

# Drooling of Saliva and its Effect on the Oral Health Status of Children with Cerebral Palsy

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**Objective:** The purpose of this study was to assess the prevalence of drooling in individuals with cerebral palsy and assess the effect these factors have on these individuals oral health. **Materials:** A total of 113 individuals with cerebral palsy between the age of 5 and 18 years were examined. The incidence and severity of drooling were determined using the index given by Blasco et al and the oral health was recorded using a modified WHO performa. The data was then subjected to statistical analysis. **Results:** While drooling may not predispose the individual to dental caries individuals with drooling have a poorer oral hygiene score than those without. **Conclusions:** There is no significant difference in the Dental caries status, Orthodontic findings or the debris component of the Oral Hygiene Index of individuals who drool saliva and those who do not.

**Keywords:** Drooling, Oral Health, Cerebral Palsy

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## INTRODUCTION

In several forms of cerebral palsy head and neck involvement may be manifested by different signs with varying patterns of abnormal function.<sup>1,2</sup> Drooling of saliva is one such accompanying condition seen in cerebral palsy.<sup>3</sup> This phenomenon has been shown to cause both psychological difficulties and problems such as irritation or maceration of the skin, increased perioral infection, a foul smelling odor and dehydration due to fluid and nutrient loss.<sup>4</sup> Drooling can also cause impairment of speech and masticatory function and leads to an increased chance of perioral infection especially *Candida albicans*.<sup>5</sup> Severe drooling may also result in aspiration pneumonia.<sup>5</sup> Studies on the oral health of cerebral palsied children have focused mainly on problems such as dental caries, periodontal disease and orthodontic considerations, largely ignoring the issue of drooling and the impact

it may have on the above mentioned problems. Furthermore while some authors have suggested an association of drooling with certain malocclusions,<sup>6</sup> the impact on the varied orofacial structures in cerebral palsied individuals has not been addressed. Thus this study was undertaken to evaluate the oral hygiene of children with cerebral palsy and the effect of the drooling of saliva on the oral hygiene.

## MATERIALS AND METHODS

113 individuals with cerebral palsy between the ages of 5 and 18, attending special schools, were studied after obtaining parental consent. Children with severe neuromuscular incoordination who were unable to cooperate, and children whose parents did not give consent to examination were excluded from the study.

Drooling was assessed by observing the children over a 5 minute period and using the index proposed by Blasco *et al*<sup>7</sup> (Table A). The oral health status was measured using a modified WHO form.<sup>8</sup> Children without drooling (score 0 on the Blasco index) formed the control group, while those with drooling (scores 1, 2 and 3) formed the study groups. The findings were then statistically evaluated by using the one way ANOVA test. All Data was analyzed using the SPSS ver.11 data processing software.

**Table A.** Blasco Index to Measure Drooling

Score	Grouping	Clinical Findings
0	Absent	No Evidence of drooling of saliva
1	Mild Drooling	Saliva spills onto the lips but not beyond the vermillion border
2	Moderate Drooling	Saliva reaches the chin
3	Severe Drooling	Dripping of saliva onto the cloth

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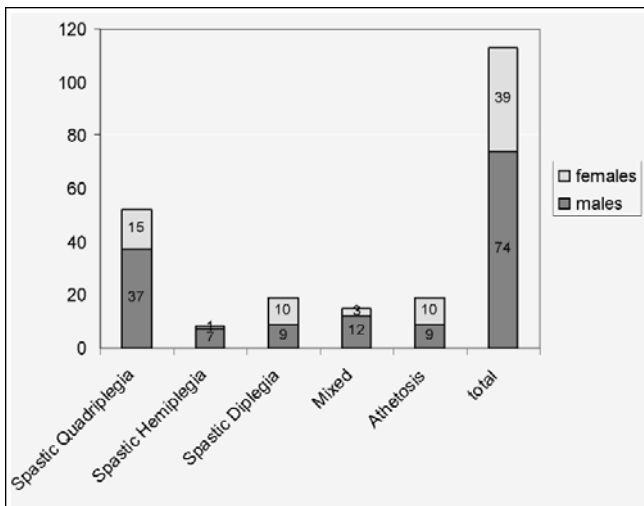


Table 1. Demographic Profile of the Population

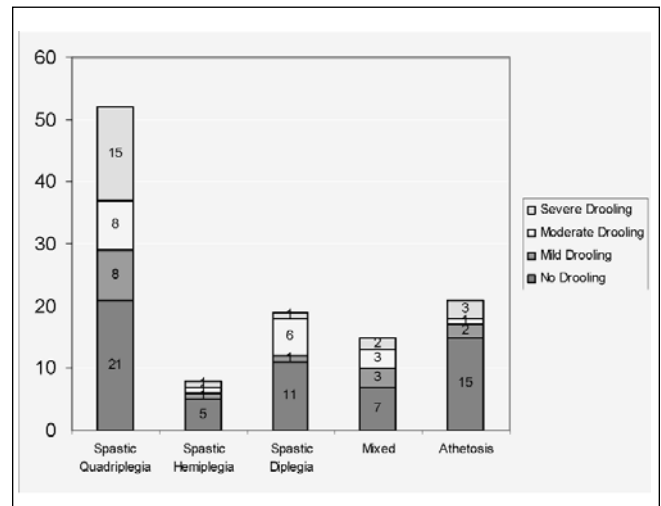


Table 2. Severity of Drooling in the Study Population

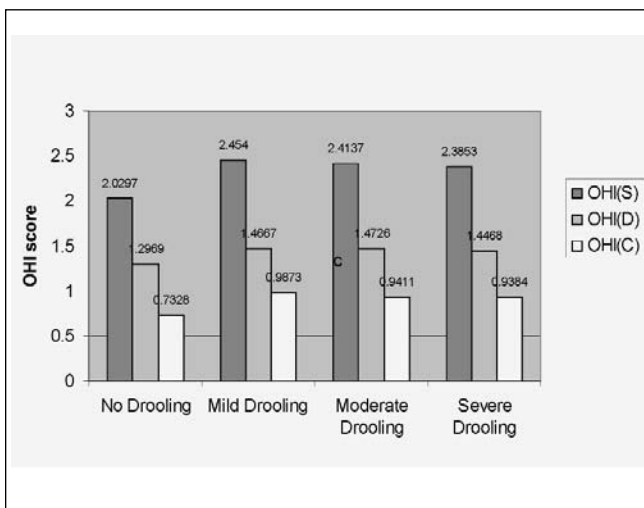


Table 3. The effect of Drooling on the Oral Hygiene

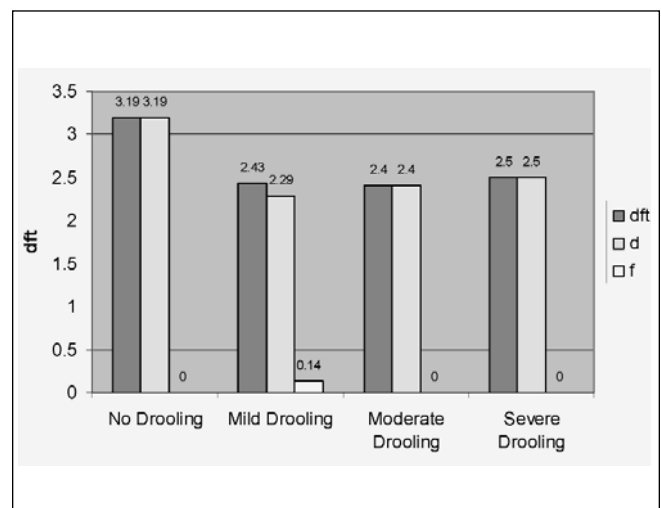


Table 4. Effect of Drooling on the Caries status of Primary Teeth

RESULTS

The sample consisted of 74 (65.48%) males and 39 (34.52%) females. Spastic quadriplegia was most prevalent form of CP while spastic diplegia was the least common form (Table 1).

The severity of drooling as evaluated by the Blasco index<sup>7</sup> showed that 59 of the 113 (52.2%) individuals had no drooling, 15 (13.3%) had mild drooling, 19 (16.8%) had moderate drooling while 20 (17.7%) had severe drooling. Drooling was most severe in those with spastic quadriplegia while it was least severe in those with athetosis (Table 2). The ANOVA showed this difference to be statistically significant at the 0.05 level of confidence. (F=3.392, p< 0.012)

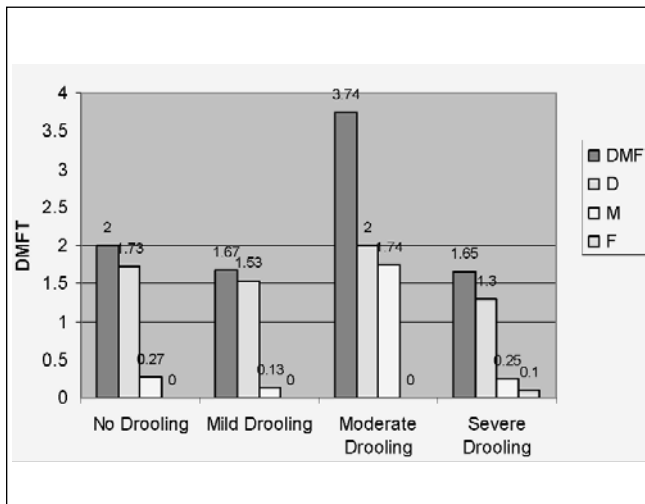
The oral hygiene status was examined in a total of 111 individuals (Table 3); two individuals were excluded as they had complete loss of all tooth structure due to rampant caries. The mean OHI(S) was 2.21 (SD ±0.71) indicating that the overall oral hygiene of the population was poor. This was reflected more in the debris [OHI (D) 1.38 SD ±0.40]

than in the calculus score [OHI(C) .84 SD ±0.39].

When the oral hygiene scores amongst the groups were compared, it was found that children with drooling of saliva had a significantly higher OHI(S) [F= 2.878, p<0.039] and OHI(C) [F=3.196, p<0.026]. There was however no significant difference in the debris scores between the groups.

The dental caries status of the primary and permanent teeth were measured separately using the DMF index for the permanent teeth and the dft for the primary teeth. The study population had no children in the primary dentition stage, 39 children were in the mixed dentition stage while 74 were in the permanent dentition stage.

The mean dft was 2.78; however the standard deviation was ±2.57, suggesting a wide range of dft values. The minimum dft was 0 while the highest score was 7. The decayed teeth were the largest component of the dft (mean d = 2.75) while the f component was virtually absent (mean f = 0.03). The children without drooling showed a slightly higher mean dft than the mean (3.18) (Table 4); however, the ANOVA



**Table 5.** Effect of Drooling on the Caries status of Permanent Teeth

showed no significant difference between the groups. ( $F=0.300, p<.825$ )

The mean DMF was 2.19 here again the standard deviation ( $\pm 3.07$ ) suggested a high range. The lowest score was 0; while two children, who had complete loss of dentition due to caries, had a score of 28. It is also of interest that the two children who had complete loss of dentition due to caries had severe spastic quadriplegia but had no drooling of saliva, associated with a very low SFR. The decayed teeth were the largest component of the DMF (mean D = 1.67) followed by the M (mean M= 0.50) The filled component was virtually negligible (mean F = 0.02). The children with moderate drooling had the highest DMF score (Table 5) but the difference was not statistically significant. (ANOVA:  $F= 2.091, p<0.106$ )

The overjet was measured in 72 of the 113 individuals, due to problems of neuromuscular coordination and trauma to the incisors we were unable to determine the overjet in 41 individuals. The mean overjet was 3.865 mm ( $SD \pm 0.99$ ), and although the mean overjet increased with the severity of drooling this significance was found to be not statistically significant. ( $F=0.566, p<0.639$ )

The molar relationship of 108 individuals was recorded. Due to severe neuromuscular incoordination we were unable to record the molar relationship of five individuals. Statistical analysis showed that there was no significant difference between the severity of drooling among children with different molar relationships. ( $F=0.874, p<0.0420$ )

There were three individuals with perioral candidiasis, all three children had mental retardation and severe drooling. There were no other perioral findings.

One child had an ulceration of the lip due to chronic lip biting. This child had severe spastic quadriplegia with mental retardation as well as severe drooling of saliva.

Also one child with severe drooling gave a history of repeated bouts of aspiration pneumonia. The child had severe spastic diplegia and mental retardation. The problem was so severe that the child was being fed through a naso-

gastric (Ryle's) tube to prevent further episodes of aspiration pneumonia and had been recommended to have a gastrostomy to overcome this problem.

**DISCUSSION**

In several forms of cerebral palsy, head and neck involvement may be manifested by different signs with varying patterns of abnormal function. Drooling of saliva is one such accompanying condition seen in cerebral palsy.<sup>4</sup>

The distribution of our population is similar to that of a recent study on CP children in special schools in Great Britain, where a greater number of males than females were affected and where Spastic Quadriplegia was the most common form of CP.<sup>9</sup> However another study found Spastic Diplegia to be the most common form of CP.<sup>10</sup> This may be partly due to the fact that the populations came from different ethnic backgrounds, but a more feasible explanation may be the poor inter examiner agreement in the classification of cerebral palsy.<sup>11, 12</sup>

Studies have shown the oral hygiene of children with CP to be poor.<sup>13, 14</sup> Comparison between the groups showed that individuals with drooling had a significantly higher OHI (C) and OHI(S) scores. However no difference was observed in the debris component of the OHI(S). The oral hygiene was best in those without drooling and worst in those with mild drooling. A possible explanation for this could be the fact that individuals with drooling have a defective swallowing mechanism<sup>15-17</sup> which could probably lead to a pooling of saliva in the floor of the mouth. The pooling of saliva is a well known factor in the formation of calculus<sup>18</sup> thus explaining the increased OHI (C) and overall OHI(S).

Children with CP have been shown to have a greater incidence of dental caries.<sup>13, 14, 19</sup> The decayed teeth were the largest component of the dft while the f component was virtually absent. These findings are in agreement with an earlier study which attributed the low number of filled teeth in these children to the difficulty in providing dental care to children with CP and also the low priority given to dental care in these children.<sup>19</sup>

A similar pattern was observed in the permanent dentition. It is of interest that the two children who had complete loss of dentition due to caries had severe spastic quadriplegia but had no drooling of saliva. However these individuals had a very low salivary flow rate. The decayed teeth were the largest component of the DMF followed by the M. Here too the filled component was virtually negligible. This is in agreement with previous studies,<sup>13, 14</sup> showing the low priority of dental care in these children.

The study by Franklin *et al* on the orthodontic considerations of children with CP had pointed out that children who had a drooling of saliva were likely to have an increased overjet and have a predisposition for a Class II molar relationship.<sup>6</sup> Although we found an increase in overjet as the severity of drooling increased in the 74 individuals where we were able to record the overjet this difference was not statistically significant.

In the 108 individuals where we were able to ascertain the

molar relationship, the Angle's Class I relationship was the most common followed by the Class II and Class III relationship respectively. This is in keeping with an earlier study.<sup>20</sup> Statistical analysis showed that there was no significant difference between the severity of drooling among children with different molar relationships. This is in contrast to the study by Franklin *et al* who attributed a greater severity of drooling to those with a class II relationship.<sup>6</sup> This difference can probably be explained by the fact that the above study used study models to observe the molar relationship while this study has measured the molar relationship clinically.

There were three individuals with perioral fungal infection, all three children had mental retardation and had severe drooling. While the literature points out that individuals with drooling of saliva may be susceptible to perioral *Candidia albicans* infection<sup>5</sup> there has been very little discussed about this finding in the studies on the oral health of children with CP. From the Data obtained in this study we can conclude that although drooling can definitely predispose an individual to perioral infection, perioral infection does not occur in all children with severe drooling, with a majority of the children with severe drooling showing no perioral infection. Perhaps another reason for this low occurrence of perioral infection could be the fact that all the children under study were attending a special school and were under the constant supervision of either parent or care taker who would probably wipe away any excess saliva that accumulated around the corners of the mouth, reducing the chance of infection.

One child with severe spastic quadriplegia with mental retardation had an ulceration of the lip due to chronic lip biting; this child had severe drooling of saliva. Lip biting is a masochistic habit and investigation of a possible underlying psychological cause of the habit was beyond the scope of this study.

Aspiration pneumonia has been one of the complications of the drooling that has been reported in literature<sup>5</sup> however there is no data on either the prevalence or severity of this problem. Even though we found only one case both the pediatric dentist and the parent/care giver should be aware of the potentially life threatening complication. Children who drool saliva should be constantly monitored to prevent any chance of aspiration.

### CONCLUSIONS

- The incidence of drooling in children with CP is high with almost half the study population suffering from some form of drooling
- There are no significant differences in the Dental caries status, Orthodontic findings or the debris component of the Oral Hygiene Index of individuals who drool saliva and those who do not.
- Individuals who drool saliva have a greater formation of calculus.
- The overall oral health of children is poor with little emphasis given to dental care irrespective of whether they drool saliva or not.

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