

Comparative Evaluation of Salivary Flow Rate, Buffering Capacity, Resting Ph in Speech and Hearing Impaired Children

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Abstract

Aim:

To compare the salivary flow rate, buffering capacity and resting pH in speech and hearing impaired children.

Material and Methods: A total of 60 Children were included in the study, consisting of 30 speech and hearing impaired children and 30 healthy children. Salivary parameters like flow rate, buffering capacity and resting pH were measured using Saliva-check Buffer kit (GC Europe) and were compared with healthy children.

Results: The difference between salivary flow rate, buffering capacity, pH was also found to be statistically significant with p value of less than 0.001.

Conclusion: The physicochemical properties of saliva, such as salivary flow rate, pH, buffering capacity is significantly low in speech and hearing impaired children when compared to healthy children.

Keywords: Speech and hearing impaired, Salivaryflowrate,Ph, Buffering capacity

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I. Introduction

Disability is the condition which restricts one's everyday activities. A person is disabled when a long term mental or physical condition affects the performance of routine activities. Children suffering from different disabilities are at high risk for poor oral health and prone to dental caries when compared to their non disabled counterparts. Oral health is a vital aspect for all children and more important for children with special needs because oral hygiene affects aesthetics, self-confidence. Children with disabilities and systemic pathologies tend to have poor oral hygiene as the sole problem is not their oral health and is usually neglected. Intellectual disability reduces the capability of an individual to maintain oral hygiene.¹

Hearing impairment is a condition in which individuals are unable to detect sound frequencies when compared to healthy individuals. Hearing impairment has a devastating effect on communication. Hearing impairment is usually associated with speech impairment due to the inability to respond. Hearing impaired child is unable to understand and communicate well even with the use of a hearing aid and understand without specific instructions.

Speech and hearing impaired individuals face significant problems in access to dental care and in communicating with the dentist.

Saliva is a clinically informative, biological fluid that is useful for novel approaches to prognosis, laboratory or clinical diagnosis, and monitoring and management of patients with both oral and systemic diseases. It is easily collected and stored and ideal for early detection of disease as it contains specific soluble biological markers²

Saliva is vital to maintain the integrity of teeth as well as the soft tissues³. Saliva secretion rate and buffering capacity have been proven to be sensitive parameters in caries prediction models⁴. Evaluation of saliva properties will provide useful information about the risk for developing dental diseases.⁵

The purpose of the present study was to determine and compare the salivary flow rate, pH and Buffering capacity of speech and hearing impaired children

II. Method

A study involving the speech and hearing impaired children in a special school for Hearing Impaired in Bangalore was carried out for children aged between 6 and 14 years old without any medical problem related to mental retardation, systemic disease and xerostomia were included in the present study. Signed written informed

consent was obtained from the school authorities and parents of the children prior to the commencement of the study.

Data for the control group was collected from healthy children who visited the department of Pedodontics and Preventive Dentistry, V.S.Dental college and hospital for a routine dental check-up.

Salivary flow rate , pH and Buffering capacity were the salivary parameters which were measured. Saliva collection was done in a an allocated classroom for research purposes. Child was not allowed to consume any food or beverages to prevent any food stimulation which may hinder the accuracy of the salivary parameters. Communication with the patients was done using sign language by a trained teacher. Saliva-Check BUFFER(GC Co., Japan) was used for the measuring the parameters. The procedure for each parameter was done following the protocol provided by the manufacturer. Saliva collection was done from 8:30am to 11:00am. Twenty children aged between 6 to 14 years were selected according to the exclusion and inclusion criteria.

The child was seated in an upright position with head slightly tilted forward to facilitate saliva collection and provided with a marked level indicator plastic cup. The child was asked to expectorate saliva for a duration of five minutes, froth formed was excluded and the results were calculated accordingly. Digital stopwatch was used to time the duration.

Salivary flow rate was calculated by dividing the reading into five to obtain millimetre per minute reading (ml/min)Salivary pH and the buffering capacity was measured and graded using the Saliva-Check BUFFER kit

III. Results

The study population consisted of 60 children which included 30 healthy children and 30 speech and hearing impaired children with a mean age being 9.533 ± 2.063 for healthy children and 10.2 ± 1.827 for speech and hearing impaired children.(table 1). The study population consisted of 77% males and 23% females for healthy children and 66% males and 34% females for speech and hearing impaired children group.(table2)

The salivary flow rate was found to be low for 70% and normal for 30% healthy children. In speech and hearing impaired children the salivary flow rate was noted to be very low for 33%, low for 43% and normal for 23%. On Chi square test the results were statistically significant for the salivary flow rate (p value-0.0023*)

The buffering capacity in normal children was observed low in 7% and normal in 93% healthy children . In speech and hearing impaired children the buffering capacity was low for 57% and normal for 43% children . The results were statistically significant for buffering capacity (p-value :0.0001*)

The mean pH in healthy children was 7.58 ± 0.2123 and in speech and hearing impaired it was found to be 6.753 ± 0.4629 .The difference was statistically significant (p value- <0.0001*)

Table 1- Gender of the participants

| | HEALTHY CHILDREN | HEARING IMPAIRED |
|--------|------------------|------------------|
| Male | 23 (77%) | 20(66%) |
| Female | 7(23%) | 10(34%) |

Table 2-Age comparison of the participants

| | HEALTHY CHILDREN | HEARING IMPAIRED |
|----------|-------------------|------------------|
| Mean age | 9.533 ± 2.063 | 10.2 ± 1.827 |

Table 3 –Comparison of salivary flow rate between the groups.

| Salivary flow rate | HEALTHY CHILDREN | HEARING IMPAIRED |
|--------------------|------------------|------------------|
| VERY LOW | 0 | 10(33%) |
| LOW | 21(70%) | 13(43%) |
| NORMAL | 9(30%) | 7(23%) |
| CHI SQUARE VALUE | 12.132 | |
| P VALUE | 0.0023* | |

P value (<0.05 is significant)

The obtained p value is less than 0.05 and there is a **significant association** regarding salivary flowrate and hearing impairment.

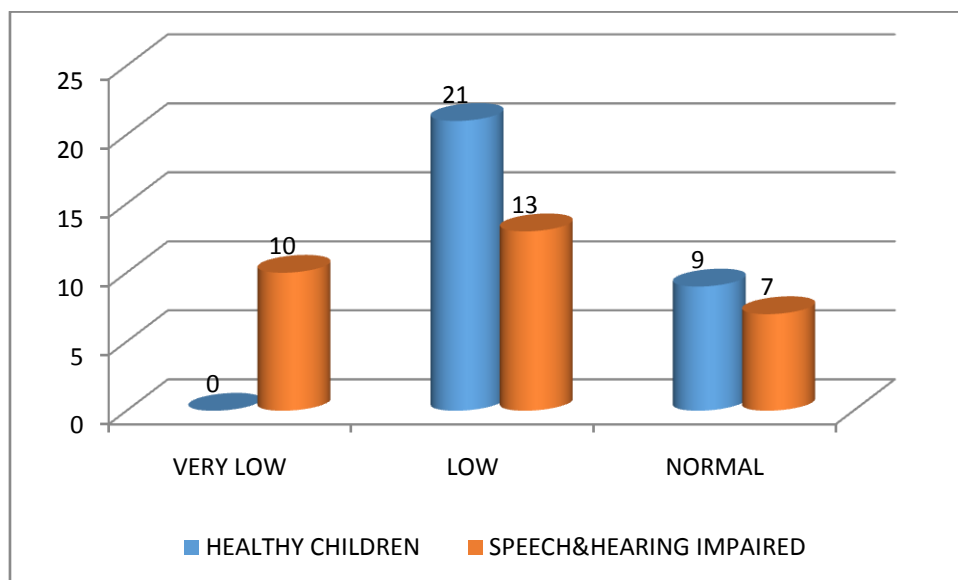


Table 4 - Comparison of buffering capacity between the groups.

| BUFFERING CAPACITY | HEALTHY CHILDREN | HEARING IMPAIRED |
|--------------------|------------------|------------------|
| LOW | 2 (7%) | 17(57%) |
| NORMAL | 28(93%) | 13(43%) |
| CHI SQUARE VALUE | 17.33 | |
| P VALUE | <0.0001* | |

P value (<0.05 is significant).

The obtained p value is less than 0.05 and there is a **very high significant association** regarding buffering capacity and hearing impairment.

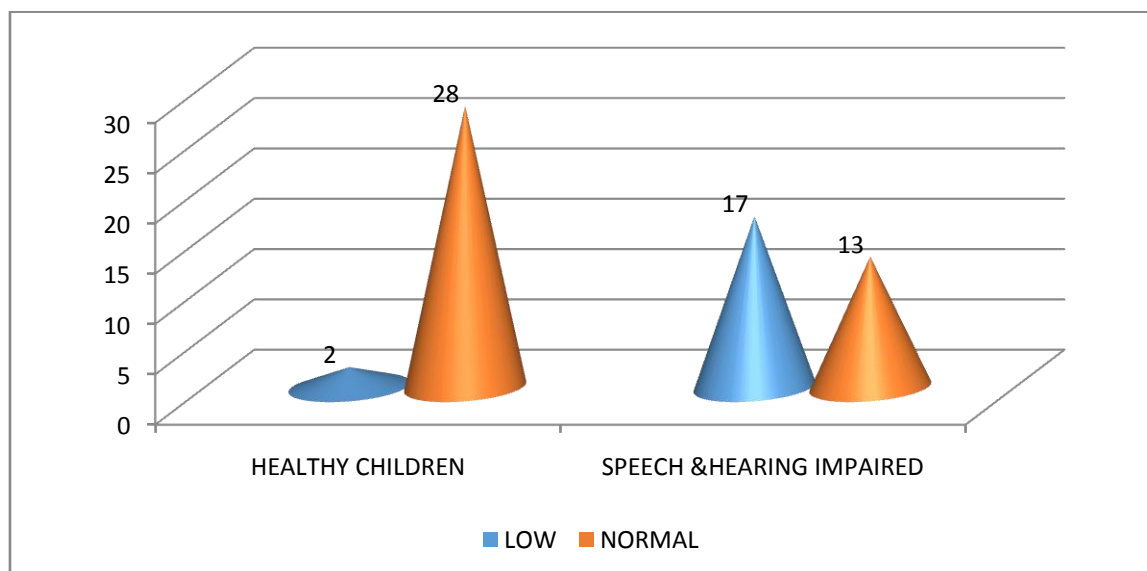
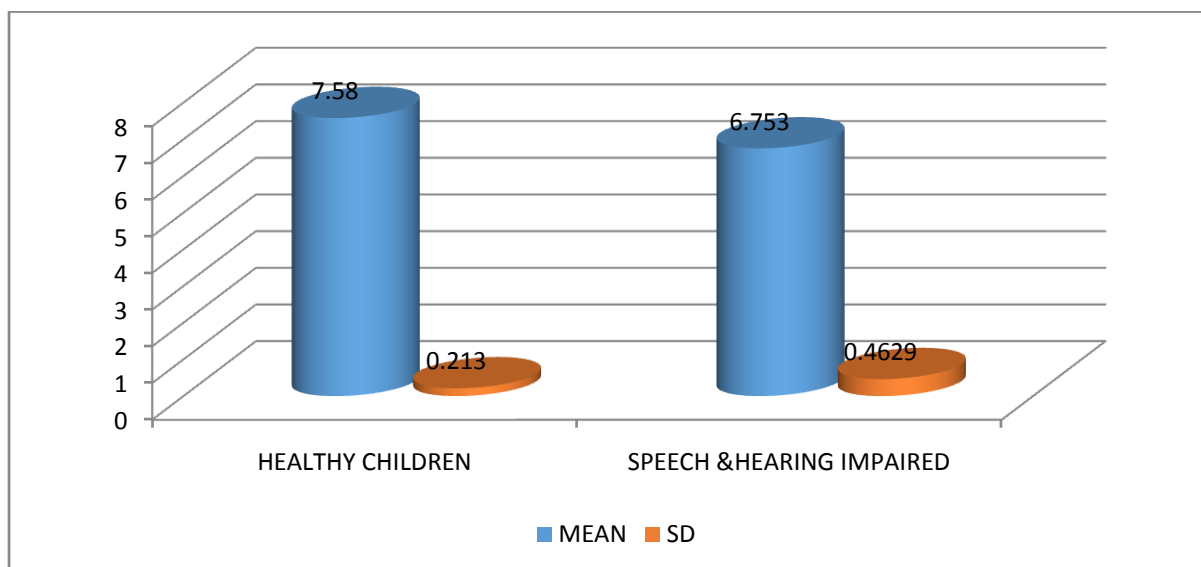


Table 5 - Comparison pH between the groups

| pH | HEALTHY CHILDREN | HEARING IMPAIRED(Mean ± SD) |
|----------------|------------------|-----------------------------|
| | 7.58±0.2123 | 6.753±0.4629 |
| DEGREE FREEDOM | 58 | |
| T VALUE | 8.911 | |
| P VALUE | <0.0001* | |

T test-(p value <0.05)is significant

The difference between the groups regarding Ph is **very highly significant** as the p value is <0.0001



IV. Discussion

Speech and hearing impaired children find it challenging to access dental health care and education due to limited communication. Speech and hearing impaired children face difficulties in communication with the dentists and nurses. Dentists are not trained in using sign languages. Lip reading and oral communication is only possible in a quiet environment. Hearing impaired children have limited dexterity and ability to control their own diet. Oral Health education should be provided to the parents, caregivers and school teachers of speech and hearing impaired children as they depend on caregivers for appropriate oral hygiene and proper diet.⁶

Saliva is essential to aid the integrity of the hard and soft tissues of the oral cavity. Saliva facilitates the demineralisation and remineralisation of the teeth, plays a major role in oral defence mechanism, modulates the adhesion of microorganisms to teeth and mucosal surfaces, buffers dietary acids.⁷

Unstimulated Salivary flow rate is essential for the maintenance of the oral health. Appropriate flow of saliva is required for oral health maintenance.⁸ The physical flow of saliva has an antiquary effect as it influences the clearance rate of the substrate, Higher the salivary flow rate faster is the clearance.⁹ In the present study there is a significant difference in the mean salivary flow rate among the study groups ($P < 0.0023$). The normal population have a significantly higher salivary flow rate when compared to the Hearing Impaired children. The results were statistically significant. These results can be substantiated by the study done by Rahman, N. A., Yusoff, A., et al., 2015⁶ which revealed that the saliva resting flow rate was low in speech hearing impaired children ($p < 0.001$). This indicated that speech and Hearing impaired children are more susceptible to caries.

Saliva facilitates demineralization and remineralisation of teeth, modifies the adhesion of microorganisms to teeth and other oral surfaces, and buffers dietary acids.¹⁰ Buffering capacity of saliva reduces the pH of saliva to some extent, but have not much role in the reduction of pH of plaque.

In our study there was a significant difference in the mean salivary buffering capacity among the study groups ($P < 0.001$). Healthy children had a statistically significant higher mean salivary buffering capacity than Speech and hearing impaired children. As there is no published literature assessing saliva buffer capacity in Speech and hearing impaired children. The present study is the first study conducted to assess saliva buffer capacity.

The salivary pH is a valuable biomarker. The saliva contributes to maintenance of the pH by two mechanisms. First, the flow of saliva eliminates carbohydrates that can be metabolized by bacteria and removes acids produced by bacteria. Second, acidity from drinks and foods, as well as from bacterial activity, is neutralized by the buffering activity of saliva.¹¹ In the present study the Mean salivary pH is 7.5 in healthy children and 6.7 in Hearing impaired. The Study conducted by Rahman, N. A., Yusoff, A., et al. 2015⁶ also reported that the mean salivary pH was 6.8 in speech and hearing impaired children. It is considered to be within the normal range at 6.5 and 7.5.¹⁰ The results revealed that the salivary pH is within the normal range in both the healthy and speech and hearing impaired children.

The properties of Saliva such as Salivary flow rate, pH, buffering capacity are low in speech and hearing impaired children when compared to healthy children. This indicated that the Speech and hearing impaired children lack oral hygiene and are prone to dental caries and other oral diseases.

V. Conclusion

Oral health is not the sole problem for Speech and Hearing individuals and their oral health is usually neglected. Pediatric dentists need to create more awareness of the importance of oral health among Speech and hearing Impaired children. The physicochemical properties of saliva, such as salivary flow rate, pH, buffering capacity are significantly low in speech and hearing impaired children when compared to healthy children.

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