demographics survey and a questionnaire interview on the factors influencing prosthetic abstinence from treatment of edentulism followed an epidemiological survey to observe and examine the state of periodontal health of the teeth around the edentulous.

## 2.2. Parameters studied

The parameters studied were:

Socio-demographic profile:

- Gender
- Age
- Place of residence

Non-compensating factors

- Minunderstanding
- Financial means
- Refusal of the prosthetic plate
- Neglect
- Lack of prosthetic space

## 2.3. Periodontal condition

We performed a periodontal examination of the teeth adjacent or antagonistic to the edentulous patient based on the clinical appearance and no radiological work-up was performed.

Periodontal health : a state free from inflammatory periodontal disease; characterized by:

- No bleeding on probing (BOP);
- No sulcular probing > 3 mm;
- No redness, swelling/ edema or pus [10].

Gingival appearance was characterized by the absence of redness, scalloped contour and no edema. Gingival inflammation was assessed by the papillary bleeding index (PBI). The diagnosis of gingivitis was made in the presence of bleeding and gingival inflammation and in the absence of deep periodontal involvement [11].

The diagnosis of periodontitis was made if the deep periodontium was affected, as evidenced by the presence of tooth mobility, gingival retraction or tooth migration [12].

## 2.4. Data analysis

The collected data were coded, recorded and analyzed on computer using the Statistical Package for Social Sciences (SPSS) 20.0 software. A univariate analysis was carried out first for the frequency distribution of the data, followed by a bivariate analysis to see the relationship between the dependent and independent variables. The significance threshold was set at  $p = 0.05$

## 2.5. Conflict of interest

Authors declare no conflict of interest

## 3. Results

**Table 1** Socio-demographic profile of samples

Profile	Effective	Percentage (%)
<b>Gender</b>		
Male	147	36.8
Female	253	63.2
Total	400	100

<b>age range</b>		
18 – 24 years	85	21.3
25 – 34 years	178	44.5
35 – 44 years	88	22.0
45 – 54 years	36	9.0
≥55 years	13	3.3
Total	400	100.0
<b>Place of residence</b>		
Urban	229	57.3
Rural	171	42.8
Total	400	100

Average age: 32.60

**Table 2** Sample distribution according to edentulism

<b>Edentulousness</b>	<b>Effective</b>	<b>Percentage (%)</b>
<b>Age</b>		
0-5 years	111	27.8
6 to 10 years	168	42.0
11 to 15 years	104	26.0
Over 15 years	17	4.3
Total	400	100.0
<b>Tooth concerned</b>		
Upper right first molar	101	25.3
Upper left first molar	171	42.8
Lower left first molar	213	53.3
Lower right first molar	283	70.8
<b>Prosthetic compensation</b>		
Yes	20	5.0
No	380	95.0
Total	400	100.0

**Table 3** Distribution of samples according to treatment proposal by odontostomatologists

<b>Prosthetic proposal by the odontostomatologist</b>	<b>Effective</b>	<b>Percentage (%)</b>
Yes	280	70.0
No	120	30.0
Total	400	100.0

**Table 4** Distribution of respondents according to factors influencing prosthetic compensation for this edentulous tooth

Factors	Prosthetic compensation						
	Yes		No		total		p-value
	Effective	%	Effective	%	Effective	%	
Lack of knowledge	0	0	120	31.6	120	30	<b>0.000</b>
Lack of financial means and refusal of removable prosthetic baseplate	0	0	124	32.6	124	31	
Insufficient space	0	0	12	3.2	12	3	
Neglect	0	0	124	32.6	124	31	
No	20	100	0	0	20	5.0	
Total	20	100	380	100	400	100	

**Table 5** Distribution of respondents according to periodontal impact and prosthetic compensation for edentulism

	Prosthetic compensation					P value
	Yes		No		Total	
	Effective	%	Effective	%	Effective (%)	
Periodontal condition of teeth surrounding edentulous						0.003
Healthy	14	70	181	47.6	195(48.7)	
gingivitis	4	20	129	34.0	133(33.3)	
periodontitis	2	10	70	18.4	72(18.0)	
Total	20	100	380	100	400(100)	

**Table 6** Distribution of respondents by periodontal impact and age of edentulism

	Age of edentulism					P value
	0-5 years	6 to 10 years	11 to 15 years old	Over 15 years	Total	
Periodontal condition of teeth surrounding edentulism	Effective(%)	Effective(%)	Effective(%)	Effective(%)	Effective(%)	<b>0.000</b>
Healthy	91(82)	72(42.8)	31 (29.8)	01 (5.9)	195(48.7)	
gingivitis	20(18)	60 (35.7)	48 (46.2)	5 (29.4)	133 (33.3)	
periodontitis	00 (0.0)	36(21.4)	25 (24.0)	11(64.7)	72 (18.0)	
Total	111(100)	168 (100)	104(100)	17 (100)	400 (100)	

## 4. Discussion

In this study, we selected 400 patients with compensated or uncompensated edentulous first molar. The aim of the study was to describe the factors that may lead to abstinence from prosthetic management of this missing tooth and to identify their consequences on the periodontal tissues.

### 4.1. Socio-demographic profile

Our sample comprised 400 patients with a predominance of female (63.2%) and a sex ratio of 0.58. This result could show that women are more affected by edentulism problems. Thera B, in 2015 and Azzaz A *and al*, in 2013 found 65.25% and 60% of the female gender respectively [13,14].

The majority of respondents were aged 25-34 (44.5%) with an average age of 32.60. This is in line with series reported in the literature where the majority of the subject (42.9%) were young people, aged between 18 to 30 [15]. But much younger compared with the study by Thioune and *al* who reported a mean age of  $42.9 \pm 13.14$  years [16].

More than half (57.3%) of those surveyed lived in Urban areas and 42.8% in Rural areas. This result is similar to the study by Samake *and al*, where the urban commune was the most represented with 75.9% of cases [15].

### 4.2. Edentulism and prosthetic compensation

The majority of respondents (42.0%) were edentulous between 6 to 10 years of age, and the lower right (70.8%) and left (53.3%) first molars were the teeth most affected by this edentulism (Table 2). This result is in line with the study carried out in Dakar, where mandibular molars were extracted more than maxillary molars (12% versus 4.4%) [4].

Ninety-five percent of those surveyed (95%) did not request denture replacement (Table 2). Only 5% had worn a resin prosthesis, which is the most common prosthesis used in dental offices in underdeveloped countries [14]. However, the development of dental technology offers other, more sophisticated and durable prosthetic restorations (conventional bridges, cantilever bridges, bonded bridges and implants) for posterior single-tooth edentulism and numerous studies have reported their efficacy [18,19, 20].

### 4.3. Factors in therapeutic abstention from missing six years tooth

A number of factors were involved in the decision not to treat this posterior unitary edentulous tooth, the main one being:

- low financial means and unacceptability of the prosthetic baseplate for removable prostheses (32.6%) (table 4). According to Sekele IB, this type of prosthesis is detrimental to oral health and is uncomfortable for the patient due to its cumbersome and unsightly nature [21]. For this reason, many patients refused the removable prostheses and preferred the fixed prostheses but only those with better economic situations had access to them, according to the study carried out in Senegal in 2012 and in Burkina Faso in 2018 [17,22]. This justifies their decision not to restore their single edentulism. According to the study by Sokolo R and *al*, the choice of edentulism treatment type was influenced by socio-professional categories [23].
- Patients' neglect of oral health was also one of the factors behind prosthetic abstention in this type of edentulous tooth. In fact, 32.6% of those surveyed thought that this was a single tooth and that its replacement was unnecessary, even though they had been informed of the consequences of the loss of the six years old tooth and the possibility of prosthetic treatment. If the patient is easily "motivated" and motivated to replace a missing tooth anterior tooth, it is not uncommon to hear that "it's not serious, it's a back tooth, you can't see it", it's useless..." for posterior teeth [24]. According to Cheylan JM, patients' motivations are almost always linked to the after-effects of edentulism: functional impotence, aesthetic handicap, psychological discomfort [25]. However, in the case of an uncompensated posterior unitary edentulism, the expected negative consequences are much less frequent, especially if the extraction of the first permanent molar takes place during the ideal age (maxilla between 6 and a half and 12 years of dental age and mandible around 8-9 years of age when the second permanent molar is built up). According to Maud D and *al*, this sometimes explains the decision to abstain from treatment in a number of situations [26].
- Lack of knowledge was also cited by respondents as a factor in not replacing the missing six-year-old tooth with a prosthesis. The study found that 31.6% of respondents had never heard that posterior teeth can be replaced by a prosthesis. According to numerous studies, little or no knowledge of the possibility of restoring an edentulous tooth is considered a risk factor for refusal or abstinence from prosthetic treatment, particularly expensive prostheses such as dental implants [27,28]. Moreover, the first permanent molar appears in the

mouth, often unnoticed by uninformed children and parents, and is often confused with deciduous teeth [29]. As a result, if this tooth is missing, the person concerned is unlikely to think about filling the gap. These different factors are strongly associated with abstention from prosthetic treatment of a first molar,  $p=0.000$ .

#### 4.4. Periodontal impact of non-prosthetic tooth compensation

In terms of periodontal tissue, periodontal disease was more frequent in edentulous non-prosthesis wearers (52.4%) than in those who had compensated for their edentulism (30%). Among non-prosthesis wearers, gingivitis accounted for 34.0% of cases and periodontitis for 18.4% (Tableau 5). Non-compensation was a highly significant predictor ( $p=0.003$ ) of the occurrence of these pathologies. According to studies, if no prosthesis, whether fixed or removable, fills the new gap, a deficient interdental contact will be created by mesial versioning of the second molar, increased space is obtained with the 2nd premolar and neighboring teeth may have versioning movements, This encourages plaque retention, contributing to the proliferation of periodontopathogenic germs that cause angular bone damage and periodontal pockets [30,31,32]. Hypermobility may develop on a reduced periodontium, and a periodontal pocket may also appear [33]. In addition, extraction of a first molar results in a 50% loss of the bone level supporting the tooth over the following 12 months, 2/3 of which occurs in the first 3 months [30].

As the age of edentulism increased, so did the incidence of periodontitis (64.7% of respondents with edentulism aged over 15 years). A highly significant correlation ( $p= 0.000$ ) was found between age of edentulism and periodontal disease (Table 6). According to Godinot Julien, periodontal disease increases significantly with age (significant increase in number of sextants affected, number of deep pockets, loss of attachment and bone loss) [31]. The age of extraction seems to have an influence on the development of migration and versioning: if edentulism occurs after the age of 26, the consequences are less frequent [34].

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## 5. Conclusion

The six-tooth is a key tooth in harmonizing the dental arch and establishing occlusion while ensuring oral function. However, the absence of this tooth was not generally considered in relation to its prosthetic management.

It was concluded from this study that the absence of the six-year-old tooth not compensated for by prosthetic treatment existed and is real. Prosthetic abstention from this edentulous tooth was significantly associated with insufficient financial means, refusal of removable prostheses, neglect of oral health and lack of awareness of the possibility of prosthetic treatment. It is a significant cause of periodontal disease such as gingivitis and periodontitis.

Thus, the absence of the six-year-old tooth and prosthetic treatment in Madagascar is still a public health problem that needs to be addressed in order to put in place an effective strategy to make the population aware of the seriousness of being edentulous, and to facilitate access to prosthetic care.

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## Compliance with ethical standards

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### *Disclosure of conflict of interest*

The authors declare no conflicts of interest.

### *Statement of ethical approval*

The present research work does not contain any studies performed on animals/humans subjects by any of the authors'.

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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