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The incidence and intensity of dental caries in children with nephritic syndrome

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CZĘSTOŚĆ WYSTĘPOWANIA I INTENSYWNOŚĆ CHOROBY PRÓCHNICOWEJ U DZIECI Z ZESPOŁEM NERCZYCOWYM

Streszczenie

Wprowadzenie: Zespół nerczycowy (ZN) to stan kliniczny, w którym występuje białkomocz o nasileniu przekraczającym możliwości kompensacyjne ustroju, często o charakterze nawrotowym. Wśród przyczyn zespołu nerczycowego wymienia się patologie dotyczące samych nerek oraz niektóre choroby ogólne. U dzieci z ZN ważne jest niedopuszczanie do infekcji, które są główną przyczyną nawrotów i konieczności intensywnego leczenia, m.in. glikokortykosteroidami (GKS) i cyklosporyną A (CsA). Dzieci z zespołem nerczycowym powinny mieć uzębienie wolne od próchnicy, której powikłania są zębopochodnymi ogniskami zakażenia. Zaburzenia ogólne występujące w ZN, zwłaszcza hipoproteinemia i niedobór odporności, mogą jednak predysponować do rozwoju zmian próchnicowych.

Materiał i metody: U 60 pacjentów z zespołem nerczycowym (średni wiek $8,4 \pm 4,6$ lat) leczonych GKS, CsA lub jednocześnie GKS i CsA oraz u 55 pacjentów ogólnie zdrowych (średni wiek $10,04 \pm 4,79$ lat) stanowiących grupę kontrolną, przeprowadzono badanie kliniczne oceniające stan uzębienia: obecność ubytków próchnicowych, wypełnień oraz zębów utraconych z powodu choroby próchnicowej. Obliczono częstość występowania próchnicy zębów oraz wskaźniki PUWz/puwz oraz PUWp/puwp.

Wyniki: Frekwencja próchnicy u pacjentów z zespołem nerczycowym wyniosła 81,67%, w grupie kontrolnej – 78,18%. Wartości średnie wskaźników puwz/puwp u pacjentów z zespołem nerczycowym (uzębienie mleczne i mieszane) były istotnie wyższe niż w grupie kontrolnej. PUWz/PUWp (uzębienie mieszane i stałe) – nieistotnie niższe. U dzieci leczonych GKS wartości puwz/puwp i PUWz/PUWp były wyższe, w tym istotność statystyczną stwierdzono dla puwp.

Wnioski: Wyższa częstość choroby próchnicowej u dzieci z zespołem nerczycowym i intensywność próchnicy w uzębieniu mlecznym, oraz wyższa intensywność próchnicy w przypadku leczenia GKS wskazują na istnienie czynników sprzyjających rozwojowi procesu próchnicowego związanych z chorobą.

Słowa kluczowe: choroba próchnicowa, zespół nerczycowy, glikokortykosteroidy, dzieci

INTRODUCTION

Nephritic syndrome (NS) is a clinical condition in which there occurs proteinuria greater than the capacity of the compensatory system (loss of protein above 50 mg/kg/day), accompanied by hypoalbuminaemia below 2.5 g/dl, hyperlipidemia, and edema. Among the causes of nephritic syndrome are pathologies of the kidney, as well as some general diseases, including diabetes and Schönlein-Henoch purpura. In children most

cases are minimal change nephritic syndrome (MCNS) whose pathogenesis remains unexplained (1).

Consequences of nephritic syndrome are edema, hypo- and dysproteinemia, hyperlipidemia, increased blood clotting and immune deficiency. Hypoproteinemia in nephritic syndrome may be accompanied by a change in the protein composition of saliva, and this is detrimental to the health of the oral mucosa, periodontium and teeth. This state may promote: mechanical damage of soft

tissues of the mouth and teeth (the clash), mucosal infections, gingivitis and caries disease (2-4). Impairment of the body's defense mechanisms in nephritic syndrome (mainly cellular response) is primarily the result of hyperlipidemia, and immunosuppressive activity of drugs, including glucocorticoid (GC) and cyclosporine A (CsA) (5-7). A poor immune response predisposes to infection changes of bacterial, viral and fungal etiology, which are a risk factor for relapse (8). An undesirable effect of GKS and calcineurin inhibitors are also disorders of calcium and phosphorus metabolism – a frequent cause of secondary hyperparathyroidism. They can cause delayed eruption of teeth, calcification and obliteration of the pulp cavities of teeth, premature loss of bone, demineralization and impaired trabecular bone, bone resorption, including periapical region of the tooth (9). The use of immunosuppressive drugs is also associated with adverse reactions, drug-specific, such as hyperplasia of oral mucosa and gingiva (3).

A characteristic feature of the syndrome is the occurrence of relapses, sometimes every few months. The risk of relapse is increased by: age < 7 years of age, hypoproteinemia during outbreak of a disease, multiple infusions of solutions of albumin, an early first relapse (< 6 months), short intervals between successive relapses, vaccination and insect bites as well as bacterial and viral infections. Therefore, in children with nephritic syndrome, it is important for preventing infection and in case it occurs – intensive treatment (5, 6).

One of the main reasons for the presence of infectious foci in the oral cavity is caries disease. Dental caries encourages the development of infectious changes in the oral mucosa and periodontal tissue, and its complications (inflammation of the pulp and periapical tissue) are odontogenic foci of infection, risk-bearing spread of infection by continuity or seeding of bacteria, their toxins and antigens into the blood.

General disorders present in nephritic syndrome may increase the risk of developing caries process. The impact on oral health can have proteinuria and hypoproteinemia/dysproteinemia as well as hyperlipidemia causing, for example, reduction in plasma oncotic pressure and the amount of immunoglobulin. The result of hypoproteinemia in the mouth can be a change in the quantity and quality of saliva. Clinical experience and unpublished authors' results indicate the presence of qualitative and quantitative disorders of saliva in children with nephritic syndrome during relapse. It is also considered that the weakening of immune function is a factor increasing the risk of tooth decay.

THE AIM OF STUDY

The aim of this study was evaluation of the frequency and intensity of dental caries in children with nephritic syndrome, including the influence of drugs.

MATERIAL AND METHODS

Clinical studies of dentition were performed in a dental surgery in 60 children (mean age 8.4 ± 4.6 years)

with nephritic syndrome while in the care of the Department of Pediatric Dentistry, Medical University of Warsaw and the Department and Clinic of Pediatrics and Nephrology, Medical University of Warsaw. The children were treated with corticosteroids, CsA, or both steroids and CsA. The control group consisted of 55 children of similar age (mean age 10.04 ± 4.79 years). The excluding criteria in the control group were chronic disease or chronic medication use in an interview. The study was conducted after approval by children and/or their legal guardians. The characteristics of respondents, depending on the type of dentition, are shown in table 1.

Table 1. Characteristics of the study depending on the type of dentition.

		Nephritic syndrome	Control group
Type of dentition	primary	23	15
	mixed	18	19
	permanent	19	21

Using the standardized clinical studies the presence of cavities, fillings and tooth loss due to caries disease has been reported. DMFt/dmft and DMFs/dmfs indices have been calculated. In the DMFt/dmft the examined unit is a tooth, while in DMFs/dmfs – surface of the tooth. DMFt/dmft – total number of teeth with carious lesions (D/d), teeth removed because of decay (M/m) and filled (F/f), while DMFs/dmfs – the total number of surfaces with decay (Ds/ds), surfaces lost due to caries (Ms/ms) and filled (Fs/fs). Treatment rate was calculated using the decay ratio and the number of filled teeth, filled teeth and the amount of caries disease (10).

RESULTS

Considering all patients, the caries disease occurred with similar frequency in patients with nephritic syndrome and control groups (81.67% vs. 78.18%) (tab. 2). It was noted, however, significantly higher incidence of caries in children with nephritic syndrome during the primary teeth (86.9% vs. 66.67%).

The mean values of dmfs and dmft indicators in patients with nephritic syndrome (primary and mixed dentition) were higher than in the control group, while DMFt and DMFs (mixed dentition and permanent) – lower. Based on the t-test found statistically significant differences only between the mean values dmfs ($p = 0.003$) and dmft ($p = 0.032$) (fig. 1).

In sub-groups, depending on the type of dentition, there were higher values of dmft and dmfs in children with nephritic syndrome, both in patients with deciduous and mixed dentition. Statistically significant differences were shown between the mean values of dmfs for teeth in mixed dentition ($p = 0.014$) (tab. 3). Analysis of the individual components of indices showed that during the primary dentition the major component of the dmft index was the number of teeth with caries in both groups, but in children with nephritic syndrome number of teeth with

Table 2. The incidence of dental caries.

Nephritic syndrome	Primary	Mixed	Permanent	Control group	Primary	Mixed	Permanent
Number of children with caries	20	13	16		10	14	19
Number of children examined	23	18	19		15	19	21
Incidence of caries	86.96%	72.22%	84.21%		66.67%	73.68%	90.48%
Overall incidence of caries	81.67%				78.18%		

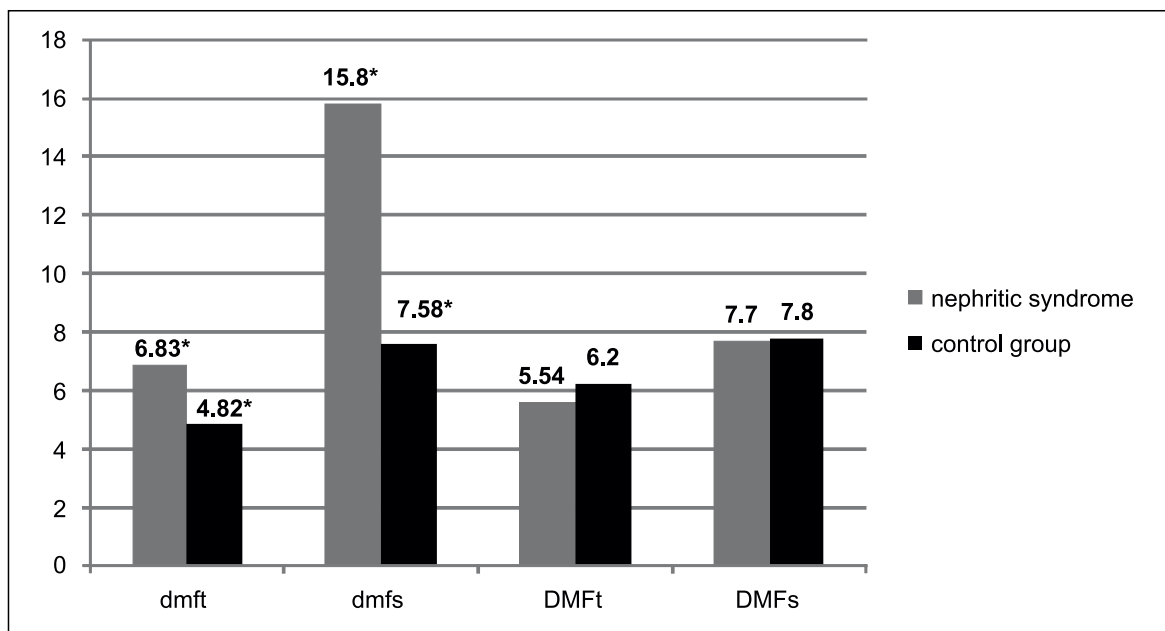


Fig. 1. The mean values of dmfs, dmft and DMFs, DMFt in patients with nephritic syndrome and control group. Statistical significance of differences ($p < 0.05$).

caries accounted for as much as 88% of the dmft, and the control group 57%. In the mixed dentition found out the higher value of the Dt component in children with nephritic syndrome (78% vs. 43%), while the primary dentition analysis showed reversal ratio and a higher rate of dt in the control group, but it was associated with an overwhelming predominance of tooth loss rate because of caries in children with NS in whom it reached 26% compared to 6% in healthy children.

In children with permanent dentition DMFt value was higher in the control group, DMFs – higher in the group with nephrotic syndrome. These were nostatistically significant differences.

Rate treatment of caries in children with NS with deciduous teeth was ten times higher in the control group. In the mixed dentition the rate was twice higher within the permanent dentition, while within the primary dentition and older children only with permanent teeth, there were no differences.

In examining the possible effect of treatment with glucocorticosteroids on intensity of caries was found higher values of dmft/dmfs and DMFt/DMFs when using GKS. Statistical significance of differences were found between the dmfs values ($p = 0.045$) (fig. 2).

DISCUSSION

The literature does not provide information on the frequency and intensity of caries in children with nephrotic syndrome. Isolated cases are found (11). Kuc and colleagues conducted a clinical examination of masticatory system in children with nephritic syndrome, and surveys. They have examined 34 children with NS, dividing them into three age group, no comparison with the control group. Age ranges do not coincide with the division due to the type of dentition made in the current study. Conclusions drawn by the authors coincide with the above results – turn out of caries in the study group was high and the treatment rate-low (12). A study by Takeuchi et al. were designed to evaluate microbial flora of patients with kidney disease. Among the 81 subjects only one patient with nephritic syndrome was present. The studies included clinical assessment of dentition using DMF index, as well as the degree of susceptibility to caries disease using tests Dentocult MS and LB. Indicators and Mt and Dtwere significantly higher in the study group than in the controls, and the title of *Streptococcus mutans* and *Lactobacillus acidophilus* also pointed to a higher susceptibility to caries disease, in individuals coping with renal insufficiency (13).

Table 3. The intensity of tooth caries.

		Number of respondents	Mean number of permanent teeth	Dt/Ds	Mt/Ms	Ft/Fs	DMFt/DMFs	Treatment index	Mean number of primary teeth	dt ds	mt/ms	ft/fs	dmft/dmfs	Treatment index
Primary dentition	Nephritic syndrome	23	-	-	-	-	-	-	19.22	6,26/10,73	0.56/2.95	0.3/0.77	7.13/14.45	0.04
	Control group	15	-	-	-	-	-	-	19.6	2,93/5,60	0.20/0.93	2.00/2.47	5.13/9.00	0.4
Mixed dentition	Nephritic syndrome	18	11	1.34/1.72	0.05/0.28	0.33/0.55	1.72/2.55	0.17	10.05	2,83/5,62	1.67/8.33	1.94/2.72	6.44/17.61	0.47
	Control group	19	13.21	1.05/2.47	0.05/0.21	1.32/3.15	2.42/5.84	0.35	8.89	2,89/3,84	0.26/0.68	1.42/1.94	4.57/6.47	0.47
Permanent dentition	Nephritic syndrome	19	27.31	5.00/6.79	0.16/0.79	3.95/5.00	9.16/12.58	0.42	-	-	-	-	-	-
	Control group	21	27.33	5.28/5.28	0.14/0.14	4.62/4.62	10.05/10.05	0.45	-	-	-	-	-	-

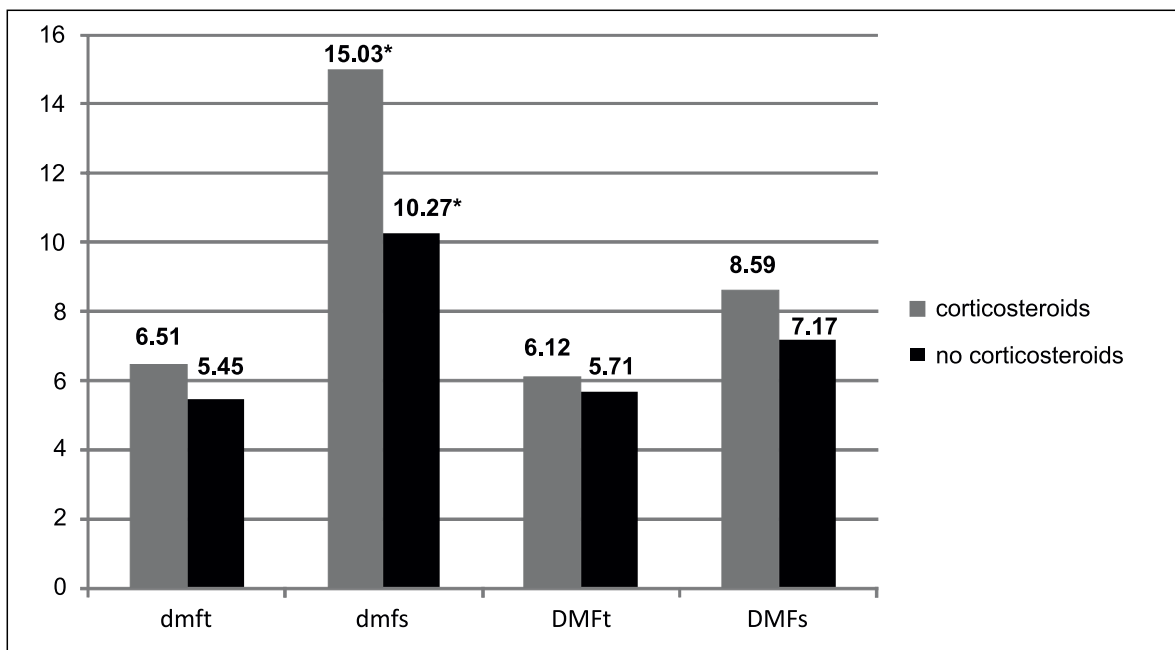


Fig. 2. The intensity of caries expressed with values of indices dmft/dmfs and DMFt/DMFs, depending on the use of corticosteroids. Statistical significance of differences ($p < 0.05$).

In a study conducted by Nunn and colleagues 38 patients took part in, most of which were after renal transplantation or during dialysis and only 1 patient – with nephritic syndrome. The results showed a low risk of caries disease in all patients. Methodology of the study raises concerns because of the small number of subjects and no control group (14).

Most of the information included in the literature relates to chronic kidney disease in the stage requiring renal replacement therapy, in which predisposition to caries process is not observed (8, 9, 14-16). It has been reported that there is increasing frequency and intensity of disease in children after renal transplantation compared with the kidney failure and dialysis. In dialysis patients, the pH of the mouth is higher, and the buffer capacity of salivary is greater. After a kidney transplant there is a change of these parameters and increased risk caries disease (17, 18).

There appears to be in sufficient direct evidence to suggest a relationship between oral cavity infectious foci and renal disease. However, it has been shown that in people with prior throat and adenoid infections, as well as in those with periodontitis, the risk of glomerulonephritis is increased 3-fold as compared to the general population.

The following have also been reported:

- improvement in nephritis after eliminating oral infectious foci,
- more prevalent periodontal disease in people with glomerulonephritis,
- increased risk of proteinuria in patients with glomerulo nephritis and infectious tooth-related lesions, and decrease in this risk after dental treatment and antibiotic therapy,
- adverse effects from the presence of oral infectious foci on the clinical course of Henoch-Schonlein purpura,
- appearance of hematuria in children with IgA nephropathy after tooth extractions.

Clinical observations of nephrologists indicate a relationship between relapses of nephrotic syndrome and the presence of odontogenic foci of infection. As it is well known NS recurrence necessitate prolonged treatment with GKS, leading to side effects and deterioration of overall health. Our results suggest the existence of a relationship between treatment with glucocorticosteroids and the intensity of caries disease in deciduous dentition. To determine the nature of this relationship is needed, however, continued research and consideration of local and systemic factors of caries disease.

In the presented research, children with nephritic syndrome noted a higher frequency and intensity of caries in deciduous dentition compared with controls, while there were no differences between the indicators describing the health status of permanent dentition.

Although the rate between treatment of caries in the deciduous dentition in healthy children was several times higher, both values were the evidence of low effi-

cacy, which indicates the need to increase the intensity of dental care. This underlines the importance of regular educational measures. Children with nephritic syndrome involved in these studies and their caregivers were repeatedly informed by nephrologists about the importance of maintaining healthy teeth and the possibility of relapse if there is odontogenic foci of infection.

CONCLUSIONS

Higher incidence of dental caries in children with nephritic syndrome and intensity of dental caries in primary dentition, and the relationship between the intensity of dental caries and treatment of with GKS indicate the existence of factors that contribute to the development of caries process associated with the disease. Therefore, children with nephrotic syndrome should be under the care of a dentist. □

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