Early Childhood Caries Experience of Pre-School Children with Down’s Syndrome in Johannesburg, South Africa: a Pilot Study

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Abstract

**Introduction:** In South Africa information on the dental caries experiences of pre-school children with Down’s syndrome (DS) has not been reported. The aims of the study reported and discussed in this paper were to: (1) determine the dental caries status among pre-school children with DS; (2) identify the unmet treatment needs of these children by comparing the dmft/DMFT data with the Significant Caries Index (SiC).

**Methods:** For the cross-sectional study, a convenience sample of 67 children attending four Down Syndrome Association (Gauteng) outreach sites in Johannesburg was used. The mean age of the participants was four years (SD 3.2) and the majority were male (67%). The dental caries status of each child was identified by using the dmft/DMFT index of the World Health Organization (WHO) and the SiC Index. The information obtained was used to compare the dental caries status of these 67 DS children with that of children of similar ages as recorded in the 1999-2002 National Children’s Oral Health Survey (NCOHS).

**Results:** The caries prevalence in the study population was 26% and the unmet treatment needs rate was 100%. Male participants had a higher caries prevalence (31%) than females (14%), although the difference was not statistically significant (p>0.05). The mean dmft score was 1.29 (SD 3.08) and no significant difference was noted between the genders. There was a significant difference between the SiC index score 3.90 (SD 4.41) when compared to the mean dmft score (p<0.002). Comparison of the dental caries status of pre-school DS children with the general population of children in the NCOHS survey revealed that children with DS had a lower dental caries score but a higher untreated caries score.

**Conclusion:** The finding that none of the pre-school DS children with dental caries had received treatment is a concern for the health system which needs to be addressed.

**ABBREVIATIONS**

- CSHCN: Children with Special Health Care Needs
- dmft: Decayed Missing Filled Teeth in a Primary Dentition
- DMFT: Decayed Missing Filled Teeth in a Permanent Dentition
- DS: Down’s Syndrome
- NCOHS: National Children’s Oral Health Survey
- Oral Health; early childhood caries
- SiC: Significant Caries Index
- SD: Standard Deviation

**INTRODUCTION**

Down’s syndrome (DS) is a genetic disorder which results from the presence of an extra copy of chromosome 21 which causes delays in physical development and learning disability [1]. The incidence of DS is estimated to be 1 in 500 live births in South Africa. Women over the age of 35 are at higher risk of giving birth to a child with DS, however more than 80% of DS children in South Africa are born to mothers under the age of 35 years [1].

Children with Special Health Care Needs (CSHCN) are defined as “those who have or are at an increased risk for chronic physical, developmental, behavioral, or emotional conditions and who also require health and related services of a type or amount beyond that required by children generally” [2]. Literature has reported that CSHCN have more untreated caries and are more susceptible to poor oral health [3]. Poor oral health can have a significant effect on an individual’s Quality of Life which can cause difficulty with eating, speech impediments, pain, sleep disturbances and missed days at school or work [4].

Young children are the prime target group of oral health care service in many countries including South Africa and CSHCN are the most vulnerable as they do not have access to services. This vulnerable group of children needs to be prioritised in the planning of health services and oral health care programs. The programs need to be informed by scientific evidence and there
is a need to establish baseline data on their oral health status. There is conflicting evidence on dental caries experience of children with DS as some studies report higher [5], and others report lower [6], or similar [7], dental caries experience than the general population. There is also paucity of information on the oral health status of children with DS in South Africa hence the aim of the study was to determine the dental caries status and unmet treatment needs among children with DS. The study also sought to compare the dmft data with the Significant Caries Index (SiC) and National Children’s Oral Health Survey (NCOHS). The Unmet Treatment Needs were measured using the Met Need Index (MNI) and Restorative Index (RI).

MATERIALS AND METHODS

Subject selection

This cross-sectional study was conducted using a convenience sample of 67 pre-school children attending four Down Syndrome Association (Gauteng) (DSA) outreach sites in Johannesburg. The DSA is a non-governmental organization established to improve the lives of people with DS and their families. The sites were randomly selected and all the parents of the children who attended the support group meetings in the outreach sites of the DSA in Johannesburg were invited to participate so that the children could be screened. Those children who did not have parental consent and those who were unable to cooperate during the examinations were excluded. The DSA schedules and facilitates support group meetings for the caregivers of children with DS and other disabilities. These meetings are held at the outreach sites which are located at government district hospitals and community health centres and are co-facilitated by the DSA’s outreach coordinator and a team of physiotherapists, occupational therapists and speech therapists. During the group meetings, the caregivers/parents facilitated group discussions and peer group education sessions. The information shared could include, for example, topics on caring for a child with DS or other disabilities, nutritional needs of the children, support from family members, etc.

Permission to undertake the current study was granted by the Human Research Ethics Committee of the University of the Witwatersrand, Johannesburg (M 1211101). Permission was also obtained from the DSA, Johannesburg branch. Parents or caregivers gave written consent for their children to participate in the study.

Dental examination

The dental caries status of the DS pre-school children was recorded using the dmft/DMFT index according to the WHO guidelines [8]. Before the dental screening took place, the four clinicians participated in two calibration sessions of four hours each, conducted by a community dentistry specialist. During these sessions each clinician screened ten children with dental caries. A discussion on the diagnosis, clinical findings observed and possible errors preceded the calibration in order to reach consensus (Kappa=0.86). Before the dental screening, inter-observer agreement for the diagnosis of caries was checked: one in every ten children was re-examined to test for inter-examiner agreement. The kappa test was adopted on a tooth by tooth basis in order to check the inter-examiner agreement in caries diagnosis, in agreement with the methodology described by Peres et al., [9]. Examiner agreement was high. The minimum value obtained was 0.75, but the great majority of values were equal to one.

The four clinicians established rapport with the children by sitting with them and their parents or caregivers during the group education sessions. The “Tell-Show-Feel and Do” technique was used with all the children. The dental examinations took place in the treatment rooms at the hospitals, using flashlight headbands and regular room light to assist with visibility. The children were in a supine position on the hospital stretcher bed and the clinicians were behind the child’s head with the parent or guardian in close proximity. If the children were uncooperative, their parents or guardians sat on a chair and carried them on their laps in a supine position with the clinician behind the head. The screening was carried out with the use of a dental mirror and an explorer probe was not used. A tongue depressant was used to aid in controlling the tongue for the children as they were not accustomed to sharp instruments. The detection of dental caries and diagnosis was based on the WHO codes and criteria in which a tooth is considered decayed when a cavitation is present [8].

Unmet treatment needs

The Met Need Index (MNI) was used to provide an indication of treatment received by an individual and is determined using the ratio of the mean missing (m) plus filled (f) teeth to mean decayed, missing and filled teeth (dmf) that is m+f/dmf. The Restorative Index (RI) was used to indicate the restorative care of those who experienced dental disease. The formula for measuring the RI is by calculating the ratio of filled (f) to filled plus decayed teeth (f+d) percent that is f/f+d percent as described by Jackson [10].

Data analysis

The data were summarized and described using relative frequencies and percentages for categorical variables (such as the presence of decayed teeth) and means for the interval scaled variables (i.e. dmft score). All the dmft scores were ranked in a descending order and the top one-third was analyzed as the presence of decayed teeth. The formula for calculating the mean score which made up the Significant Caries Index (SiC). ANOVA tests were used to compare mean scores. When the outcome variables were categorical, chi-squared and t-test was used to examine differences by gender, and age group for statistical significance. Data was analysed using SPSS software, version 12.0 (SPSS Inc., Chicago, IL, USA) for Windows. Statistical significance was set at P<0.05.

RESULTS

Demography and dental caries prevalence

The study group was comprised of 67 participants who were examined and the mean age was four years (SD 3.2). Figure 1 indicates that males were in the majority (67%). The...
caries prevalence of the study population was 26% and male participants had higher prevalence (31%) than females (14%). However, the difference was not statistically significant (p>0.05).

**Mean dmft values**

Table 1 illustrates the mean dmft components and SiC index scores. The mean dmft score was 1.29 (SD 3.08) and no significant difference was noted between the genders. When analysing the individual dmft component scores, the results indicates that the “d” and the “m” components were major contributors towards the overall dmft score, contributing 94% and 90% respectively.

**Caries significance values**

The SiC index score of 3.90 (SD 4.41) was almost four times the dmft score and there was a significant difference when the two scores were compared (p=0.002). This means that the burden of disease is unevenly spread in the study population.

**Comparison of caries prevalent with the NCOHS**

Data from the DS under 6 year old (n=50) pre-school children was compared with data from the NCOHS. Figure 2 indicates that compared to the general population, children with DS had lower dental caries experience but higher levels of untreated caries.

**Unmet treatment needs**

The MNI was 12.4% and the RI was 0%. This indicates that only 87.6% of the pre-school children in the DS study population had not received treatment. They also had not received any restorative care.

Table 1: Mean d, m, f, dmft scores and SiC mean score.

<table>
<thead>
<tr>
<th></th>
<th>d</th>
<th>m</th>
<th>f</th>
<th>dmft</th>
<th>SiC</th>
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<td>Whole population</td>
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<td>0.16</td>
<td>0</td>
<td>1.29</td>
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<td>0.04</td>
<td>0</td>
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<td>0</td>
<td>1.03</td>
<td>**</td>
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<tr>
<td><strong>p value</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.145</td>
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</tr>
</tbody>
</table>

**Abbreviations:** dmft: Decayed Missing Filled Teeth (primary dentition); NCOHS: National Children's Oral Health Survey; SiC: Significant Caries Index

![Figure 1](image1.png)

**Figure 1** Distribution of participants by Gender.

![Figure 2](image2.png)

**Figure 2** Comparison of caries prevalence and untreated caries with the NCOHS.
DISCUSSION

The caries prevalence in the study population was consistent with results from similar studies on children with special needs in Gauteng [11], and lower than the prevalence in India (Shukla et al., [5], and Purohit et al., [12]). The prevalence of dental caries was also lower than the value reported for the general population in the NCOHS in South Africa [12]. The mean dmft score was lower than that reported for similar age groups of children in the NCOHS [13]. According to the WHO classification of caries levels [8], this study population had low levels of caries (dmft score range between 1.2-2.6). Although the caries levels were low, the study found a high level of untreated caries as expressed by the “d” (decayed) component of the dmft score which contributed 94% to the overall score.

Data obtained from the DS study population indicates that the untreated caries rate is high. This concurs with findings from other studies that unmet treatment needs are high for CSHCN [11]. Studies have shown that CSHCN experienced several barriers to health care services and oral health care remains one of the frequently cited unmet health care needs in these children [14]. Kagihara et al. [15], reported that about 67% of parents of children with special needs have reported dentists’ unwillingness to treat or lack of knowledge of how to treat children with special needs [15]. Another possible reason for the high unmet treatment needs may be that caregivers might have overlooked the children’s oral health needs while focusing on attending to the other medical, physical, and emotional needs of the children [16]. The “m” (missing) component of the dmft score contributed 90% to the overall score which indicated that the main type of treatment that this cohort received was extractions with no preventive treatment done. This finding demonstrates the impact of the barriers to oral health care. A possible reason for the high level of extractions is that the children may have been brought to the dental clinics while in pain at a late stage of dental caries when only extraction could be done. Reduction in the barriers to oral health care for CSHCN requires systemic intervention.

The aim of the SiC score is to bring attention to those children with the highest caries scores in each population [16], and in this study population there was a significant difference between dmft and SiC scores (p < 0.05) This result suggests that the burden of disease is unevenly spread throughout the sample with some participants carrying much more of the disease burden than others. It is argued that a high risk approach rather than a population approach is required when working with CSHCN to ensure success in a prevention or intervention program. However this approach should be used with caution because those children who are regarded as “caries free” or “low risk” should not be excluded from prevention programs. Literature has shown that when the children who are “low risk” are excluded from prevention programs, 94% of them still develop dental caries later [17].

Limitations of the study

The first limitation of the study is that a small convenience sample was used. Secondly, the study used data from a national survey instead of a matched cohort of children without Special Health Care Needs as a control group.

CONCLUSION

While recognizing the limitations of the study, its key finding that the only treatment for dental caries given to pre-school DS children was tooth extraction, requires a response from the health care system. These children have the same rights as all other children to preventative dental treatment.

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