Zimbabwe – caries prevalence among children – an analyze of previous surveys

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Summary

Aim: The purpose of this study was to collect and analyze previous studies carried out in Zimbabwe regarding caries prevalence, its severity and main causes.

Methods: Articles concerning surveys previously completed in Zimbabwe were searched in Pub Med. The relevant information on the topic of caries prevalence among children and young adolescents were selected and analyzed. The results were compiled and discussed.

Results: The caries prevalence and the interacting causes have been surveyed several times during the past decades, however the surveys are a bit aged and may therefore not reflect the current situation. Regarding affected teeth, location, oral hygiene and gender the results from the different surveys shows similar results.

Conclusions: According to the previous surveys few filling were noted and few teeth was extracted in the surveys. This along with the high prevalence of calculus and plaque among the subjects shows that the inhabitants in Zimbabwe rarely visit the dentist regularly. The predominant treatment is tooth extraction. The caries prevalence and severity is low, but along with higher consumption of sugar the risk for an increase of caries is substantial.
Introduction

Africa has a low priority regarding oral care due to the high amount of severe general health problems and development needs and as well as low number of oral care personnel educated in the continent. The most prominent and major oral health problems in low socioeconomic communities are oral cancer, ANUG (acute necrotizing ulcerative gingivitis), oral manifestations of HIV/AIDS, facial trauma and dental caries (Thorpe 2006).

National surveys in Africa have shown that the prevalence and severity of dental caries is very low to low, regardless of socioeconomic status and location. Most of the lesions go untreated, about 90 per cent. Chronic destructive periodontal disease is not that common.

Table 1. Global frequency of DMFT data at twelve years.

<table>
<thead>
<tr>
<th></th>
<th>DMFT &lt;3</th>
<th>DMFT &gt;3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Developing countries</td>
<td>69</td>
<td>31</td>
</tr>
<tr>
<td>2. Developed countries</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>3. Africa/Southeast Asia</td>
<td>88</td>
<td>12</td>
</tr>
<tr>
<td>4. America</td>
<td>22</td>
<td>78</td>
</tr>
</tbody>
</table>

Zimbabwe

The total population in Zimbabwe is 13.2 million. Educated dentists 2004 were 191 (Zimbabwe Oral Health Manpower). The sugar intake is 25.3 kg per capita consumption of raw sugar (WHO Oral Health Country/Area Profile Programme).

Several studies regarding oral health and caries prevalence have been conducted for twenty years ago. The caries prevalence and severity in Zimbabwe was shown to be very low to low, but in the urban areas a higher prevalence was observed. But due to the economic crisis the past decades a lower priority has been given to the research concerning oral health.

Aim

The purpose of this study was to collect and analyze previous surveys made in Zimbabwe concerning the caries prevalence, its severity and main causes.

Materials and Methods

The articles were collected by searching in Pub Med. Words in focus were: Zimbabwe dental caries (19 hits in December 2009), Zimbabwe caries prevalence (9 hits December 2009), sub sharan Africa caries (597 hits in February 2010). Some of the articles could be read online; the remaining articles were printed out and collected at the Karolinska Institute Library.

The criteria’s for including and using an article were that it have to be written in English, been published in a scientific journal and include surveys made on children/adolescents with a maximum age of 19 years, primary in Zimbabwe but also areas in Sub Saharan Africa. Four articles were selected.
for the main analyze about Zimbabwe and three articles were selected for comparing results regarding Zimbabwe with neighboring countries. The articles were read several times and the relevant information and data were selected. The information were compiled, compared and discussed.

Results

**National oral health survey Zimbabwe 1995: dental caries situation and periodontal conditions**

In 1985 the first National oral health survey was carried out in Zimbabwe (Government of Zimbabwe 1990). The aim of the study was to develop the first National Plan for Oral Health which started in 1991 and covered a period of 15 years.

The second survey took place in 1995 which was the end of the first 5 year period of the Plan. The purpose was to continue and collect material for the next phase of the Plan.

Dental caries situation and periodontal conditions among the inhabitants in Zimbabwe was simultaneously registered through a multi-stage sampling procedure. 3,709 persons were examined according to the WHO oral health assessment form and criteria (WHO 1986).

Background variables used in the survey was socio-economic background, gender, age and type of location.

The age groups were divided into three segments: 5-year old children, 15-19 year old adolescents and 35-44 year old adults. Urban areas examined where the same as in the 1985 survey: Mutare, Harare, Masvingo and Bulawayo. The rural areas examined: Bubi, Goromonzi, Zaka and Mutasa.
The urban areas were divided in Socio-economic status (SES): high SES and low SES. The fluoride level were sampled in the drinking water and analyzed in a laboratory.

The areas were selected at random with stratification for gender. The examinations were performed by 12 examiners who had been calibrated during two one-week sessions. The WHO Oral Health Assessment form and booklet was used for determinate the dental caries situation among the inhabitants.

The prevalence of dental caries among 5 year-old children was 37 per cent in the primary dentition. Among the adolescents 45 per cent and adults showed the highest prevalence with 77 per cent. DMFT among the adolescents of 3 or more was observed among 19 per cent compared to the adults that showed a DMFT score of 50 per cent (DMFT 4 or more).

When looking at the gender as an variable a difference were observed between male and female persons, males had a lower prevalence of dental caries compared to females (Frencken et al 1999; dental caries situation). In periodontal conditions the females showed a higher range of healthy periodontium 27 per cent compared to male adolescents 18 per cent. Over all in adolescents 23 per cent were healthy, 21 per cent had bleeding and 47 per cent had calculus. Urban adolescents showed a higher range of healthy periodontium 25 per cent (Frencken et al 1999; periodontal conditions).

Type of location revealed a difference between urban and rural among children aged 5 years.

Urban children (50 per cent) had a higher prevalence of dental caries compared to the rural 5-year olds (30 per cent). The dmft among the urban 5-year olds: 1, 5 compared to rural children: 1, 0.

When analyzing the primary dentition a difference could be observed in dmft between boys, dmft=1, 4 and girls, dmft=1, 2. In the permanent
dentition a difference could be observed between adolescent males DMFT=1, 0 and adolescent females DMFT=1, 4.

Table 2. The mean dmft/DMFT score (x), its components and standard deviation (SD) in the children aged 5 years and the adolescent group.

<table>
<thead>
<tr>
<th>Age</th>
<th>Mean number of teeth present</th>
<th>dmft/DMFT x SD</th>
<th>d/D x SD</th>
<th>m/M x SD</th>
<th>f/F x SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 5°</td>
<td>19,1</td>
<td>1,3 2,4</td>
<td>1,2 2,3</td>
<td>0,0 0,4</td>
<td>0,0 0,3</td>
</tr>
<tr>
<td>2. 5</td>
<td>1,4</td>
<td>0,1 0,4</td>
<td>0,1 0,4</td>
<td>0,0 0,0</td>
<td>0,0 0,0</td>
</tr>
<tr>
<td>3. 15-19</td>
<td>28,1</td>
<td>1,2 2,0</td>
<td>1,0 1,7</td>
<td>0,1 0,5</td>
<td>0,1 0,7</td>
</tr>
</tbody>
</table>

° Deciduous caries experience

According to the background variables showed that urban 5-year olds, adolescents from high SES suburbs and females had a significantly higher prevalence of caries than rural 5-year olds, adolescents from low SES suburbs and males.

The severity of dental caries among the Zimbabwean inhabitants that were examined: Females and adolescents from high SES suburbs and with high education had more severe dental caries than males and adolescents from low SES with lower levels of education.

Unmet and the unmet treatment of dental caries among the children and adolescents differ a lot. Among the 5-year-olds the unmet treatment need is 97 per cent and respectively 88 per cent for the 15-year-olds. Only 1 per cent filled teeth among the 5-year-olds and 5 per cent among the 15-year-olds. Tooth extraction was the most common kind of treatment among all age groups (Frencken et al. 1999; dental caries situation).
Oral health status among secondary school students in Harare, Zimbabwe

A study was carried out in Zimbabwe in 1993, it was a demonstration oral care programme to evaluate dental caries among secondary school students in Greater Harare. 569 students were examined with a mean age of 13.9 years. 57 per cent males and 43 per cent females. The examinations were made by two examiners, recording plaque, calculus and dental caries. Fluoride content in the drinking water resulted in a range of 0.1 to 0.5 ppm. According to Department of Energy and Works 1994 the drinking water in Harare has contained fluoride in the range of 0.5 to 0.9 ppm between 1979 to 1994.

The prevalence of calculus on at least one of the index teeth was 89.5 per cent. Caries prevalence was 41.3 per cent and 15.9 per cent of the students had 3 or more scoring in DMFT. The mean DMFT was 1.1. No difference in gender was observed. The lesions were predominant observed in occlusal surfaces (81 per cent). In 51 per cent of all dental caries lesions the 6th permanent tooth was affected, followed by the 7th in 32 per cent of all the lesions. Few fillings were observed and few teeth had been extracted. The conclusions made according of the results of the survey was that the caries situation in prevalence and severity was low among the students despite that they hardly get any oral care. The prevalence of calculus and plaque was high (Makoni et al. 1993).
Dental caries, fluoride levels and oral hygiene practices of school children in Matebeleland South, Zimbabwe

In 1996, 1386 5-6 year-old schoolchildren and 1326 12 year-old schoolchildren were examined in rural province of Matabeleland South in Zimbabwe. 8-10 schools were randomly selected. The survey contained a measuring of the fluoride content in the drinking water, an examination for dental caries and interviews concerning oral hygiene habits. The examinations were performed by three trained examiners and two recorders. The results of this study revealed a caries prevalence of 25.2 per cent in the 5-6 year olds and a prevalence of 19.8 per cent in the 12 year olds with a mean dmft/DMFT of 0.6 respectively 0.3. A low level of fluoride in the drinking water could be associated with high caries prevalence, because the caries prevalence and the severity among the children with low content of fluoride in the drinking water was significant higher compared to the children with a high content of fluoride in the water. The most common oral hygiene tool was chewing sticks and children using chewing sticks had a lower caries prevalence compared to the children using tooth brush and tooth paste.

The survey also showed lower caries prevalence among school children in Matabeleland compared to other areas in Zimbabwe. This could be explained by the high level of fluoride in the drinking water and the fact that this province is one of the least urbanized province in Zimbabwe (Sathananthan et al. 1996).
Table 3. Prevalence of caries in 5-6- and 12-yr-old children in schools with high (>0, 8 ppm) and low levels of fluoride in drinking water

<table>
<thead>
<tr>
<th>Fluoride level</th>
<th>5-6-yr-olds with caries (n=348)</th>
<th>5-6-yr-olds caries-free (n=1006)</th>
<th>12-yr-olds with caries (n=253)</th>
<th>12-yr-olds caries-free (n=1017)</th>
</tr>
</thead>
<tbody>
<tr>
<td>low</td>
<td>32%</td>
<td>68%</td>
<td>25%</td>
<td>75%</td>
</tr>
<tr>
<td>high</td>
<td>16%</td>
<td>84%</td>
<td>13%</td>
<td>87%</td>
</tr>
</tbody>
</table>

Table 4. Oral hygiene practices and prevalence of caries in 5-6- and 12-yr-old children

<table>
<thead>
<tr>
<th>Oral hygiene practice</th>
<th>5-6-yr-olds with caries (n=347)</th>
<th>5-6-yr-olds caries-free (n=1039)</th>
<th>12-yr-olds with caries (n=263)</th>
<th>12-yr-olds caries-free (n=1063)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toothbrush without paste</td>
<td>4.5%</td>
<td>4%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Toothbrush with paste</td>
<td>42%</td>
<td>29%</td>
<td>39%</td>
<td>26%</td>
</tr>
<tr>
<td>Chewing stick</td>
<td>40.5%</td>
<td>56%</td>
<td>58%</td>
<td>70%</td>
</tr>
<tr>
<td>No Method</td>
<td>13%</td>
<td>11%</td>
<td>1%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Dental caries in 12-year-old urban and rural children in Zimbabwe

To find out if any difference could be found between urban and rural children in Zimbabwe a survey was conducted in 1996 among 12 year old children. 608 children living in Harare and 556 rural children living in areas of Mashonaland and Central Province were examined to record the caries prevalence among the children.

10 schools were selected in each area and the children were randomly selected. The examinations were conducted by one examiner according to criteria’s recommended by WHO.

The survey showed a prevalence of 27.6 per cent in Harare and 20.9 per
cent in the rural area. In both areas less than 4 per cent had a DMFT scoring at 4 or more. The urban group showed a higher level of filled teeth compared to the rural area. No significant difference could be found between the mean DMFT and DMFS when comparing the surveyed areas. Girls had a higher value of the DMFT and DMFS; this was explained by the higher score in decayed and missed teeth among the girls. The permanent first molar was the most affected tooth in both the urban and the rural areas. In the rural area a higher range of decayed second molars could be observed compared to the urban area. The occlusal surface was the most common site for caries. The conclusions were that the caries prevalence in both the urban and rural area was low (Chironga et al. 1989).

Table 4. Mean DMFS and DT, MT, FT and DMFT values in urban and rural boys and girls

<table>
<thead>
<tr>
<th>Area</th>
<th>n</th>
<th>DMFS</th>
<th>DT</th>
<th>MT</th>
<th>FT</th>
<th>DMFT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Harare</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>310</td>
<td>0.98</td>
<td>0.40</td>
<td>0.06</td>
<td>0.05</td>
<td>0.50</td>
</tr>
<tr>
<td>Girls</td>
<td>298</td>
<td>1.30</td>
<td>0.48</td>
<td>0.10</td>
<td>0.06</td>
<td>0.64</td>
</tr>
<tr>
<td><strong>Rural</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>287</td>
<td>0.66</td>
<td>0.36</td>
<td>0.28</td>
<td>0.01</td>
<td>0.40</td>
</tr>
<tr>
<td>Girls</td>
<td>269</td>
<td>1.15</td>
<td>0.50</td>
<td>0.07</td>
<td>0.02</td>
<td>0.59</td>
</tr>
</tbody>
</table>
Neighboring countries

When investigating the neighboring countries a survey in South Africa was conducted 2004 among 519 school children. The age groups examined: 6, 12 and 15 years old. They were examined according to WHO diagnostic criteria concerning dental caries. Both urban and peri-urban locations.

Table 5. Caries prevalence among school children in South Africa 2004

<table>
<thead>
<tr>
<th>Age</th>
<th>caries prevalence</th>
<th>mean DMFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 yrs</td>
<td>61.8 %</td>
<td>2.68</td>
</tr>
<tr>
<td>12 yrs</td>
<td>21.8%</td>
<td>0.61</td>
</tr>
<tr>
<td>15 yrs</td>
<td>42.7%</td>
<td>1.26</td>
</tr>
</tbody>
</table>

The 6-year-olds had a higher prevalence of caries in the upper anterior teeth. In the 12 and 15-year-olds the first lower molar was most affected. No gender difference could be observed (Bajomo AS 2004).

The caries situation in Nigeria have been surveyed sporadic and based on convenience samples. According to the existing data the caries prevalence is very low to low among the inhabitants. The prevalence is more severe in urban communities, an increase has been observed over the years. The mean DMFT in most of the studies shows a result between 1.2 and 1.3 in the 12-21-year-olds. The restorative need is very high, most of the decayed teeth are left untreated. A higher range of dental caries is found in the second molar compared to the first molar. This can be a result of changes in the diet as the developing countries are exposed to different kind of diet (Akpata 2004).
Discussion

Location

The caries prevalence among 5-year-olds and 15-19 years were 37 per cent respectively 45 per cent. A higher prevalence could be seen among the urban children and adolescents (Frencken el al. 1995). This was also shown in Matabeleland South when the survey resulted in a caries prevalence of 25.2 per cent in the 5-6 year olds (Sathananthan 1996). The survey showed a prevalence of 27.6 per cent in Harare and 20.9 per cent in the rural area. In both areas less than 4 per cent had a DMFT scoring at 4 or more. The urban group showed a higher level of filled teeth compared to the rural area (Manji 1986). This shows that children living in rural areas have a lower caries prevalence compared to children in urban areas. This could be related to a difference regarding the sugar intake. In urban areas the sugar consumption increases and with this nutrition change an increase of dental caries appears.

Gender

Males had a lower prevalence of caries compared to females, in both among the adolescents and the 5-year-olds (Frencken et al. 1995). This was also shown by Manji 1986. Regarding periodontal conditions the females showed a higher range of healthy periodontium 27 per cent compared to male adolescents 18 per cent. The periodontal status among females showed a higher range of healthy periodontium compared to the males (Frenken et al. 1995).
Affected teeth

The permanent first molar were the most affected tooth, this was shown by Makoni 1993 and Manji 1986 and in the surveys made in South Africa and Nigeria.

A survey made in East Africa 1986 among 12-year-old children showed that the molars are the most affected tooth when detecting dental caries. In 90 per cent of the cases the affected tooth is a molar. The first molar was more affected compared to the second molar. The anterior teeth showed very few cases of decayed surfaces. The occlusal surface was the most affected surface (Manji et al. 1986).

Oral hygiene and fluoride

Sathananthan 1996 showed that a high content of fluoride in the drinking water resulted in a lower caries prevalence among the children examined compared to the children with a low fluoride level in the water. The prevalence of calculus and plaque is high in general. The fluoride level in the drinking water in Harare is between 0.0-0.49 ppm (WHO Oral Health Country/Area Profile Programme. Fluoride in drinking water).

The prevalence of calculus and plaque is high in general. Children using chewing sticks for oral cleaning had a lower caries prevalence compared to children using tooth brush in the survey made by Sathananthan et al. 1996.

Cleaning teeth using chewing sticks, mefaka, is a very common method used in Africa. In a study performed in Ethiopia 248 children used chewing sticks or tooth brush. They were examined 3 months later and compared to each other regarding oral hygiene. This survey showed that the chewing sticks were as effective as a tooth brush to remove oral deposits (B. Olsson
1978).

**Dental caries prevalence**

Age 12= 27.6% in Harare. 20.9% rural area.
Age: 15-19 = 57% National Plan for Oral Health 1985
Age: 15-19 = 44% National Oral health survey 1995
Age: 5= 37% National Oral health survey 1995
Age: mean age 13, 9 = 41.3% Oral Health status Harare 1993
Age: 5-6= 25.2% Matabeleland South 1996
Age: 12= 19.8% Matabeleland South 1996
Conclusions

Several surveys have been conducted in Zimbabwe. But during the past decades along with the crisis in Zimbabwe an update about the oral health in the country is difficult to come across. According to the previous surveys few filling were noted and few teeth’s was extracted in the surveys. This with the high prevalence of calculus and plaque among the students shows that the inhabitants in Zimbabwe rarely visit the dentist regularly. The predominant treatment is tooth extraction. This is also shown in surveys conducted in neighboring countries.

The caries prevalence and severity is low, but along with higher consumption of sugar the risk for an increase of caries is big. Unfortunately no research regarding dental caries among the population in Zimbabwe has been carried out over the last two decades. Reasons for this are probably influenced by the severe economic position Zimbabwe have been afflicted with the past twenty years, the inflation stroked a level at 6.5 quindecillion novemdecillion per cent in 2009 (ZIMBABWE: Inflation at 6.5 quindecillion novemdecillion percent).

During catastrophe conditions like this research is not a priority for explicable reasons, oral health and the caries prevalence gets left out. Almost twenty years have passed by without any up-dates touching the current caries condition.

But according to a survey made at Old Mutare Primary School in July 2009 by dental students from Sweden the caries prevalence and oral health seems remarkably unchanged compared to surveys made two decades ago.

Hopefully more research and help to improve the oral health will be carried out for Zimbabwe in the future.
References

Articles:


Websites:


7. ZIMBABWE: Inflation at 6.5 quindecillion novemdecillion percent, January 2009.

Handledarintyg

Som handledare för detta projekt tillstyrker jag att studentens eller studenterna ska examineras eftersom dennes/deras prestation och insats i projektet och att den vetenskapliga rapporten är av tillräcklig omfattning och kvalitet för examination.

2010-04-27

______________________________
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