

Oral Health Status in Pediatric Patients with Renal Disease at Srinagarind Hospital, Khon Kaen University, Thailand

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Background: Renal diseases involve multiple organs including the soft and hard tissues of the oral cavity.

Objective: The objective of this study was to explore oral health status in pediatric patients with renal diseases at Srinagarind Hospital, Khon Kaen University, Thailand.

Material and Method: This cross-sectional study was conducted between January and August 2013, at Srinagarind Hospital, Khon Kaen University. Ninety-seven pediatric patients with renal diseases were allowed by their parents to participate in this study. Data were collected from medical records, questionnaires and oral examination records. The oral health status was recorded using the Decay, missing and filling teeth index, Plaque index, Calculus index, Modified gingival index, Developmental defects of enamel index and Gingival enlargement index. An oral examination was conducted using a mouth mirror, explorer and periodontal probe.

Results: The average age of the pediatric patients with renal diseases was 11.53 ± 3.7 years (ranged 4-17 years). The majority of subjects were able to (a) brush their teeth twice a day (77.3%), (b) visit dentists only when they had any symptoms (79.4%) and (c) never visit dentists for previous six months (73.2%). The prevalence rate of dental caries was 78.4%. Decay, missing and filling of deciduous teeth (dmft) were 1.6 ± 3.1 teeth/person. Decay, missing and filling of permanent teeth (DMFT) were 1.7 ± 2.5 teeth/person. The average value of plaque index was 1.4 ± 0.6 . The average value of calculus index was 0.3 ± 0.4 . The average value of modified gingival index was 1.3 ± 0.4 . The prevalence rate of enamel defect and gingival enlargement were 27.8% and 16.5%, respectively.

Conclusion: The most common oral health problem of these pediatric patients was dental caries. The majority of subjects had visited dentists only when they had symptoms and never visited dentists for the past six months.

Keywords: Enamel defect, Gingival enlargement, Pediatric patients, Kidney disease

J Med Assoc Thai 2015; 98 (Suppl. 7): S185-S191

Full text. e-Journal: <http://www.jmatonline.com>

Clinical manifestations of oral diseases are common among patients with chronic kidney diseases. A poor oral hygiene would suffice for delaying much awaited kidney transplant and increase the morbidity. Therefore, dentists pay special attention to oral care in chronic renal disease patients who may present with a wide range of conditions. These include poor oral hygiene, enamel hypoplasia, enamel opacities, uremic stomatitis, decreased periodontal disease, reduced salivary flow, xerostomia, increased tendency for calculus deposition, reduced prevalence of caries, bad

metallic taste and ammonia odor⁽¹⁻⁴⁾. The most important considerations and management of these patients are bleeding tendency, hypertension, anemia, drug intolerance and increased susceptibility to infections⁽⁵⁾.

Oral hygiene in children, particularly with renal disorders, is therefore a huge challenge for dental professionals. The objective of this study was to explore oral health status in pediatric patients with renal diseases at Srinagarind Hospital, Khon Kaen University, Thailand.

Material and Method

Subjects

This cross-sectional study was conducted between January and August 2013, at Srinagarind Hospital, Khon Kaen University. Ninety-seven pediatric

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patients were allowed by their parents to participate in the study. The subjects were those who: aged between four and 17 years; had renal diseases; and followed-up at the Division of Pediatric Nephrology, Srinagarind Hospital. Data were collected from medical records, questionnaires and oral examination records.

Oral examination

An oral examination was carried out under a natural light using plane mouth mirrors, world health organization (WHO)'s probes, and explorers. The instruments used in this study were sterilized by autoclave method. No radiographs were taken. Dental caries were registered using the dmf and DMF indexes according to the WHO codes and criteria⁽⁶⁾. Simplified oral hygiene index was applied for measuring plaque and calculus scores⁽⁷⁾. Gingivitis was registered using the modified gingival index⁽⁸⁾. Enamel defect was assessed using the developmental defects of enamel index (DDE index)⁽⁹⁾. The gingival enlargement index was applied for measuring overgrowth/height of the gingival tissue vertically in the apex-crown direction from the cemento-enamel line to the free gingival margin⁽¹⁰⁾.

Reproducibility of oral indices

Two researchers were trained to examine oral status. Our study was conducted with aims of assessing the reproducibility of recording indices for dental caries, dental plaques, calculus, gingivitis, enamel defect and gingival enlargement. The intra-examiner kappa value for DMFT index, plaque index, calculus index, modifies gingival index, DDE index, and gingival enlargement index was 1.0, 0.8, 0.8, 0.9, 1.0 and 0.8, respectively. The inter-examiner kappa value for DMFT index, plaque index, calculus index, modifies gingival index, DDE index, and the gingival enlargement index was 1.0, 0.7, 0.8, 0.7, 0.7 and 0.8, respectively.

Medical records and questionnaires

The diagnosis of kidney diseases and administration of medications were gathered from medical records. A questionnaire was developed to collect information on: (a) socio-demographic characteristics; (b) oral and general health care and (c) dental care over the previous 6-month period.

Data analysis

A descriptive analysis was performed. Results are hereafter presented as percentages or means and standard deviation (SD).

Ethics approval

The current study was approved by the Khon Kaen University Ethics Committee for Human Research, based on the stipulations of the Declaration of Helsinki and the ICH Good Clinical Practice Guidelines (HE551355). Written informed consent was obtained from the parents of the pediatric patients and assent from the children.

Results

An average age of the pediatric patients with renal disease was 11.53 ± 3.7 years (ranged 4-17 years). Among the 97 patients, boys represented 44.3% and girls 55.7%. The educational level completed by parents was: primary school or below (44.3%), secondary school (21.6%), diploma (8.2%) and bachelor degree (23.8%). The distribution of family income (baht/month) was: <5,000 (34.0%); 5,100-10,000 (26.8%); 10,001-20,000 (21.6%); and, 20,001-50,000 (17.6%).

Nephrotic syndrome was the major form of renal diseases (34.0%) closely followed by systemic lupus erythematosus (33.0%) (Table 1). A majority of subjects brushed their teeth twice a day (77.3%), visited a dentist when they had symptoms (79.4%) and had not visited a dentist in the past six months (73.2%). Ice cream, snacks, sweet milk, beverage and candy were consumed by 87.6%, 70.1%, 66.0%, 56.7% and 70.1% of participating patients, respectively (Table 2).

The prevalence rate of dental caries was 78.4%. Decay, missing and filling of deciduous teeth (dmft) were 1.6 ± 3.1 teeth/person. Decay, missing and filling of permanent teeth (DMFT) were 1.7 ± 2.5 teeth/person. The patients aged between 4-17 years and their age was categorized into groups as: 4-5 years, 6-11 years and 12-17 years. Among those 4-5 years of age, children with nephrotic syndrome had dmft more than other type of renal diseases (Fig. 1). For those 6-11 years of age, children with vesicoureteral reflux had dmft more than other type of renal diseases. Children with nephrotic syndrome and systemic lupus erythematosus had DMFT more than other type of renal diseases (Fig. 2). Among those 12-17 years of age, children with periodic hypokalemia had DMFT more than other type of renal diseases, whilst renal failure had the least DMFT in this group (Fig. 3). The average of plaque index and calculus index were 1.4 ± 0.6 and 0.3 ± 0.4 , respectively (Table 3).

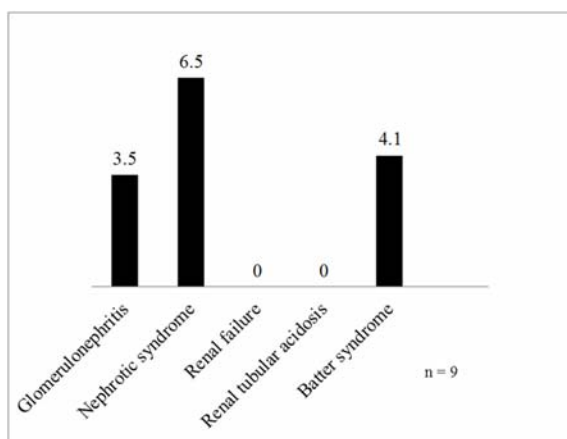
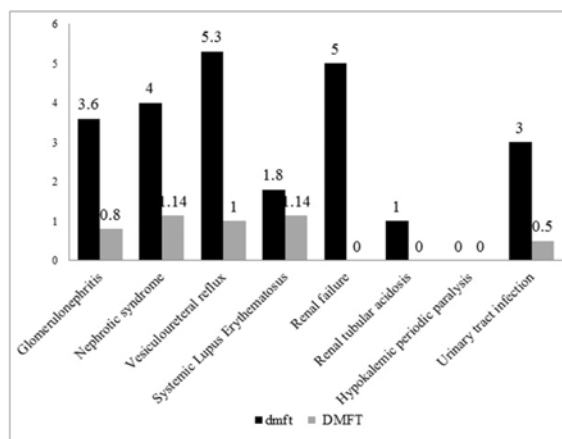
Gingivitis was assessed by the modified gingival index (MGI) with a non-invasive (no probing) method. Our study showed that 36.1%, 39.1% and 19.1% of patients had very mild gingival inflammation (score

Table 1. Type of renal disorders in participating patients

Type of renal disorder	Age-group, n (%) frequency (column percent)			
	4-5 years	6-11 years	12-17 years	4-17 years
Glomerulonephritis	2 (22.2)	5 (14.8)	1 (1.8)	8 (8.2)
Nephrotic syndrome	4 (44.5)	14 (41.2)	15 (27.8)	33 (34.0)
Vesicoureteral reflux	0 (0)	3 (8.8)	0 (0)	3 (3.1)
Systemic lupus erythematosus	0 (0)	7 (20.6)	25 (46.3)	32 (33.0)
Renal failure	1 (11.1)	1 (2.9)	7 (13.0)	9 (9.3)
Renal tubular acidosis	1 (11.1)	1 (2.9)	3 (5.6)	5 (5.2)
Bartter syndrome	1 (11.1)	0 (0)	0 (0)	1 (1.0)
Renal transplantation	0 (0)	0 (0)	2 (3.7)	2 (2.1)
Periodic hypokalemia	0 (0)	1 (2.9)	1 (1.8)	2 (2.1)
Urinary tract infection	0 (0)	2 (5.9)	0 (0)	2 (2.1)
Total	9 (100)	34 (100)	54 (100)	97 (100)

Table 2. Percentage of eating between-meals sugary foods and drinks

Eating between-meals sugary foods and drinks	Total, n	Yes, n (%)
Candy	97	68 (70.1)
Snacks	97	68 (70.1)
Beverage	97	55 (56.7)
Sweet milk	97	64 (66.0)
Ice cream	97	85 (87.6)

**Fig. 1** Mean values of dmft (teeth/person) in pediatric patients (aged 4-5 years) by type of renal disease.**Fig. 2** Mean values of dmft, DMFT (teeth/person) in participating pediatric patients (aged 6-11 years) by type of renal diseases.

1), mild gingival inflammation (score 2) and moderate gingival inflammation (score 3), respectively, whilst only 5.7 % of these children had normal gingiva.

The prevalence rate of enamel defect and gingival enlargement were 27.8% and 16.5%, respectively.

Discussion

The current study represents a preliminary report on Thai children demonstrating about oral health status in pediatric patients with renal diseases. In our study, educational level and family income of the majority of participating parents were low. Foreed et al revealed that low socio-economic status (SES) associated with an increased risk of chronic renal failure⁽¹¹⁾. A review by Patzer et al showed that low SES associated with increased incidence of chronic kidney diseases, progression to end-stage renal disease, inadequate dialysis treatment, reduced access to kidney transplantation and poor health outcomes⁽¹²⁾. A study in Brazil involving older children (aged 12 years) reported a significant association between a lower level of mother's education and dental caries experience⁽¹³⁾ and increased dental caries in children from families with a low household income where the father has a low level of education⁽¹⁴⁾.

In our study, the majority of subjects had

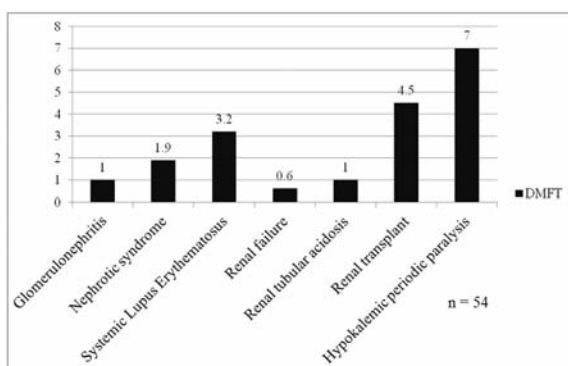


Fig. 3 Mean values of DMFT (teeth/person) in participating pediatric patients (aged 12-17 years) by type of renal diseases.

visited a dentist only when they had symptom(s) and never visited a dentist during previous six months. It is quite understandable that the renal disease subjects have a strict treatment routine. This lack of time may be the reason why these subjects had not visit a dentist. However, other factors, such as economical difficulties, lack of motivation and stress may also impede their visits to a dentist⁽¹⁵⁾.

Our study showed high prevalence of dental caries (78.4%), in primary teeth, which is higher than previous reports in pediatric patients with renal disease^(2,3,16). This could be due to the high consumption of snacks, ice cream, sweet milk and candy (Table 2). Arens reported that dental caries occurs due to demineralisation of enamel and dentine (the hard tissues of the teeth) by organic acids which were formed by bacteria in dental plaque through the anaerobic metabolism of sugars derived from the diet. When sugars or other fermentable carbohydrates are ingested, the resulting fall in dental plaque pH caused by organic acids increases the solubility of calcium hydroxyapatite in the dental hard tissues and demineralisation occurs as calcium is lost from the tooth surface⁽¹⁷⁾. In contrast, Subramaniam et al reported from their study, from the Indian city of Jaipur, that, though there was high intake of dietary carbohydrates and sugars in long-term medicated syrups, the children with chronic renal disorders showed low caries in both primary and permanent dentition⁽²⁾. A similar outcome of low caries prevalence was also reported by Nunn et al⁽¹⁶⁾, Ertugrul et al⁽¹⁸⁾ and Proctor et al⁽¹⁹⁾.

Martins et al described that although pediatric patients with chronic renal failure required a diet with an increased intake of carbohydrates in order to compensate the reduced calories from a protein-sparing diet, which aimed at minimizing nitrogenous waste

Table 3. DMFT, dmft, Plaque index, Calculus index, Oral hygiene index and Modified gingival index, in the participating pediatric patients by age-group

Index	Oral health status (mean \pm standard deviation)			
	4-5 years (n = 9)	6-11 years (n = 34)	12-17 years (n = 54)	Total (n = 97)
DMFT (teeth/person)	0 \pm 0	0.9 \pm 1.4	2.4 \pm 3.0	1.7 \pm 2.5
dmft (teeth/person)	4.1 \pm 6.2	3.3 \pm 3.2	0 \pm 0	1.6 \pm 3.1
Plaque index (full score = 3)	1.1 \pm 0.7	1.4 \pm 0.6	1.3 \pm 0.6	1.4 \pm 0.6
Calculus index (full score = 3)	0 \pm 0	0.2 \pm 0.3	0.4 \pm 0.4	0.3 \pm 0.4
Oral hygiene index (full score = 6)	1.1 \pm 0.7	1.6 \pm 0.7	1.7 \pm 0.8	1.7 \pm 0.8
Modified gingival index (full score = 4)	1.0 \pm 0.7	1.3 \pm 0.7	1.3 \pm 0.5	1.3 \pm 0.6

products, a low prevalence of dental caries has been observed in these subjects. This may result from increases in the salivary urea concentration. The pH of the saliva is elevated by the presented urea, possibly minimizing the effect of any acid formation by the cariogenic bacteria resulting from sugar intake. This mechanism also decreases caries⁽¹⁴⁾. This study revealed that participating subjects had low dental plaque and dental calculus. It was similar to a study in Jaipur, India⁽²⁾. Babu et al found that 58% of children with nephritic syndrome had poor oral hygiene and 37% of these children had fair oral hygiene whilst only 5% of these children had good oral hygiene⁽²⁰⁾. Gingivitis status in our study was similar to a study at India Gandhi Institute of Child Health, Bangalore, Karnataka, India which found that most of children with nephritic syndrome showed very mild and mild gingival inflammation (score 1-2) of the entire gingiva⁽²⁰⁾.

In our study, enamel defect occurred in 27.8%. The prevalence of developmental defects of the enamel was lower in our study than previous reports conducting in children with renal disease^(16,21). This may explain by most of our patients having received early management of their renal diseases prior to renal transplantation, which may minimize any metabolic disturbances and dental calcification anomalies.

The prevalence of gingival enlargement in the current study was 16.5%, which is lower than previous reports^(22,23). It is higher than the study in normal children in India⁽²⁴⁾. In 1997, Seymour et al reported gingival enlargement secondary to drug therapy was the most-reported oral manifestation of patients with renal diseases. An estimation of 30% of dentate patients who were treated with cyclosporine alone experienced clinically significant gingival enlargement. When patients were treated with a combination of cyclosporine and calcium channel blockers (i.e. nifedipine, verapamil, diltiazem, oxodipine or amlodipine), the prevalence of gingival enlargement increased to 50%. The pathogenesis of this disorder was multifactorial, but it was thought that the key factors were drug variables, plaque-induced inflammation, the susceptibility of gingival fibroblasts and other genetic factors⁽²⁵⁾.

This study is limited because of a small number of subjects, which represented a fraction of the total cases of pediatric patients with renal diseases. It does not have sufficient data to show the relationship between severity of renal disease and oral health status. However, the subjects and their parents should receive

adequate preventive advice about oral health care and the availability of dental treatment. Closer cooperation between pediatric nephrologist, pediatric dentists and parents can improve dental health care for these children.

Practical implications

The present findings may help pediatric nephrologists and pediatric dentists prevent and treat oral diseases in individuals with renal disease.

Conclusion

The most common oral health problem of these pediatric patients was dental caries. The majority of subjects had visited dentists only when they had symptoms and never visited dentists over the past six months.

What is already known on this topic ?

This topic presents oral health status including: (1) the prevalence of dental caries; (2) gingival status; (3) amount of plaque and calculus; (4) the prevalence of enamel defect; and (5) the prevalence of gingival enlargement in pediatric patients with renal diseases at Srinagarind Hospital, Khon Kaen University, Thailand. The most common oral health problem of these patients was dental caries.

What this study adds ?

Our study is different from previous studies. We collected oral health behaviors such as eating between meals, sugary foods and drinks, family income and parental education. These information would benefit in planning for oral health preventive programs for pediatric patients with renal diseases at Srinagarind Hospital, Khon Kaen University, Thailand. These patients and their parents should receive adequate preventive advice about oral health care and the availability of dental treatment.

Acknowledgement

The authors thank (a) the children and their families for participating in the study, (b) the Center of Cleft lip-Cleft palate and Craniofacial Deformities, Khon Kaen University, in association with Tawanchai Project for supporting this publication and (c) Mr. Bryan Roderick Hamman for assistance with the English language presentation.

Potential conflicts of interest

None.

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สภาวะสุขภาพช่องปากในผู้ป่วยเด็กโรคไตที่ได้รับการรักษาที่โรงพยาบาลศรีนครินทร์ มหาวิทยาลัยขอนแก่น ประเทศไทย

วิบูลย์ วีระอาชากุล, วิลาวัลย์ วีระอาชากุล

ภูมิหลัง: โรคไตเกี่ยวข้องกับหลายอวัยวะรวมทั้งเนื้อเยื่ออ่อนและเนื้อเยื่อแข็งในช่องปาก

วัตถุประสงค์: สำรวจสภาวะสุขภาพช่องปากในผู้ป่วยเด็กโรคไตที่ได้รับการรักษาที่โรงพยาบาลศรีนครินทร์ มหาวิทยาลัยขอนแก่น ประเทศไทย

วัสดุและวิธีการ: การศึกษาแบบตัดขวางนี้ดำเนินการในช่วงเดือนมกราคม ถึง สิงหาคม พ.ศ. 2556 ที่โรงพยาบาลศรีนครินทร์ มหาวิทยาลัยขอนแก่น มีผู้ป่วยเด็กโรคไตทั้งหมด 97 ราย ที่ผู้ปกครองสมัครใจให้เข้าร่วมในการศึกษานี้เก็บรวบรวมข้อมูลจากแบบบันทึกการแพทย์ แบบสอบถาม และแบบตรวจสอบสุขภาพช่องปาก บันทึกสภาวะสุขภาพช่องปากโดยใช้ดัชนีดีเอ็มเอฟที่ ดัชนีวัดแผ่นคราบจุลินทรีย์ ดัชนีวัดหินน้ำลาย ดัชนีวัดเหงือกอักเสบ ดัดแปลง ดัชนีวัดรอยโรคของเคลือบฟันและดัชนีวัดเหงือกโต การตรวจสอบสุขภาพช่องปากใช้กระจกตรวจช่องปาก เครื่องมือตรวจฟัน และเครื่องมือตรวจเนื้อเยื่อปริทันต์

ผลการศึกษา: อายุเฉลี่ยของผู้ป่วยเด็กโรคไตเท่ากับ 11.53 ± 3.7 ปี (4-17 ปี) ผู้ป่วยส่วนใหญ่แปรงฟัน 2 ครั้ง/วัน (ร้อยละ 77.3) ไปพบทันตแพทย์เมื่อมีอาการเท่านั้น (ร้อยละ 79.4) และไม่เคยไปพบทันตแพทย์ในรอบ 6 เดือนที่ผ่านมา (ร้อยละ 73.2) ความชุกของโรคฟันผุพบร้อยละ 78.4 ค่าเฉลี่ยดีเอ็มเอฟที่ฟันน้ำนมเท่ากับ 1.6 ± 3.1 ซี่/ราย ค่าเฉลี่ยดีเอ็มเอฟที่ฟันแท้เท่ากับ 1.7 ± 2.5 ซี่/ราย ค่าเฉลี่ยดัชนีวัดแผ่นคราบจุลินทรีย์เท่ากับ 1.4 ± 0.6 ค่าเฉลี่ยดัชนีวัดหินน้ำลายเท่ากับ 0.3 ± 0.4 ค่าเฉลี่ยดัชนีวัดเหงือกดัดแปลงเท่ากับ 1.3 ± 0.4 พบรอยโรคของเคลือบฟันในผู้ป่วยร้อยละ 27.8 และพบเหงือกโตในผู้ป่วยร้อยละ 16.5

สรุป: ปัญหาสุขภาพช่องปากที่พบบ่อยที่สุดในผู้ป่วยกลุ่มนี้คือ ฟันผุ ส่วนใหญ่ไปพบทันตแพทย์เฉพาะเมื่อมีอาการเท่านั้นและไม่ไปพบทันตแพทย์ในรอบ 6 เดือนที่ผ่านมา
