

Risk Assessment for the Development of Caries in Visually Impaired Children in Sofia City, Bulgaria

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Abstract: *Introduction:* The children with vision impaired are part of children with special needs. In Bulgaria of that population so far is not conducted risk assessment for the development of dental caries. She is of great importance to model of the oral environment and reducing risk factors for the development of this process. *Aim:* The aim of this study was to conduct an assessment of caries-the risk in group of children with impaired vision and the resulting data to be compared with the results of a control group of healthy children. *Material and Methods:* In the study participated 30 children the visually impaired and 100 healthy children. To them assess the risk of developing dental caries with the Tool for assessment of caries-risk of the children in Bulgaria. *Results:* has been found that the most significant risk factors in children with impaired vision are the poor oral hygiene, fluoride prophylaxis the pursued, tooth decay of the parents, the social status and the caries activity as emerging dental caries over the past year compared with healthy children. *Conclusion:* In the examined children with impaired vision has a serious risk of caries. The risk assessment of them will allow be managed caries environment and to reduce the risk through the periodic monitoring of the risk factors and implementation of appropriate preventive measures.

Keywords: Visually impaired children, dental caries, risk assessment of caries indicators, oral health

1. Introduction

Dental caries is a multifactorial disease and left without control and management can arise and developing at any age, person or social group. This requires constant to implementing programs for prevention, even in countries achieved real restriction on the caries prevalence [1, 2]. For his controlling is required a complex approach, including a risk assessment of dental caries, recommendations for healthy behaviors and clinical professional care by general dentists [2, 3, 4].

2. Aim

The aim of this study was to conduct an assessment of caries-risk group of blind children. They have a high risk of dental caries in terms of their harmful condition and therefore the task of this study was to analyze the extent of any risk factors attendees in these children and to compare them with a control group of healthy peers.

3. Material and Methods

The study covers 30 blind children from school "Louis Braille" in Sofia aged 6 to 12 years and a control group of 100 healthy children. The children were included in the survey after signing the informed consent of their parents. To conduct the study was authorized by Ethics Commission of scientific studies (KENIMUS) at the Medical University - Sofia. The data of each of the the children studied were registered in ambulatory card and questionnaire card-clinical "assessment tool of the risk of caries ", made and implemented in the Department of Pediatric Dentistry, Faculty of Dental Medicine, Medical University, Sofia. Assessing the quality of the saliva were evaluated using the "Saliva Check" Company GC by complying with the methodology of test. The statistical data processing is performed by software program product SPSS for Windows 11.5.

4. Results

The first important risk factor that was analyzed is the frequency of dental caries. The data for the distribution of the children in degree of the risk are plotted on Table № 1.

Table 1: Risk factor - the frequency of dental caries

| Frequency of dental caries | Cases N=30 | Controls N=100 | χ^2 | P value |
|----------------------------|------------|----------------|----------|---------|
| Low - to 2 DMF | 4 (13.3%) | 17 (17%) | 0.2 | n.s. |
| Moderate - to 4 DMF | 0% | 7 (7%) | | |
| High - More than 4 DMF | 26 (86.7%) | 76 (76%) | 1.5 | n.s. |

*non-significant – n.s.

The data show that the majority of the surveyed blind and healthy children have a frequency of 4 DMF, and are with high risk of caries. One small part are with a low risk. Reported was only a small relative share of healthy children with moderate risk. In comparing of the data does not establish statistical reliability.

Table 2: Risk factor - active carious lesions

| Active carious lesions | Cases N=30 | Controls N=100 | χ^2 | P value |
|------------------------|------------|----------------|----------|---------|
| Low risk | 11 (36.7%) | 13 (13%) | 8.6 | <0.01 |
| Moderate risk | 9 (30%) | 37 (37%) | 0.5 | n.s. |
| High risk | 10 (33.3%) | 50 (50%) | 2.6 | n.s. |

*non-significant – n.s.

The presence of reversible active carious lesions shows that has an active caries protection in the patient's mouth. From the obtained results can be seen that in healthy children there is a real risk of caries such as most are in the groups with a high and moderate risk and a small part have a low risk. In children with visual the distribution is relatively even in the three risk groups. Statistical reliability is established only in the group of children with low risk.

Table 3: Risk factor - frequency of carbohydrate intake

| Frequency of carbohydrate intake | Cases N=30 | Controls N=100 | χ^2 | P value |
|--|------------|----------------|----------|---------|
| Low risk – Limited intake | 6 (20%) | 27 (27%) | 0.6 | n.s. |
| Moderate risk - Seldom between the meals | 8 (26.7%) | 20 (20%) | 0.6 | n.s. |
| High risk - Frequent intake | 16 (53.3%) | 53 (53%) | 0.001 | n.s. |

*non-significant – n.s.

Examining the risk factor frequency of carbohydrate intake can be seen that the difference between healthy children and the children with visually impaired is not essential. This was confirmed by the lack of a statistically significant difference between them. Finds that more than half the children in both groups are high caries-risk. This shows that this risk factor a serious threat to the health of the teeth of majority of the investigated children.

Table 4: Risk factor - level of oral hygiene

| Oral Hygiene | Cases N=30 | Controls N=100 | χ^2 | P value |
|----------------------|------------|----------------|----------|---------|
| Low risk – Good | 0 % | 10 (10%) | | |
| Moderate risk - Fair | 6 (20%) | 43 (43%) | 5.2 | <0.05 |
| High risk - Poor | 24 (80%) | 47 (47%) | 10.1 | <0.01 |

From the results of the three risk groups is established statistical reliability in the groups with moderate and high risk. Oral hygiene is a major risk factor for the development of dental caries. She is poor at about half of healthy children and the majority of blind children. This is explicable, since visual impairment is a serious barrier to maintaining good oral hygiene to them.

Table 5: Risk factors - fluoride prevention

| Fluoride prevention | Cases N=30 | Controls N=100 | χ^2 | P value |
|----------------------------------|------------|----------------|----------|---------|
| Low risk – Satisfactory | 11 (33.3%) | 40 (40%) | 0.1 | n.s. |
| Moderate risk -Only with F paste | 9 (36.7%) | 50 (50%) | 3.7 | n.s. |
| High risk - Without F prevention | 10 (30%) | 10 (10%) | 9.6 | <0.01 |

*non-significant – n.s.

Fluoride prevention is a protective factor for the development of dental caries. Order to be able is present such an protection that should be conducted some form of fluoride prevention. From the data for the presence of such protective factor in the studied children with disabilities and healthy children established that these are almost uniformly distributed in the three risk groups. Statistical reliability has been established only in high risk groups.

Table 6: Risk factor - tooth decay parents

| Tooth decay parents | Cases N=30 | Controls N=100 | χ^2 | P value |
|---|------------|----------------|----------|---------|
| Low risk – Single restorations | 0% | 7 (7%) | | |
| Moderate risk -with single restorations | 16 (53.3%) | 77 (77%) | 6.3 | <0.05 |
| High risk - many restorations and extractions | 14 (46.7%) | 16 (16%) | 12.2 | <0.001 |

The attitude of parents towards their oral health influences to some extent and the oral health of their child. Underestimating him is reflected of the state of teeth in their children. In the group with low caries-risk is only a small part of the parents of healthy children. In the group with moderate risk fall within most of the parents of the children in both groups, as finding statistical significance of results. The results show that more credible are the parents of children with disabilities who have a greater affected of the carious process in comparison with those of the healthy controls. This speaks of insufficient care for oral health, reflecting is also of the children.

Table 7: Risk factor - social status

| Social status | Cases N=30 | Controls N=100 | χ^2 | P value |
|-------------------------------|------------|----------------|----------|---------|
| Low risk - high status | 0% | 0% | | |
| Moderate risk - middle status | 17 (56.7%) | 90 (90%) | 17.6 | <0.001 |
| High risk - low status | 13 (43.3%) | 10 (10%) | 17.6 | <0.001 |

Social status is certainly an important risk factor for the development of dental caries. Data show that the majority of all children live in families with moderate risk to social status confirmed with high statistical reliability. The remaining blind children live in families with lower social status, which is a serious risk for dental caries and they are longer than healthy children.

Table 8: Risk factor - a visit to the dentist

| Visit to the dentist | Cases N=30 | Controls N=100 | χ^2 | P value |
|---------------------------------|------------|----------------|----------|---------|
| Low risk - 2 times per year | 11 (36.7%) | 100 (100%) | 74.2 | <0.001 |
| Moderate risk - 1 time per year | 9 (30%) | 0% | | |
| High risk – Rarely if necessary | 10 (33.3%) | 0% | | |

The frequency of preventive examinations shows the attitude of parents towards oral health of their children. From the survey of this factor can be seen that all healthy children fall into the group of low risk. In children with disabilities is observed almost uniformly distributed in the three risk groups, such as reliable result is observed only in children in the group with low risk. This clearly shows that most of the parents of the children studied think about the need to implement a timely care for the oral health of children.

Table 9: Risk factor – new dental caries in the last year

| New dental caries in the last year | Cases N=30 | Controls N=100 | χ^2 | P value |
|---|------------|----------------|----------|---------|
| Low risk - No | 10 (33.3%) | 33 (33%) | | n.s. |
| Moderate risk - A single new dental caries | 8 (26.7%) | 63 (63%) | 12.3 | <0.001 |
| High risk – More than one new dental caries | 12 (40%) | 4 (4%) | 27.7 | <0.001 |

*non-significant – n.s.

The distribution of healthy children in the groups with different caries-risk shows that about one third of children are placed in the group with low risk most of them are with moderate risk and a small part with a high risk. Unlike them the children with visual impairments have approximately equal distribution in the three risk groups. The result is worrisome for 40% of the surveyed blind schoolchildren, because in the past year have evolved more than one carious

lesions. The results are credible groups with moderate and high caries-risk. For the assessment of the risk factor stimulated saliva were made using all blind schoolchildren and only 30 healthy children, due to the limited quantity of the tests.

Table 10. Risk factor - stimulated saliva

| Stimulated saliva | Cases N=30 | Controls N=100 | χ^2 | P value |
|---|---------------|-------------------|----------|---------|
| Low risk - norm > 5 ml / 5min | 25 (83.3%) | 93 (93%) | 2.6 | n.s. |
| Moderate risk - small current 5-3,5ml /5min | 5 (16.7%) | 7 (7%) | 2.6 | n.s. |
| High risk - very weak current <3,5ml / 5min | 0% | 0% | | |

***non-significant – n.s.**

At the verification of the current in saliva stimulated saliva is found that the distribution of all children examined is similar. The majority of them fall in the group with low risk, and the rest are moderate caries-risk without statistical reliability of the results. This factor is not a serious risk for the development of caries in the children from both groups.

Table 12: Risk factor - not stimulated saliva

| Not stimulated | Cases N=30 | Controls N=100 | χ^2 | P value |
|---|---------------|-------------------|----------|---------|
| Low risk - the appearance of saliva on bottom lip for less than 1 min | 27 (90%) | 87 (87%) | 0.2 | n.s. |
| High risk - the appearance of saliva on bottom lip over 1 min | 3 (10%) | 13 (13%) | 0.1 | n.s. |

***non-significant – n.s.**

In all the surveyed children was evaluated not stimulated saliva. Most of the children blind and healthy fall within in the group with low risk and a small part in the high risk group without significant differences between them. Therefore, this indicator can not be accepted as a risk factor for the development of caries in the studied children.

Table 13: Risk factor - consistence of saliva

| Consistence of saliva | Cases N=30 | Controls N=100 | χ^2 | P value |
|--------------------------------------|---------------|-------------------|----------|---------|
| Low risk - performance liquid saliva | 21 (70%) | 97 (97%) | 20.1 | <0.001 |
| Moderate risk - saliva with bubbles | 4 (13,3%) | 3 (3%) | 4.8 | <0.05 |
| High risk - a dense, viscous saliva | 5 (16,7%) | 0% | | |

The consistency of saliva is not a risk factor for children included in this study. Significant part of them are with low caries-risk and a small part are of moderate risk, such as is reported statistical significance of results with respect to this risk indicator. For only five of the surveyed blind schoolchildren, the consistency of saliva is a serious risk factor.

Table 14: Risk factor - pH of saliva

| pH на слюнката | Cases N=30 | Controls N=30 | χ^2 | P value |
|------------------------------|---------------|------------------|----------|---------|
| Low risk – pH (6.8-7.8) | 21 (70%) | 24 (80%) | 21.6 | <0.001 |
| Moderate risk - pH (6.0-6.6) | 9 (30%) | 6 (20%) | 13.0 | <0.001 |
| High risk – pH (5,5 -5,0) | 0% | 0% | | |

From the conducted study is found that the acidity of the saliva is not a risk factor for the majority of the examined children. Significantly different results were established in the groups with low and moderate risk in respect of this risk indicator.

Table 15: Risk factor - buffer capacity of the saliva

| Buffer capacity of the saliva | Cases N=30 | Controls N=30 | χ^2 | P value |
|--------------------------------------|---------------|------------------|----------|---------|
| Low risk – Normal Buffer capacity | 25 (83.3%) | 27 (90%) | 30.5 | <0.001 |
| Moderate risk - Low Buffer capacity | 5 (16.7%) | 3 (10%) | 7.5 | <0.001 |
| High risk – Very low Buffer capacity | 0% | 0% | | |

The analysis of the buffering capacity of the saliva of visually impaired children and healthy children from the control group showed that for the majority of them it is in norm. At the other children was registered that he was low. Significant difference in the results is accounted in the both risk groups.

5. Discussion

The strategies for the control of dental caries are increasingly based on the concept of assessment the risk of his progression [3, 5, 6, 7, 8, 9, 10, 11, 12]. The tool for assessing the risk of caries (CAT- Caries-risk Assessment Tool) is based on a set of physical indicators such the environment and general health indicators and is one dynamic tool that can be evaluated and revised periodically when the data so require (6). Prevention is the most acceptable way to ensure oral health especially for patients with disabilities since they require multiple care due to the systematic condition [9, 13]. The American Academy of Pediatric Dentistry recommends assessing the risk of caries in children with special needs, as they are at high risk due to their disability [5]. The risk assessment of caries allows to evaluate changes in risk status of the child with special needs [3, 4, 7, 10]). It is basis in the strategy for control of the dental caries and allows to make correct clinical decisions [3, 4, 5, 6, 7, 10, 11, 12, 13, 14, 15]. The recommendations are to use modern indicators for forecasting the risk, that take into account the ratio between risk and protective indicators taking into consideration the fact that everyone has a unique an organic characteristic [4, 16].

The only study of the risk of caries in children with disabilities was made by Marshall et al. [8]. The aim of this study was to assess the dental status of 99 children with autism aged 2.7 to 19 years and to examine its relationship with Tool assessing the risk of caries (CAT), approved by the American Academy of Pediatric Dentistry. Data were collected from the children, their parents and dentists using talks and records about the treatment. It was found that the children under 7 years of age have more new caries than older participants but the result was not statistically significant [8]. It is pointed out that all children who brush their teeth less than once a day have new caries and average of 7.3 DMF. The children with poor oral hygiene have many new caries than those with good or excellent oral hygiene. According to the authors caries status was not bound by

gender, socio-economic status, medical history, type of visit, the dental office, food encouragements, limited diets and some general hygienic habits [8].

Rashkova and colleagues in their study determined the most important indicators for the occurrence of dental caries in children in Bulgaria and shall develop a system of factors for forecasting the risk and registration form for the risk factors and dental status of the patient. To quickly assess of the quality of the saliva used Saliva-Check, produced by the company "GC" [2]. The authors created three point scale for assessment of each risk factor, such as the saliva is assessed according to the methodology of the company manufacturer. This scale make it possible to reduce of the risk of tooth decay by tracking indicators of risk and implementation of appropriate preventive and curative measures. In each subsequent visit of the patient monitoring compliance with the prescribed measures and recommend new when is necessary [2].

The oral hygiene status of the studied visually impaired children studied are poor compared to healthy peers. Our results are confirmed by the findings of Brown and colleagues [16], Shaw and Maclaurin [17]. Gizani and team also reported data for poor oral hygiene in the studied of them children with disabilities [18]. So far have not been performed studies of saliva in children with disabilities. Bassoukou and colleagues conducted the only one study in children with autism [19]. The results showed no statistically significant difference in the quantity of the saliva per unit time, and the buffering capacity of the saliva. The data of the authors indicate that the quantity of the saliva, the buffer capacity in subjects with autism are not different from the healthy controls [19]. The studies carried by our team of the saliva of children with disabilities and healthy children from the control group did not show major differences in risk factors - not stimulated, stimulated saliva a pH, viscosity and buffering capacity. They are not risk factors for the development of caries in most children of the studied groups.

6. Conclusion

The risk assessment for the development of caries gives you the opportunity to create individual preventive programs tailored to oral risk profile of each child. This makes it possible be modeled its oral environment and to conduct preventive measures to reduce the risk factors for dental caries.

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