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Research Article

Prevalence of Tooth Decay and Associated Factors in North-Benin Schools in 2014

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Abstract

Introduction: The oral - dental pathologies as tooth decay raise a serious public health problem in the world. They remain a reason of morbidity related to the access to treatment and socio-economic problems.

Objective: The aim of this research was to study the prevalence and the factors associated to the tooth decay in scholar environment in Parakou in 2014.

Methods: It was a cross sectional descriptive and analytic survey which has taken place from May to June 2014. School children aged five to fourteen years old in public primary schools of Parakou were included. The sampling was probabilistic and multi-stages (three degrees). The school children and their mothers answered a questionnaire completed with an oral-dental examination.

Results: Our survey was based upon 536 school children and their mothers. The mean age of the school children was 9.61 years ± 1.82 year and the sex - ratio was 1.22. The tooth brush was the most used brushing instrument used (60.82%). In 60.82% of the cases, the school children consumed sweets at least once a day. The average DMFT index was of 1.23. The prevalence of tooth decay was 38.62%. Factors associated with the tooth decay were the consumption of sweets (p=0.032), the control of teeth cleanness by parent after brushing (p=0,007), the dental pains (p=0,000), the education level (p=0,000) and the living environment (p=0,000).

Conclusion: These results confirm the existence of the tooth decay among scholars. It is necessary to implement preventive measures among them.

Keywords

Tooth decay; DMFT index; Prevalence; Associated factors; School children

Introduction

Oral and dental diseases such as tooth decays raise serious public health issue globally [1]. The rapid globalization of African cities has produced substantial changes in eating habits, among the youth [2]. In Africa, tooth decay prevalence is still very high due the increasing intake of sugar and insufficient exposure to fluorides, among children [3]. The burden of this disease has a heavy impact on poor and marginalized populations [1]. In Sub-Saharan Africa, 14 States adopted a national oral and dental health plan in 1998. However, the implementation and evaluation of those guidelines remain limited [4]. The DMF (Decayed, Missing, Filled) Teeth index has been increasing steadily [5].

In Benin, though oral and dental diseases affect all the population segments and are defined as national priorities, tooth decay prevention as public health concern remains largely ignored.

Many others studies have shown the load of tooth decay among child morbidity [6-8]. Undertaking another study in such a field can help authors and school health authorities to implement prevention and tooth care measures as oral hygiene for healthier teeth, an oral health education module in school programs and the integration of oral systematic visits [6] for schools children in order to reduce its load.

In this context, we consider it relevant to perform this work which aimed to determine prevalence of tooth decay and identify factors associated with it in Parakou schools in 2014.

Study Setting Participants and Method

Study location

The study was carried out in public primary schools of Parakou (North-Benin). The town of Parakou has 21 public nursery schools and 148 public primary schools. The number of public primary school students is estimated at 45,268 (22,306 boys and 22,962 girls) according to the Statistics Office of the School district.

Type and duration of study

The study was a descriptive cross-sectional and analytical one. It has been performed from 1st of May to 30th June 2014.

Inclusion criteria

This study involved school-aged (from 5 to 14 years old) children enrolled in public primary schools of Parakou during the study period.

Exclusion criteria

Children whose parents did not give their consent and those who were not present during the survey were excluded.

Sampling

We used Schwartz formula to calculate the minimal size of our sample: p=0.461 [9]. We obtained n =472 school students, to which we had added 10% (48) for possible losses i.e. a total of 520 school students.

A three-stage random sampling technique has been used. The sampling frame consisted of the list of all public primary schools of the two school districts of Parakou with their respective numbers i.e. 148 public primary schools. In the first stage we selected 1/5 of the public primary schools of the town i.e. 30 public primary schools. In the second stage we selected 1/5 among classes in public primary schools. In the third stage we selected half (50%) of school students in the classrooms identified. By means of a numbered alphabetical list of students received from the school management board, we carried out a random draw of 50% of the classroom students by using Epi 6 software.

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Study variables

The outcome variable was the existence of tooth decay. The independent data were sociodemographic (sex, age), related to knowledge of tooth decay, eating habits and teeth brushing habits, and clinical. The parents' sociodemographic characteristics had also been investigated.

School students'knowledge about tooth decay was considered good if the answer to the question was correctly given and poor in case of inadequate answer. Socio-economic level was assessed through the national socio-economic assessment tools. Parental control over child teeth brushing condition was considered as always done when that control was made every day, often when made three to four times a week, sometimes when made twice and qualified as never when that control has never been done by parents.

Data collection

The data collection technique used was an interview with children followed by an oral exam. In a second time, parents were interviewed through their children or at home by using the addresses given by the children, in order to collect sociodemographic data concerning them.

The exams were performed by physicians who were previously trained for that purpose. The oral and dental exam was focused on teeth checkup and exploration of their surface with a mouth mirror, a lamp and tongue depressors. Four qualitative parameters were thus recorded, especially the presence of missing, decayed, decayed and lead-lined or filled, while specifying its number and quantity according to the World Dental Federation (WDF) numbering or notation system.

Data processing and analysis

After data collection, the survey questionnaires were manually processed in order to verify completeness of filling. The data were captured with EPI DATA software version 3.1 and analyzed with EPI info 7. EXCEL 2007 was used for data presentation in the form of tables and graphs. The averages were presented with their standard deviation and the proportions with their confidence interval. Pearson's X^2 test was used with a 0.05 significance level, a confidence interval and its p-value to compare the different frequencies.

Logistic regression has been used as a model for identification of independant variables associated to tooth decay among students. Independant variables with less than or equal to 20% significant threshold were used to generate a bivariate analysis. A descendant step by step alteration has been made to identify significant variables for a final model with <5% threshold limit and Hosmer Lemeshow test was used to determine the final model adequation.

Ethical and professional considerations

This study received approval from institutional ethical committee review board. The subjects' anonymity and confidentiality were respected. Informed consent of all respondents was obtained.

Results

A total of 536 school students aged 5 to 14 years were registered in this research work.

Distribution of school students according to age and sex

More than half of the children were males with a sex ratio of 1.22. School students' mean age was 9.61 years ± 1.82 (minimum 5years, maximum 14 years). In 49.44% of the cases, school students were under 10 years of age. About three in four school students lived in urban areas. Toothbrush was used by 60.82% school students. In 50.19% of the cases, parents had never examined their children's teeth condition after they finish brushing their teeth. Results are detailed in Table 1 and 2.

School students' knowledge of tooth decay and eating habits

About 60.13% of school students claimed to have a good knowledge of tooth decay.

As regards type of foods, 53.73% of the school students took candies and sweetened drinks. In 60.82% of the cases, school students consumed high-sugar foods at least once a day. Among the ones who consumed sweetened foods 50% were used to taking sweets and sweetened drinks on a regular basis. These results are detailed in Table 2.

Prevalence of tooth decay and DMFT index

Among the 536 school students interviewed, 207 had tooth decay (38.62%; $IC_{95\%}$=[34.50; 42.90]). The total number of decayed (D) teeth was 536; the total number of missing (M) teeth was 123 and there were 2 filled (F) teeth; Number of subjects examined=536. The total number of DMF (D+M+F) teeth was 661. DMFT index was 1.23 within our sample (Table 3).

Factors associated with tooth decay

The factors associated with the occurrence of tooth decay were toothache (OR 1.75; 95%CI 1.42- 2.16; p=5.79.10⁻⁶), intake of

Table 1: Sociodemographic characteristics of parents and students within the framework of the study on tooth decay prevalence in Parakou schools in 2014.

Variables	Frequency	%	Frequency of tooth decay's cases
Sex			
Male	295	55.04	91
Female	241	44.96	116
Age (in years)			
[05 – 10[	265	49.44	97
[10 – 14]	271	50.56	110
Area of residence			
Suburban area	142	26.49	122
Urban area	394	73.51	85
Religion			
Christian	217	40.49	78
Muslim	311	58.02	127
Traditional	6	1.12	02
Others	2	0.37	00
Mothers' socio-demographic characteristics			
Age			
[20 – 40[	421	78.54	61
[40 – 65]	115	21.46	146
Educational background			
None	237	44.22	92
Primary	179	33.39	65
Secondary	102	19.03	43
University	18	3.36	07
Households' socioeconomic status			
Low	323	60.26	131
Average	144	26/87	53
High	69	12.87	23

Table 2: Distribution of primary school students according to their habits, knowledge and clinical characteristics as regards tooth decay in Parakou schools in 2014.

	Frequency	%	Frequency of tooth decay's cases
Tooth brushing tool			
Toothbrush	326	60.82	59
Toothpick	156	29.10	125
Cotton/charcoal	47	8.77	21
Others*(vernonia leaf)	7	1.31	02
Control over child tooth condition			
Sometimes	118	22.01	26
Always	100	18.66	16
Often	49	9.14	44
Never	269	50.19	121
Frequency of daily brushing			
Once	387	72/20	08
Twice	114	21.27	153
Three times	17	3.17	41
Do not know	18	3.36	05
Knowledge of tooth decay disease			
Good	333	62.13	103
Poor	203	37.87	104
Breakfast (n= 536)*			
Consistency foods	398	74.25	139
Sweetened foods	227	42.35	18
Candy	279	52.05	16
Drinks taken during the recess or playtime (n= 536)			
Sweetened drinks	288	53.73	142
Water	367	79.61	65
Frequency of intake of sweets			
Once a day	326	60.82	83
Twice a day	133	24.86	36
More than twice a day	77	14.32	24
Toothaches			
Yes	92	17.16	152
No	444	82.84	55
Attitude towards toothache (n=92)			
Nothing	37	40.22	13
Consult a dentist	5	5.43	10
Medication	50	54.35	32
*one subject can give more than one answer			

sweets (OR 1.30; 95%CI 1.02 – 1.66; p=0.032), parental control over child's tooth condition after brushing (OR1.73; 95%CI 1.21 – 2.47 with p=0.0069), level of knowledge about tooth decay (OR 1.66; 95%CI 1.36 - 2.03 with p=0.00). Besides, urban or suburban living environment was associated with occurrence of tooth decay (OR 1.93; 95% CI $_{\%}$1.91 -1.95 with p=0.00). An attempt of multivariate analysis shows an association between poor parental control over cleanliness of tooth brushing and tooth decay and students living in suburban area and tooth decay. These findings are detailed in Tables 4 and 5.

Discussion

This descriptive cross-sectional and analytical research work helped us determine tooth decay prevalence in Parakou schools in 2014 (38.62% with 95% CI $_{\%}$=[34.50; 42.90]) and identify the factors associated with tooth decay in Parakou schools in 2014. The factors associated with tooth decay were intake of sweet, parental control

over tooth cleanliness after brushing, toothaches, school students' level of knowledge about tooth decay disease and living environment.

The type of three-stage random sampling allowed us to limit selection biases and ensure a good representativeness of our sample. The performance of a three-stage random sampling and compliance with inclusion criteria enabled us to register 536 school students. The interview method used also permitted to reduce the causes of errors and biases in answers for after explanation of the study content to the students, the survey sheet was given to them to be filled in at home with the help of parents. The interviewers were distributed into students' homes in the event of missing data to complete the questionnaire. Those different precautions enabled to improve the reliability and quality of the data collected and the validity of results.

As well, one of the biases expected in this study could be related to the quality of dental exam. To minimize that bias the examiners were previously trained by specialists.

Comparison of results with those of other authors and study relevance

In our research work mean age was 9.61 years ± 1.82. A study carried out by Maroya [10], on oral and dental health in the schools of Cotonou in 2014 had found out a mean age higher than the one identified in our sample (13.2 years ± 1.5) for its target consisted of adolescents. In our study, male sex predominated (sex ratio estimated at 1.22). Boys were also more numerous in the studies conducted in 2009 in Mali by Kebe and in Gabon by Koko et al.; in those studies sex ratios were respectively 1.14 and 1.4 [11,12]. In contrast, boys were not more represented in the study of Lo et al. in 2001 in Senegal [13].

In this research work, children living in urban areas were more represented than those living in suburban areas. This predominance of children living in urban areas was also observed in the study performed by Fall in Senegal [14]. This could be a common situation in west-African cities.

Tooth brushing habit and knowledge level

As regards tools used for tooth brushing, 60.82% of school students used toothbrushes. The proportion of children using toothbrush in our sample is lower than the one observed by Koko et al. in Gabon (97.9%) [12], the one observed in Cameroon by Majoli in 2003 (86.1%) [15], in Congo by Okoko (99.4%) [7] and in Southern Benin by Djossou et al. (73%) [6].

On the contrary, this proportion is higher than the one reported by Kebe in Mali (59.70%) [11] and by Moalic et al. (3.33%) in the South-Benin in 1998 [16].

Table 3: Frequency of decayed, missing and filled teeth in Parakou schools in 2014.

	Frequency	(%)
Number of decayed teeth		
1	51	24,64
[2-3]	103	49,76
[4-6]	48	23,19
More than 6	5	2,41
Number of missing teeth (n=207)		
0	123	59,42
1	50	24,15
2	29	14,01
3	05	2,42
Number of filled teeth	02	

Table 4: Relationship between tooth decay and students and mothers sociodemographic characteristics, students' habits and clinical characteristics in Parakou in 2014.

	Total	Tooth decay		OR	[95% CI]	p
		n	%			
Sex						
Female	241	91	37.76	1		0,71
Male	295	116	39.32	1.04	0.89-1.29	
Age of students						
[05-10[	265	97	36.60	1		0.34
[10-14]	271	110	40.59	1.11	0.89-1.37	
Toothaches						
No	444	152	34.23	1		$5.79.10^{-6}$
Yes	92	55	59.78	1.75	1.42 – 2.16	
Intake of sweets						
No	177	57	32.20	1		0.032
Yes	359	150	41.78	1.30	1.02 – 1.66	
Instruments used for brushing teeth						
Tooth pick	156	59	37.82	1		0.78
Toothbrush	326	125	38.34	1.01	0.79-1.29	
Cotton/charcoal	47	21	44.68	1.18	0.81-1.72	
Other*	7	2	28.57	0.75	0.23-2.48	
Parental control over tooth cleanliness after brushing						
Always	100	26	26.00	1		0.0069
Often	49	16	32.65	1.25	0.75 – 2.11	
Sometimes	118	44	37.29	1.43	0.96 – 2.15	
Never	269	121	44.98	1.73	1.21 – 2.47	
Level of primary school students' knowledge about tooth decay disease						
Good	333	103	30.93	1		0.00
Poor	203	104	51.23	1.66	1.36 - 2.03	
Educational background of students' mothers						
None	237	92	38.82	1.06	0.83 – 1.37	0.81
Primary	179	65	36.31	1		
University	102	43	42.16	1.16	0.86 – 1.56	
Secondary	18	7	38.89	1.07	0.58 – 1.97	
Monthly income level of students' household of origin						
Low	323	131	40.56	1		0.46
Average	144	53	36.81	0.90	0.70 – 1.17	
High	69	23	33.33	0.82	0.57 – 1.18	
Students' living environment						
Urban	394	122	30.96	1		0.00
Suburban	142		59.86	1.93	1.91 -1.95	

*vernonia leaf

These differences are probably the results of differences in the socio-economic level of populations of Gabon, Cameroun and those of Benin and Mali. However the difference in the knowledge level of these populations are probably the results of educational level and lack of consistent and continuing dental and oral hygiene programs in scholar curricula in Benin schools.

The comparison of the findings of the study carried out by Moalic et al. in 1998 with ours shows a possible change and progression in oral and dental health habits by an increased use of toothbrush [16]. Among the urban population toothbrush is the most preferred because it provides a quick maintenance of oral and dental health. Moreover, it is more accessible due to its relatively low cost. This fact would provide a better explanation of the result. However, according to Moalic et al. [16], some populations living in urban areas of Benin would keep on using toothpicks i.e. plant-made toothbrushes.

Within our sample 3.17% of the children said that it was recommended to brush one's teeth at least three times a day but 72.20% said it was recommended to brush teeth once per day. Those results indicate a lack of Information, Education and Communication as regards oral and dental health. At the same time, one school student in four did not know how often it is necessary to brush teeth a day.

Concerning the frequency of sweets intake, the study showed that 60.82% of students consumed sweets at least once a day. Candies and sugar-sweetened drinks were the types of sweet that are most consumed (50%). This proportion was higher than the one observed by Maroya in 2014 in Cotonou schools where 24% of children consumed sweets at least once a day [10].

The high proportion of children consuming sweets in our study could be due to our sample target. In that age group, children are more attracted by sweetened beverages and foods without nutritive values.

Table 5: Attempt of multivariate analysis showing the relation between some characteristics and tooth decay.

	Total	Tooth decay		Adjusted OR	[95% CI]	p
		n	%			
Parental control over tooth cleanliness after brushing						
Always	100	26	26.00	1	-	
Often	49	16	32.65	1.55	0.85 – 2.83	0.14
Sometimes	118	44	37.29	1.28	0.59 – 2.77	0.51
Never	269	121	44.98	2.00	1.18 – 3.37	0.009
Students' living environment						
Urban	394	122	30.96	1	-	
Suburban	142	85	59.86	3.11	2.08 -4.65	0.000

Consultation of a dentist is rare. In our study, 17.16% said that they had toothaches. Among them, only 5.43% had consulted a dentist. In Cote d'Ivoire, Samba et al. had emphasized that when dental problem occurs, 11.4 % of Abidjan inhabitants went to a dentist as a first-line care provider [17]. The low rate of dental practices attendance noted in this research work may be due to self-medication, traditional dental care providers, lack of dental practices or clinics in Parakou and to relatively high cost of consultations for dental care.

Prevalence of tooth decay: was estimated at 38.62% 95% CI [34.50; 42.90]. Other works had found out prevalences higher than ours. In this way, Kaoutar et al. in Morocco in 2013 [18], Fall in Senegal in 2003, [14] and Koko et al. in Gabon in 2009 [12] had respectively encountered prevalences estimated at 44.1%, 67% and 79.4%. The large size of their samples may justify that high prevalence in their research works.

The prevalence found out in our work was higher than the ones observed by Kebe in Mali (32.26%) in 2009 [11] and by Maroya in the South-Benin in 2014 (14%) [10].

This prevalence may be due to the role of westernization of eating habits of the African children (frequent intake of sweets or candies), to the low use of vegetal toothpicks which was an obligation in families and to the cost of toothpastes. Using toothpicks, though it takes too much time, is not subject to toothpaste buying. In addition, the difficulties of access to oral and dental care due to their very high costs and lack of knowledge about oral and dental health such as twice-daily brushing, either after meals or before going to bed, which are not deep-rooted habits among those children, may also explain that. Nevertheless, it would also be interesting to conduct investigations on running water fluoride content in Parakou.

DMFT Index was 1.23. This index is similar to the one obtained by Semmarene in 2006 (1.23) [19]. A study conducted by Lardinois et al. in Belgium in 2009 and Okoko et al. in Congo reported respectively a higher DMFT index (1.6) [20] and (2.06) [7]. Other research works found out low DMFT Indexes, especially Okeigbemen in Nigerian schools (0.65) [21], Djossou et al. and Moalic et al. in the South-Benin (0.7 and 0.83) [6,16].

The possible change in oral and dental health habits through the use of toothbrushes and toothpastes increased. This may be the cause of decline in tooth decay index observed, according to WHO estimates [4].

Factors associated with tooth decay

There was no significant relationship between gender and presence of tooth decay (p=0.71). Koko et al. had made the same remark [12]. In contrast, in the study conducted in 2003 by Fall in Senegal [14], a significant relationship between gender and presence of tooth decay had been found out (p=0.025). Besides, there was no relationship between age and presence of tooth decay (p=0.34). Moreover, Fall [14] reported that age was not associated with tooth decay occurrence (p=0.26). Tooth decay affects all age groups.

Sweetened food intake was significantly associated with occurrence of tooth decay in our study (p=0.032). This remark was found out and confirmed by several research works as well as by tooth decay pathophysiology. In Morocco Kaoutar et al. made the same remark in 2013 (p<0.001) [18]. A Sugar-sweetened diet plays an important role in the occurrence of tooth decay. Sugar deposit on tooth has an acidogenic effect and a cariogenic potential responsible of tooth decay although tooth decay is now considered as a multifactorial communicable infectious disease [22,23]. Risk of developing tooth decay was 1.30 times higher than in the other children.

The control exerted by a parent over his child tooth condition after brushing, had an influence on the occurrence of tooth decay (p=0.0069), for 32.20% of those children had tooth decay versus 44.98% of the children whose parents never had a look at their tooth condition after brushing. Parents' involvement in the oral and dental health of their children would reduce the prevalence of tooth decay disease, for in preschool and school age, children still need a monitoring of their dental health and personal hygiene as a whole. The children whose parents did not get involved in their oral and dental health ran 1.73 times more risk of being affected by tooth decay than the other children. That risk may therefore be reduced with a better parental control over tooth brushing at home.

Students' level of knowledge was significantly associated with tooth decay occurrence (p=0.00). Tooth decay prevalence was estimated at 51.23% among the children who had a poor knowledge of the disease, versus 30.93% among the children who had a good knowledge about the disease. School students with poor knowledge of tooth decay had 1.66 times risk of developing tooth decay than the other students.

Behavior change steps are knowledge, attitude, decision, action and confirmation. Therefore, children must first have a good knowledge of the disease, then attitude and decision to change behavior as regards oral and dental health. These findings further highlight the lack of information, education and communication as regards oral and dental health on the part of parents as well as of educators. This fact brings to mind that support is absolutely required from adults and parents towards children as regards education, behavior and attitude.

The significant association found out (p=5.79.10⁻⁶) between tooth decay and toothache would be due to the fact that toothaches may be

late warning signs of decay for tooth pains are also a decay sign. In this research work, children with tooth pains were exposed to a risk of developing tooth decay which is 1.75 times higher than the other children.

The significant association existing between tooth decay and living environment (p=0.00) is similar to the observation made by Paquet et al. in Quebec which indicates that a child living in a vulnerable environment runs a risk of developing tooth decays which increases by 112% [24]. Thus, tooth decay would be the disease of populations with low economic status. However, in 2006 [25] Sall had demonstrated in Mauritania that tooth decay was not associated with living environment.

When taking into consideration, students' living environment, those who never had parental control over tooth cleanliness after brushing ran twice more risk (p=0.009) of developping tooth decay than students who benefit from parental control. On the other hand, taking into consideration, parental control over tooth cleanliness after brushing, students living in suburban areas develop 3.11 times more risk (p=0.000) of tooth decay than those living in urban areas (Table 5).

Study limitations : Besides all the statements in this study, we found that some of the results were obtained through declarative responses during the survey and can not be verified sometimes.

Conclusion

According to this study on prevalence and factors associated with tooth decay in Parakou schools, toothbrush was the cleaning tool most used by students. In more than six cases in ten, school students claimed that they have a good knowledge of tooth decay. Most of them consumed sweets at least once a day. Around four in ten school students had tooth decay and DMFT index was 1.23. The factors associated with tooth decay were intake of sweets, lack of parental control over child tooth condition after brushing, toothaches, students' level of knowledge and living environment.

Parents, educators and health authorities should therefore get more involved in monitoring children's oral and dental health and food hygiene. Tooth decay prevalence could increase because of children's permanent exposure to associated factors mentioned above. Due to this high prevalence of tooth decay in Parakou schools, we suggest that health and screening activities be resumed in schools but also integration of oral health and hygiene be introduced in the curriculum.

References

1. Secretariat Report (2007) Action plan for the promotion of oral health and disease integrated prevention. World Health Organization.

2. Yach D, Mathews C, Buch E (1990) Urbanization and health: methodological difficulties in undertaking epidemiological research in developing countries. Soc Sci Med 31: 507-514.

3. World Health Organization (1998) Oral health in the WHO African region: 1999-2008 regional strategy. World Health Organization.

4. World Health Organization (2003) Global oral health report. World Health Organization.

5. Kane AW, Faye B, Toure B, Sarr M, Cisse D, et al. (2001) Oral hygiene habits and status of students' tooth decay: Survey on 150 students at university residence in Dakar – Senegal. Tropical Odonto-Stomatology 93: 16-21.

6. Djossou D, Nancy J, Houinato D, Lanchoessi D (2015) Prevalence of Dental Caries in School in the City of Ouidah in 2013. Odontostomatol Trop38: 15-22.

7. Okoko AR, Ekouya Bowassa G, Moyen E, Oko APG, Togho Abessou LC, et al. (2013) Tooth Decay in School Environment at Brazzaville (Congo). Odontostomatol Trop 36: 25-30.

8. Ouedraogo Y, Kabore WAD, Konsem T, Fall M, Millogo M, et al. (2015) Tooth Decay: Epidemiological and Therapeutic Aspects in Dental Service of University Teaching Hospital Yalgado Ouedraogo and Municipal Centre of Oral Health. Odontostomatol Trop 38: 49-55.

9. Dossou-Togbe P, Hassan J, China E, Ahouandogbo F (1999) National policy and strategies to fight oral and dental diseases in Benin. FDI World Dental Federation Annual summit.

10. Maroya K (2014) Oral and dental health of 12 to 15 year-old adolescents in Cotonou, Benin. University of Bordeaux.

11. Kebe S (2009) Tooth decay among students of North Korofina school group: an epidemiological approach. University of Bamako.

12. Koko J, Ategbo S, Ateba-Ngoa U, Moussavou A (2009) Epidemiological study of tooth decay in the schools of Libreville (Gabon). Clinical Mother Child Health 6: 1065 – 1073.

13. Lo M, Faye D, Gaye F, Cissé D, Yam AA (2001) Study of tooth decay in the public primary schools depending on the Nabil Choucair health center of Dakar (Senegal). Journal of Tropical Dentistry 96: 9-12.

14. Fall T (2003) Evaluation of oral and dental health needs among children ending primary school in the District of Dioubel. University of Dakar.

15. Majoli S (2003) Oral and dental health and hygiene in Cameroon: a preliminary study to establish a preventive program among primary school students. University of Geneva.

16. Moalic E, Zérelli A, Capo-chichi S, Apovi G (1999) Oral and dental condition of a population of children enrolled in the Zou (Benin) region schools in 1998. Cahier Santé 95: 273-276.

17. Samba M, Guinan JC, Sangare A, Da-Danho V, Bakayoko-Ly R (2004) Oral health care practices in Abidjan. Journal of Tropical Dentistry 27: 37-40.

18. Kaoutar K, Hilali MK, Loukid M (2013) Current status of tooth decay among adolescents living in the Wilaya of Marrakech (Morocco). Anthropology 29: 101-108.

19. Semmarene F, Weissenbach M (2008) Study of DMFT index among an Algerian population (comparison with a French population). University of Nancy.

20. Lardinois J, Gueders A, Geerts S (2009) Update of data currently available in tooth decay epidemiology among Belgian children. RMLG 64: 587-591.

21. Okeigbemen SA (2004) The prevalence of dental caries among 12 to 15-year-old school children in Nigeria: report of a local survey and campaign. Oral Health Prev Dent 2: 27-31.

22. Vanderzwalm-Gouvernaire A (2006) Tooth decay: what pediatrician should look for. Realites pediatriques 109: 12-16.

23. Chaussain-Miller C, Opsahl-Vital S (2006) Fluoride and tooth decay: at the opposite of common opinions. Realites pediatriques 109: 17-24.

24. Paquet G, Hamel D (2005) Partners for the health of very young children living at the bottom of the social ladder. Longitudinal study of childhood development in Quebec (ÉLDEQ 1999-2002) 3: 7-8.

25. Sall A (2006) Study of tooth decay among children from nursery schools in Nouakchott (Mauritania). University of Dakar.

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