

Impact of Secretor Status (AB Blood Type) in Relation to Caries Experience Related to Salivary Alkaline Phosphatase Among A Group of School Children

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Abstract

Background: About 80 percent of people are secretors of AB antigen. It has been proposed that secretion of these antigens into the saliva might be caries-preventive. So this study was conducted to determine the salivary secretor status of AB blood group in relation to experience and severity of dental caries on one hand, and salivary alkaline phosphatase related to dentition status on the other hand.

Materials and methods: One hundred three primary school children were selected randomly for this study in Baghdad city; all of them were between six to eight years of age. Oral examination was performed, dental caries experience and severity was recorded, unstimulated salivary samples were collected for laboratory examination for the AB antigen and Alkaline Phosphatase. Statistical analysis was performed using SPSS version 20.

Results: in the present study 36% of the children were found to be secretor for AB antigen in saliva. Dental caries in primary teeth represented by mean dmfs was lower among secretor than non-secretor group, concerning its grade the mean value of the two lowest grades of severity were higher among secretor than non secretor group while opposite results were found for the highest two grades of severity. The caries experience in permanent teeth represented by mean DMFs was higher among secretor children than non-secretor however the difference was not significant. The same results were found concerning D₂ and D₃ while opposite figure was found for the D₁ grade of caries severity. Salivary alkaline phosphatase was non-significantly lower among secretor children than non secretor group. There were non-significant inverse relation between the salivary alkaline phosphatase and caries experience in primary and permanent teeth in both secretors and non-secretors except the relation concerning Ds component of DMFs for the non-secretor group as the relation was in positive direction

Conclusion: The secretor children had lower caries experience and severity. While the relation between salivary alkaline phosphatase and caries experience of primary and permanent teeth in both secretor and non-secretor children were non-significant.

Keywords: Dental caries, salivary ABO, salivary alkaline phosphatase.

I. Introduction

ABO blood type system are the most important (clinically significant) blood type system for health care, with blood types A, B, AB, and O⁽¹⁾, these refer to erythrocyte antigens ⁽²⁾ which are produced by a series of reactions in which enzymes catalyze the transfer of the units. A person's DNA determines the type of enzymes they have and therefore, the type of antigens that end up on their red blood cells ⁽³⁾. About 80 percent of people are secretors ⁽⁴⁾.

AB antigens are glycolipid in nature (oligosaccharides) attached directly to lipids on red cell membrane. These antigens are also present as soluble antigens in plasma, saliva, and other secretions ⁽³⁻⁵⁾.

There is evidence to suggest a link between secretor status and the appearance of caries. It has been proposed that secretion of these antigens into the saliva might be caries-preventive ^(6,7). In previous century; Arneberg in 1976 had been found less dental caries among secretors than non-secretors of blood group substance other found the secretors of blood group mucin A had the lowest caries prevalence ⁽⁸⁾, however; this proposition is still a matter of debate, because other study found that the secretor status was unrelated to the caries scores ⁽⁹⁾.

It is postulated that blood group substances may interfere with the adherence of Streptococcus mutans to teeth ⁽¹⁰⁾, also significant inhibition of agglutination results were obtained when the saliva of these non-secretors were examined ⁽¹¹⁾.

The alkaline phosphatase (ALP) is an enzyme found in many human tissues ⁽¹²⁾. It requires a basic pH for optimal activity (pH=10), its function is to remove the phosphate group from bio-molecules ⁽¹³⁾. Adults have

lower levels of ALP than children because children's bones are still growing produce higher levels of ALP during some growth spurts^(14, 15).

Many researchers had reported a positive correlation between salivary alkaline phosphatase activities with dental caries⁽¹⁶⁻²¹⁾. while, later on Shahrabi and his co-workers in 2008 found no significant difference in the salivary alkaline phosphatase among severe, moderate and caries free groups⁽²²⁾. On the other hand Shaw in 1983, recorded inverse relation between caries rate and alkaline phosphatase level⁽²³⁾. In addition, it was found in other study that the level of alkaline phosphatase was significantly greater in caries-free group than in caries-active group⁽²⁴⁾.

The relation between secretor status and the activity of serum alkaline phosphatase was determined by many studies as they found that strong association as the non-secretor had lower level than secretor of ABO blood type⁽²⁵⁻²⁷⁾. Intestinal alkaline phosphatase (IAP) appears in the circulation more frequently in blood group B or O secretors than in blood group A or AB secretors and non-secretors⁽²⁸⁾.

As far as there is no previous Iraqi study concerning the secretor status among children with its relation to caries experience in primary and permanent teeth and salivary alkaline phosphatase, therefore; this study was conducted.

Aims Of The Study

This study was conducted among primary school children aged 6-8 years in order to determine the salivary secretor status of AB blood group in relation to:

1. Experience and severity of dental caries
2. Salivary alkaline phosphatase related to dentition status

II. Materials And Method

One hundred three primary school children were selected randomly for this study in Baghdad city; all of them were between six to eight years of age. Consent had been obtained for examining the children in every school. Oral examination was followed the criteria of WHO recommendations for oral health surveys⁽²⁹⁾ using disposable mouth mirror and dental explorer under the day light at the classroom desk. The dental caries was recorded following the criteria of Manjje et al, 1989 which include the (d₁₋₄) for primary teeth and (D₁₋₄) for permanent teeth.

“The Criteria For Coding Were As Follows:

Grade 1: Smooth surface: white/ opaque or brownish lesion in enamel only, including slight loss of the surfaces, appears smooth, hard, and glossy; the lesion is most often separated from the gingival margin.

Occlusal surfaces: dark fissures or pits which are hard on probing; the lesion appears to be confined to the enamel where there is extrinsic discoloration only, then recorded as sound. Proximal surfaces: clinically visible, whitish/ brown lesion where no obvious cavity can be probed; where a proximal surface are not in contact with the neighboring tooth, then the same criteria as for smooth surfaces are applied.

Grade 2: Smooth surfaces: enamel lesion (white/ opaque or brownish/ dark in color) including slight loss of surface, but without suspected dentinal involvement; the surface is rough or softened and dull.

Occlusal surfaces: fissures and pits with distinct sticking on probing indicative of ongoing caries activity without evidence of dentinal involvement. A proximal surfaces: recording of darkening enamel lesion catching on probing, but no evidence of dentinal involvement.

Grade 3: Coronal caries: involving the dentin, but pulpal involvement is not suspected.

Grade 4: Coronal caries: with possible or definite pulpal involvement. (f,F) Fraction of (dmfs, DMFs) was recorded when one or more permanent restoration was present and no area of tooth was affected whether by primary or recurrent caries. (m,M) Fraction of (dmfs, DMFs) was recorded for teeth that has been extracted because of caries and was estimated as five surfaces for posterior teeth and four surfaces for anterior teeth. In primary tooth, it was recorded when normal exfoliation could not be sufficient explanation for its absence. Differentiation between unerupted and extracted tooth was made by the evaluation of the status of corresponding contralateral tooth, the appearance of the alveolar ridge in the area of the tooth space in question and the caries status of the other teeth in the mouth. Radiographs were not taken because of technical difficulties.⁽³⁰⁾

Unstimulated salivary sample was taken from the children according to Fejerskov and Thylstrup⁽³¹⁾

- “1. The patient should not eat or drink (except water) one hour before saliva collection.
2. A pre – sampling period of one minute is recommended.
3. A fixed collection time (10-15 min. for unstimulated saliva) should be used.
4. The patient should sit in a relaxed position in an ordinary chair.
5. Samples containing blood should be discarded if chemical analyses of saliva are planned.”

Salivary analysis for the secretory AB and alkaline phosphatase was performed in the laboratory of the department of basic science, College of Dentistry – Baghdad University. “By using Blood Typing Kit # 11: Blood Typing Using Saliva Student Manual, detection of AB salivary secretors was performed.⁽³²⁾“The salivary Alkaline Phosphatase activity was determined spectrophotometrically (according to the recommendation of the German Clinical Chemistry Association using the kit of Human Company, Germany)⁽³³⁾. Statistical analysis was performed using SPSS version 20.

III. Results

The distribution of the sample according to secretor status is shown in table 1 this table shows that the percentage of non-secretor children (64%) was more than the secretor (36%). Caries experience in the primary teeth were recorded for the sample that represented by dmfs and its components, however data analysis shows that the mean dmfs value was lower among secretor than non secretor group the same results were found concerning ds, ms and fs, however; the filling surfaces for the primary teeth was absent among secretor group. All these differences were not significant except the differences for the missing surfaces as it was highly significant (Table 2)

Caries severity represented by ds grades are shown in table 3. This table shows that the mean value of the two lowest grades of severity were higher among secretor than non secretor group while apposite results were found for the highest two grades of severity as the mean values of d3 and d4 were higher among non-secretor than secretor group however all these differences were not significant. Caries experience in permanent teeth represented by DMFS and its component according to secretor status are shown in table 4. This table shows that the caries experience represented by DMFS was higher among secretor children than non-secretor however the difference was not significant the same result was found concerning Ds and FS components while the missing permanent tooth surfaces represented by Ms component was absent for both groups The same results were found concerning D₂ and D₃ as the mean values were statistically none significant higher among secretor than non secretor group while apposite figure was found for the D₁ grade of caries severity as the mean value was not significantly higher among non-secretor than secretor group however the pulp insolvent for permanent teeth represented by D₄ grade was absent for both group (table 5). Salivary alkaline phosphatase was determined only according to secretor status is shown in table 6. This table shows that the concentration of salivary alkaline phosphatase was non-significantly lower among secretor children than non secretor group. Data analysis concerning the relation between the salivary alkaline phosphatase and caries experience in primary teeth showed that all the relations were non-significant in negative direction for both group (table 7). For the permanent teeth other picture was found the relation were in negative direction concerning DMFS and filling component (Fs) for both groups while for decayed component (Ds) different result were found as the relation was in negative direction among secretor group and apposite for the non-secretor status group however all these relations were non-significant (table 8).

IV. Discussion

In this study, the percentage of non-secretor children was higher (64%) than the secretor children (36%), as well as higher than that reported previously⁽⁴⁾, however; this may be due to the inclusion of the (O) blood group within non-secretor children.

Caries experience in the primary teeth represented by dmfs, ds, ms, in addition to the highest grades of ds severity (d₃, d₄) were lower in secretor children than non-secretors; this result is in agreement with previous studies⁽⁶⁻⁸⁾. However; the fs component was not found in both groups giving a clue for low dental education. While the lowest grades of ds severity of dental caries (d₁, d₂) were higher in secretor children which gives an impression of protective effect of AB antigens. This is in accordance with many studies⁽⁹⁻¹¹⁾.

Caries experience in the permanent teeth represented by DMFS, Ds, Fs, severity of dental caries represented by D₂, D₃ were higher among secretor children than non-secretors, however; the difference is statistically non-significant. This may be due to the differences in the number of erupted permanent teeth in this age group (6-8 years) as the secretor person reported by many studies to have good health condition so they had earlier eruption of teeth^(3,34-35).

The data of the present study showed that there was no significant difference in salivary alkaline phosphatase between the secretor and non-secretors groups. The result disagree with previous studies⁽²⁵⁻²⁷⁾ which proposed that the non-secretors have lower salivary alkaline phosphatase than the secretors, this may be due to the differences in the criteria of sampling as this study include the (O) blood type with the non-secretors group .

Concerning the relation with caries experience the salivary alkaline phosphatase showed an inverse non-significant relation this result is in accordance with that of previous studies⁽²²⁻²³⁾.

V. Conclusion

The secretor children had lower caries experience and severity. While the relation between salivary alkaline phosphatase and caries experience of primary and permanent teeth in both secretor and non-secretor children were non-significant.

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Table 1. Distribution of the children according to the secretor status

| AB secretor status | | | | | |
|--------------------|----|--------------|----|-------|-----|
| Secretor AB | | Non-secretor | | Total | |
| No | % | No | % | No | % |
| 37 | 36 | 66 | 64 | 103 | 100 |

Table 2: Caries experience of primary teeth dmfs and its components according to secretor status

| caries experience | AB secretor status | | | | T-test | sig |
|-------------------|--------------------|------|--------------|------|--------|-------|
| | Secretor AB | | Non-secretor | | | |
| | mean | ±SD | mean | ±SD | | |
| | 37 | | 62 | | | |
| ds | 12.18 | 1.46 | 13.60 | 1.37 | 0.37 | 0.71 |
| ms | 0.27 | 0.19 | 2.02 | 0.39 | 3.32 | 0.001 |
| fs | 0.00 | 0.00 | 0.13 | 0.10 | 0.98 | 0.33 |
| dmfs | 13.08 | 1.44 | 15.74 | 1.41 | 1.25 | 0.22 |

Table 3: Caries experience severity (d₁₋₄) of primary teeth among children according to secretor status

| severity of caries experience | AB secretor status | | | | T-test | sig |
|-------------------------------|--------------------|------|--------------|------|--------|------|
| | Secretor AB | | Non-secretor | | | |
| | mean | ±SD | mean | ±SD | | |
| | 37 | | 62 | | | |
| d ₁ | 0.76 | 0.25 | 0.56 | 0.13 | 0.76 | 0.45 |
| d ₂ | 1.95 | 0.30 | 1.26 | 0.25 | 1.75 | 0.08 |
| d ₃ | 9.62 | 1.25 | 10.31 | 1.17 | - | 0.70 |
| d ₄ | 1.51 | 0.72 | 2.18 | 0.46 | - | 0.82 |

Table 4: Caries experience of permanent teeth DMFs and its components according to secretor status

| caries experience | AB secretor status | | | | T-test | sig |
|-------------------|--------------------|------|--------------|------|--------|-------|
| | Secretor AB | | Non-secretor | | | |
| | mean | ±SD | mean | ±SD | | |
| | 30 | | 55 | | | |
| DS | 0.931 | 0.31 | 0.618 | 0.16 | 0.99 | 0.32 |
| MS | 0.0 | 0.00 | 0.00 | 0.00 | ----- | ----- |
| FS | 0.067 | 0.07 | 0.036 | 0.04 | 0.44 | 0.66 |
| DMFS | 0.967 | 0.32 | 0.655 | 0.16 | 0.96 | 0.34 |

Table 5: Caries experience severity (D₁₋₄) of permanent teeth among children according to secretor status

| severity of caries experience | AB secretor status | | | | T-test | sig |
|-------------------------------|--------------------|------|--------------|------|--------|------|
| | Secretor AB | | Non-secretor | | | |
| | No | ±SE | mean | ±SE | | |
| | 30 | | 55 | | | |
| D ₁ | 0.37 | 0.16 | 0.53 | 0.13 | - | 0.76 |
| D ₂ | 0.73 | 0.27 | 0.47 | 0.13 | 0.97 | 0.33 |
| D ₃ | 0.20 | 0.09 | 0.05 | 0.04 | 1.71 | 0.09 |
| D ₄ | 0.00 | 0.00 | 0.00 | 0.00 | | |

Table 6: Salivary alkaline phosphatase according to secretor status

| | AB secretor status | | | | T-test | sig |
|-----|--------------------|-------|--------------|-------|--------|------|
| | Secretor AB | | Non-secretor | | | |
| | mean | ±SD | mean | ±SD | | |
| | 35 | | 61 | | | |
| ALP | 0.995 | 0.209 | 1.131 | 0.213 | - | 0.68 |
| | | | | | 0.42 | |

Table 7: Salivary alkaline phosphatase in relation to caries experience in primary teeth according to secretor status

| | ds | | ms | | fs | | dmfs | |
|--------------|------|------|------|------|------|-------|------|-----|
| | r | p | r | p | r | p | r | p |
| Secretor AB | - | 0.39 | - | 0.25 | ---- | ----- | - | 0.3 |
| | 0.15 | | 0.20 | | -- | -- | 0.18 | |
| Non-secretor | - | 0.57 | - | 0.15 | - | 0.62 | - | 0.3 |
| | 0.08 | | 0.25 | | 0.07 | | 0.13 | |

Table 8: Salivary alkaline phosphatase in relation to caries experience in permanent teeth according to secretor status

| | Ds | | Ms | | Fs | | DMFs | |
|--------------|------|------|------|-------|------|-----|------|-----|
| | r | p | r | p | r | p | r | p |
| Secretor AB | - | 0.73 | ---- | ----- | - | 0.6 | - | 0.7 |
| | 0.07 | | -- | -- | 0.09 | | 0.07 | |
| Non-secretor | 0.01 | 0.99 | ---- | ----- | - | 0.7 | - | 0.9 |
| | 0.01 | | -- | -- | 0.06 | | 0.01 | |