IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

Renal Diseases -Oral Findings And Dental Treatment Approaches

Dr Sujata Datta, Dr Deepti Jawa, Dr Shipra Jaidka, Dr Vidhyatharan M, Dr Ashmita Debnath

Divya jyoti college of dental sciences and research

Abstract

Renal disease is a term for any condition that damages the kidneys, the organs that filter waste and excess fluid from the blood. In children, renal disease can give rise to a wide spectrum of oral manifestations in the hard and soft tissues. Renal disease may lead to the development of pale oral mucosa , dental calculus, enamel hypoplasia, dry mouth ,low caries rate, poor oral hygiene, and uremic stomatitis, and may cause changes in the salivary composition and flow rate. These complications can lead to excessive bleeding, anemia , increased susceptibility to infection, drug intolerance, renal osteodystrophy, adrenal crisis, and enamel defects in children. The management on the dental chair for this patient is different from the normal patient At Dental operatory patient should be treated under precaution .In this article ,common oral findings related to renal disease will be discussed and the precautions and treatment approaches of dentist will be mentioned.

Keywords: Renal disease, Nephrotic syndrome, Renal failure, Oral finding, Dental management.

INTRODUCTION

Kidney disease can affect your body's ability to clean your blood, filter extra water out of your blood, and help to control your blood pressure. It can also affect red blood cell production and vitamin D metabolism needed for bone health. When your kidneys are damaged, waste products and fluid can build up in your body. That can cause swelling in your ankles, nausea, weakness, poor sleep, and shortness of breath. Without treatment, the damage can get worse and your kidneys may eventually stop working. That's serious, and it can be life-threatening.[1]Common renal disorders seen in children include congenital nephropathies, Nephrotic syndrome, chronic renal failure (CRF), glomerulonephritis, hydronephrosis ,and multicystic renal dysplasia, which ultimately lead to end-stage renal disease (ESRD).[2]

EPIDEMIOLOGY[3]

Global

The global prevalence of chronic kidney disease (CKD) was estimated to be 13.4% in all five stages and 10.6% in stages 3–51. Chronic kidney disease affects nearly 10% of the general population worldwide. The prevalence of CKD worldwide is 10.4% among men and 11.8% among women. Oral health care is an important aspect of managing patients with chronic kidney disease (CKD).

India

According to a study conducted by the Indian Chronic Kidney Disease (ICKD), the prevalence of chronic kidney disease (CKD) in India is approximately 800 per million people (pmp). The incidence of end-stage renal disease (ESRD) is estimated to be 150-200 pmp .

CLASSIFICATION OF RENAL DISEASE

1)According to "ECLINOPATH"

A. Early renal success: Renal dysfunction, principally an acute azotemia, that is due to prerenal causes. Correction of prerenal conditions leads to restoration of renal function, e.g. fluid resuscitation. In such patients, there is no evidence of tubular injury or necrosis.

B. Acute kidney injury (AKI): characterized by a rapid deterioration in renal function over hours to days, resulting in a failure of the kidneys to excrete nitrogenous waste products and to maintain fluid and electrolyte balance. e.g:Acute renal failure.

C. Chronic kidney disease (CKD): [4] divided into five stages based on the eGFR test result and how well your kidneys work to filter waste and extra fluid out of your blood. e.g:Chronic renal failure.

Stage of CKD	eGFR result	What it means
Stage 1	90 or higher	· Mild kidney damage · Kidneys work as well as normal
Stage 2	60-89	· Mild kidney damage · Kidneys still work well
Stage 3a	45-59	· Mild to moderate kidney damage · Kidneys don't work as well as they should
Stage 3b	30-44	· Moderate to severe damage · Kidneys don't work as well as they should
Stage 4	15-29	· Severe kidney damage · Kidneys are close to not working at all
Stage 5	less than 15	· Most severe kidney damage · Kidneys are very close to not working or have stopped working (failed)

Stages Of Chronic Kidney Disease

NEPHROTIC SYNDROME

The first recorded description of nephrotic syndrome dates to the 15th century. Later, Volhard and Fahr popularized the term nephrosis, using it to describe a major classification of bilateral renal disease. Today, nephrotic syndrome is recognized as a common chronic illness in childhood.[5] This syndrome refers to massive proteinuria more than 3.5 g/day(1.73 g/m^2/day) mainly albumin, reduce albumin concentration (hypoalbuminaemia), oedema, hyperlipidaemia, lipiduria and hypercoagulability.[6]Before labeling a patient with nephrotic syndrome ,it must be ascertained that protein excreted in the urine are albumin or high molecular proteins and not para-proteins which are excreted in urine in multiple myeloma.Although nephrotic syndrome may be associated with many renal diseases, the most common form in childhood is primary nephrotic syndrome, which develops in the absence of features of nephritis or associated primary extra-renal disease . Less commonly, childhood nephrotic syndrome is the consequence of an inflammatory or ischaemic glomerular disorder or is due to an inherited renal disease.

EPIDEMIOLOGY

Nephrotic syndrome is an important chronic disease in children. Estimates of the annual incidence of nephrotic syndrome range from 2 to 7 cases per 100,000 children and prevalence from 12 to 16 cases per 100,000 (Eddy and Symons, 2003). There is epidemiological evidence of a higher incidence of nephrotic syndrome in children from South Asia.It is more common in boys than girls at younger ages, but once adolescence is reached, there is no significant difference between genders.Increased incidence and more severe diseases are seen in African American and Hispanic populations.There is epidemiological evidence

of a higher incidence of nephrotic syndrome in children from south Asia . The condition is primary (idiopathic) in 95 per cent cases. An underlying disorder that might be identified in less than 5 per cent cases, includes systemic lupus erythematosus, Henoch Schonlein purpura, amyloidosis and infection with HIV, parvovirus B19 and hepatitis B and C viruses.[7]

ETIOLOGY

1) **Genetic disorders** [5]

a) **Nephrotic-syndrome typical:** Finnish-type congenital nephrotic syndrome, Focal segmental glomerulonephritis(FSGS), Diffuse mesangial sclerosis ,Denys-Drash syndrome, Schimke immuno-osseous dysplasia.

b) **Proteinuira with or without nephrotic syndrome**:Nail-patella syndrome,Alport's syndrome.

c) **Multisystem syndromes with or without nephrotic syndrome**: Galloway-Mowat syndrome,Charcot-Marie-Tooth disease, Jeune's syndrome, Cockayne's syndrome,Laurence-Moon-Biedl-Bardet syndrome.

d) **Metabolic disorders with or without nephrotic syndrome**:Alagille syndrome, Alpha-1 antitrypsin deficiency,Fabry disease,Glutaric acidaemia,Glycogen storage disease,Hurler's syndrome,Lipoprotein disorders,Mitochondrial cytopathies,Sickle-cell disease.

e) **Idiopathic nephrotic syndrome :**Minimal-change nephrotic syndrome (MCNS), Focal segmental glomerulosclerosis (FSGS), Membranous nephropathy.

2)Secondary causes [8]

a) **Infections:** Hepatitis B, C,HIV-1,Malaria,Syphilis,Toxoplasmosis

b)**Drugs:**Penicillamine, Gold, NSAIDS , Pamidronate, Interferon,Mercury,Heroin,Lithium

c)**Immunological or allergic disorders:** Castleman's disease, Kimura's disease,Bee sting,Food allergens

d)**Associated with malignant disease:** Lymphoma,Leukaemia.

e)**Glomerular hyperfiltration:** Oligomeganephronia, Morbid obesity, Adaptation to nephron reduction.

PATHOPHYSIOLOGY

The glomerular capillaries are lined by fenestrated endothelium, which sits on the glomerular basement membrane, covered by glomerular epithelium, or podocytes, which envelop the capillaries with the cellular extensions called foot processes. These processes interdigitate with special cell-cell junctions called the slit diaphragm, which together form the glomerular filter. Normally, larger proteins (greater than 69 kD) are excluded from filtration. The destruction of podocytes above a critical mass leads to irreversible glomerular damage.Damaged to glomerular capillary membrane leads to loss of plasma protein (albumin) through the urine which caused hypoalbuminemia,and there is reduction in plasma oncotic pressure.Thus fluid flows from the capillaries into the interstitial space and produce oedema.The shift of fluid from the plasma to the interstitial spaces the intravuscular fluid volume resulting in hypovolemia, which stimulate renin angiotension axis and volume receptor to secret aldosterone and anti-diuretic hormone these lead to reabsorption of Na and H_2O in distal tubules resulting in oedema.Loss of protein and immunoglobulin predisposes to infection in the children. Diminished oncotic pressure leads to hepatic lipoprotein synthesis which result in hyperlipidemia.[8]

GENERAL SIGN AND SYMPTOMS

1)**Proteinuria-**The presence of abnormal quantities of protein in the urine (>3.5 g/day).

2)**Hypoalbumenia-**Where the level of albumin in blood serum are abnormally low (<2.5 g/dl).[6]

3)**Hyperlipidemia**-An elevation of one or more lipids including cholesterol, phospholipids and triglyceride in the bloodstream (serum cholesterol >200 mg/dl).

4) **Edema**-The accumulation of excessive body fluids in the interstitial space or serous body cavity,which is a pathogenic process caused by disease rather than a disease entry. Pitting edema over the arms and legs.[8]

5)**Others**- Fever, chills ,lethargy,nausea, vomiting etc.

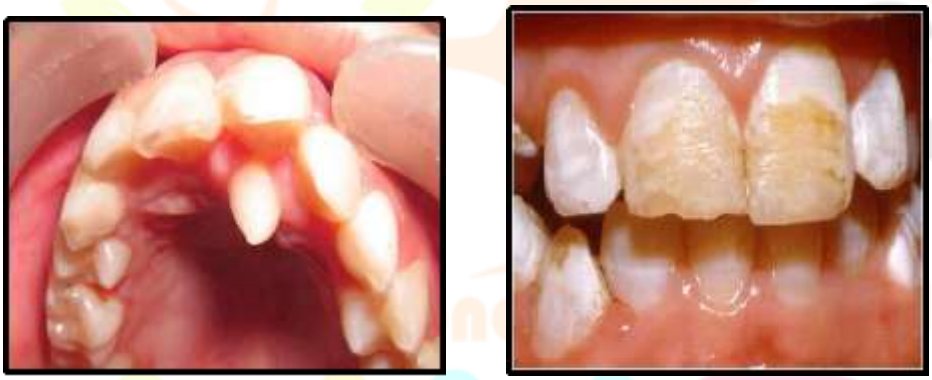
ORAL MANIFESTATION

1)**Enamel hypoplasia**-Children with nephrotic syndrome are likely to have a high incidence of enamel hypoplasia and discoloration of permanent teeth. It has been observed that their presence was not associated with a child's age at nephrotic syndrome (NS) onset but rather the total dose of prednisone received by the age of 7, when the amelogenesis process is usually completed.[9]

2)**Developmental disturbances**- Number or structure of teeth, including significantly frequent incidences of hyperdontia, presence of impacted teeth, and abnormal crown shapes etc.

Treatment with glucocorticoids in children with nephrotic syndrome can be the cause of developmental disorders of the masticatory organ and bone or teeth abnormalities.Other tooth implications of long-term glucocorticoid treatment are, changes in excessive forming and fibrosis of dentin and also obliteration of pulp chambers and occurrence of pulp stones.[10]

3)**Others**-Oral inflammation, mucosal lesions, reduced saliva flow, or xerostomia also seen in the patient with nephrotic syndrome.



A **B**

Oral Manifestation Of Nephrotic Syndrome

A-Hyperdontia, B-Enamel Hypoplasia

MANAGEMENT

Medical management: Oral corticosteroids form the cornerstone for management of most children with nephrotic syndrome. The commonly used preparations are prednisone (USA) or prednisolone (most other countries including India). Deflazacort, an oxazoline derivative of prednisolone, with equivalent anti inflammatory and immunosuppressive activity, but fewer side effects has been used anecdotally, with satisfactory result.

DENTAL CONSIDERATION

After gaining a proper written medical consent from the paediatrician and nephrologist, the dental treatment was started**.** Dental management of children with nephrotic syndrome begins with prevention of

dental disease and thus maintenance of a caries-free dentition because children with nephrotic syndrome are at high risk of developing poor gingival health which is a consequence of neglected or insufficient tooth brushing .[11]The dental consideration for the management of Nephrotic syndrome is-

Dental Considerations	Precautions/Recommendations
Invasive dental treatment	Prophylactic antibiotics
Antibiotics	IM should be avoided -Poor GIT absorption
Excessive stress	Antianxiety medication
Nephrotoxic drugs	Avoided
If on Corticosteroids	Corticosteroid cover
Anaesthetic of amide type –Due to reabsorption potential in liver	
Electrolyte disturbances complicate-General Anaesthesia	Treat under local anaesthesia
While administering nerve block	Bleeding tendency should be excluded
Infiltration analgesia – Not Contraindicated	
Nerve block	Bleeding tendency should be excluded Haemostatic agent ready during extraction
Electrolyte disturbances- Complicate general anaesthesia	Treat under local anaesthesia
Hypertensive	Anti-hypertensive drugs
Moderate renal impairment is likely to lead to fluoride retention	Additional fluoride contraindicated
There is creatinine increase	Intramuscular injections should be avoided

Dental Management Of Nephrotic Syndrome

RENAL FAILURE

The term renal failure denotes deterioration of renal function resulting in decline in glomerular filtration rate (GFR) and rise in urea and non-nitrogenous substances in the blood.When nephrons get destroyed to an unrepairable extent,kidney go back into a compensatory mechanism through the hypertrophy of remaining nephrons in order to maintain normal kidney function.This further leads to the burden and destruction of existing nephrons therefore manifesting itself with the symptoms of renal functional impairemeny. [12]

EPIDEMIOLOGY

Between 1990 and 2017, the global all-age prevalence and mortality from Chronic kidney disease(CKD) increased by 29.3 and 41.5%, respectively . In India, there was a 38% increase in the proportion of deaths attributable to kidney failure between 2001–03 and 2010–13 .[13]

The estimated incidence of ESRF(End stage renal failure) in childhood, either due to a congenital or acquired condition, is 10–12 cases per 1 million children, with a prevalence varying from 39 to 56 million children.

CLASSIFICATION OF RENAL FAILURE

Acute and chronic renal failure are the two kinds of renal failure.[6]

1)Acute Renal Failure (ARF)

ARF is the syndrome in which glomerular filtration declines abruptly (hours to days) and is usually reversible. According to the Kidney Disease Improving Global Outcomes (KDIGO) criteria in 2012, Acute kidney injury(AKI) can be diagnosed with any one of the following: creatinine increase of 0.3 mg/dL in 48 hours, creatinine increase to 1.5 times baseline within last 7 days, or urine volume less than 0.5 mL/kg per hour for 6 hours. Recently the term acute kidney injury (AKI) has replaced Acute renal failure (ARF) because Acute kidney injury (AKI) denotes the entire clinical spectrum from a mild increase in serum creatinine to overt renal failure.

2)Chronic Renal Failure (CRF)

CRF or chronic kidney disease (CKD) is defined as a persistent impairment of kidney function, in other words, abnormally elevated serum creatinine for more than 3 months or calculated glomerular filtration rate (GFR) less than 60 ml per minute / 1.73m2. It often involves a progressive loss of kidney function necessitating renal replacement therapy (dialysis or transplantation). When a patient needs renal replacement therapy, the condition is called end-stage renal disease (ESRD).

ETIOLOGY

1. Acute renal failure(ARF)

a) **Pre-renal(renal hypoperfusion)** – Haemorrhage,severe burns,Crushing injuries, shock, hypovolaemia, septicaemia,cardiac failure,anesthesia and rhabdomyolysis.
b) **Intra-renal (intrinsic renal disease)** – Vasculitis, renovascular obstruction (bilateral or unilateral with one functioning kidney),Rapidly progressive glomerulonephritis,acute tubular necrosis due to toxins or ischaemia.[6]
c) **Obstruction(Post renal)** – Urinary tract obstruction at any site.

2. Chronic renal failure (CRF)

a)**Congenital or Heredofamilial disorder**- Polycystic disease of kidney,Alport syndrome.

b)V**ascular disease of kidneys**- Vasculitis,Systemic lupus erythematosus.

c)**Glomerular disease**- Proliferatiive glomerulonephritis(GN) , Membranous GN,Diabetic nephropathy.

d)**Tubulointerstitial diseases**- Chronic pyelonephritis ,tuberculosis of kidney,Analgesic nephropathy.

e)**Obstructive renal disease**- Benign enlargement of prostate, pelvis tumor.

PATHOPHYSIOLOGY

The kidney performs four essential functions:

(1) Excretion of metabolites, particularly urea.
(2) Regulation of blood volume and electrolyte concentration.
(3) Regulation of erythrocyte production in the bone marrow by secreting erythropoietin.
(4) Participation in calcium homeostasis through hydroxylation of vitamin D3 into active or inactive metabolites.

Any pathology involving renal function would be expected to have serious pleiotropic effects.End stage renal disease(ESRD) is a chronic and progressive disease characterized by the destruction of nephrons. Diabetes, pyelonephritis, glomerulonephritis, nephrosclerosis, polycystic kidney disease, and collagen vascular disease are among the leading causes of this destruction. Congenital causes are responsible for the greatest percentage of all cases of chronic renal disease CRD seen in children. However, infectious or acquired causes predominate in developing countries, where

patients are referred in the later stages .When injury to the renal tissue occurs (e.g., due to congenital or acquired disease), the normally functioning nephrons adapt to the tissue insult and continue functioning. However, beyond a certain limit, renal hypertrophy leads to glomerular hyperfiltration (increased workload) of the remaining nephrons, which ultimately causes the nephrons to fail. Moreover, the original renal lesion can initiate progression of immunological damage.[13]

GENERAL SIGN AND SYMPTOMS

1)**Appearance** -Pallor secondary to anaemia of chronic kidney disease(CKD).

2)**Hypertension**-Common in chronic kidney disease(CKD) as either primary or secondary effect.[6]

3)**Shortness of breath** -May be due to any of: fluid overload, anaemia cardiomyopathy, or occult ischaemic heart disease.

4)**Kidneys**

a)Kidney shape on imaging may give clues to cause of chronic kidney disease(CKD). b)Bilaterally small kidneys with thinned cortices suggest intrinsic disease (e.g, glomerulonephritis). c)Unilateral small kidney may indicate renal arterial disease. d)Clubbed calyces and cortical scars suggest reflux with chronic infection or ischaemia. e)Enlarged cystic kidneys suggest cystic kidney disease.[13]

5)**Itch and cramps**

a)Common in advanced chronic kidney disease(CKD).

b)Cause of itch is incompletely understood but may involve deregulation of immune response and opioid systems.

c) Cramps are typically worse at night, and are likely to be due to neuronal irritation caused by biochemical abnormalities of chronic kidney disease(CKD).

6)**Cognitive changes**

a)Chronic kidney disease(CKD) increases risk of cognitive impairment by 65%. b)Cognition is affected early in CKD but different function decline at different rates. c)Language and attention may be particularly affected.

7)**Gastrointestinal symptoms**

a)Anorexia, vomiting, and taste disturbance may occur with advanced chronic kidney disease(CKD). Their cause is incompletely understood, and may have a genetic component.

b)Uraemic odour may occur in advanced CKD, caused by breakdown of urea by saliva.

8)**Change in urine output**

a) Polyuria where tubular concentrating ability is impaired.

b) Oliguria

c) Nocturia as a consequence of impaired solute diuresis or oedema.

d) Persistently frothy urine may indicate proteinuria

9)**Haematuria**

a)Glomerular bleeding results from immune injury to the glomerular capillary wall. Differentiated from lower tract bleeding by microscopy showing dysmorphic red cells and casts.

10)**Proteinuria**

a)Tubular damage results in low grade proteinuria typically <2 g, of low molecular weight proteins (eg, beta-2 microglobulin)

b)Glomerular damage results in loss of selectivity to protein filtration often exacerbated by hyperfiltration.Losses protein greater than 3·5 g are regarded as nephrotic range.

11)**Peripheral oedema**

a)Peripheral oedema due to renal sodium retention.

b)Exacerbated by reduced oncotic gradient in nephrotic syndrome, because of hypoalbuminaemia.

ORAL MANIFESTATION

Oral symptoms are observed in 90% of patients with renal disease, as the disease itself and treatments have systemic and oro-dental manifestations.[14]

1)**Oral mucosa**

a)Reduced erythropoietin and the resultant anemia lead to pallor of the oral mucosa.

b)Platelet aggregations altered during uremia . This situation combined with the use of heparin and other anticoagulants in hemodialysis, leads patients to become predisposed to ecchymosis, petechiae, and hemorrhages in the oral cavity.

c)Stomatitis, mucositis, and glossitis can cause pain and inflammation of the tongue and oral mucosa.

2)**Dysgeusia-** Altered taste sensations, as well as bacterial and candidiasis infections can develop due to the underlying renal disease .

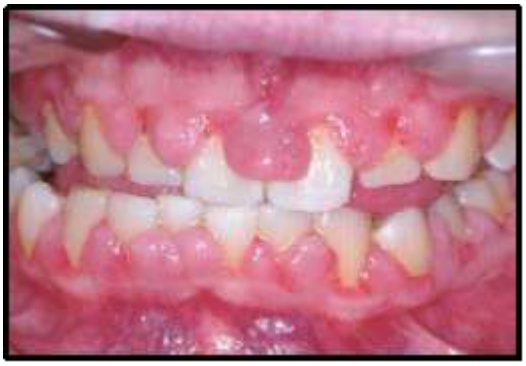
3)**Xerostomia-** A common oral symptom of chronic renal failure(CRF) is dry mouth, which may be caused by restricted fluid intake (necessary to accommodate the reduced excretory capacity of the kidney), adverse effects of drug therapy, and the low salivary flow rate.

4)**Uremic fetor**-Patients also suffer from odorous breath (uremic breath) and sensations of metallic tastes in the mouth (uremic fetor).Uremic fetor occurs as a result of a high salivary concentration of urea, which is converted to ammonia.Additional possible causes are increased phosphate and protein concentrations, as well as changes in salivary pH .

5)**Gingival enlargement**-Another manifestation of chronic renal disease(CRD) is gingival enlargement secondary to drug therapy or transplantation. Gingival enlargement chiefly affects the labial interdental papillae. The unpleasant appearance of gingival enlargement has adverse psychological impacts on the patient, interferes with the normal oral function, speech, and oral hygiene, as well as results in delayed or ectopic eruption. Meticulous oral hygiene is essential to reduce the inflammation associated with gingival overgrowth.

7)**Gingival and periodontal disease**-Gingival inflammation has been reported to be due to plaque accumulation and poor oral hygiene .Calculus has an important effect on gingival and periodontal disease incidence. Children with chronic renal disease(CRD) demonstrate an elevated salivary pH, decreased salivary magnesium, and high levels of salivary urea and phosphorus lead to precipitation of calcium-

phosphorus and calcium oxalate, and, thus, dental calculus formation. Calculus is more prevalent on the lingual surface of the lower incisors due to their proximity to the submandibular gland orifices .[15]



Oral Manifestation Of Renal Failure(Gingival enlargement)

MANAGEMENT

Medical management

1)Patient with reduce GFR but without any sign and symptoms should be treated conservatively. Aim should be to correct metabolic alterations, preserve existing renal function capacity, body weight control etc. Care should be taken about prescribed drugs as they should not be metabolized via kidney otherwise putting excessive load on kidney.

2)Renal replacement therapy(dialysis and renal transplant) is considered in the absence of conservative therapy. Hemodialysis, also spelled haemodialysis, or simply dialysis, is a process of filtering the blood of a person whose kidneys are not working normally. This type of dialysis achieves the extracorporeal removal of waste products such as creatinine and urea and free water from the blood when the kidneys are in a state of kidney failure. Hemodialysis is one of three renal replacement therapies (the other two being kidney transplant and peritoneal dialysis).[16]

DENTAL CONSIDERATION

1)Special attention requires for treating patient with renal failure.In any situation consultation with nephrologist is mandatory.

2)Due to the haematological alterations in these patients,CBC and coagulation test should be done before attempting any dental procedure.

3)As these patient are very prone to infection,prophylactic antibiotic (eg:penicillin or cephalosporins) should be given.Due to poor GI resorption antibiotic should be administered through. IM route.[15]

4)Amide type(Lidocaine,xylocaine) local anesthesia should be use because of their resorption potential in liver.

5)NSAIDS should be adjusted or avoided in case of advance renal failure because NSAIDS can reduce renal blood flow, cause tubular obstruction through crystal deposition, and induce direct cytotoxicity and cell-mediated immune injury mechanisms leading to the occurrence of acute kidney injury.Paracetamol is the drug of choice in such cases.

6)Desmopressin should be the choice to controls severe bleeding.

7)For dialysis patient, provide treatment on no dialysis day and local hemostatic agents available in clinic.

8)For patient with renal transplant, avoid elective dental procedure 6months post-renal transplant. Prophylactic antibiotic should be given by desire route . As they are on prolonged steroid therapy a recommended dose of 25 mg hydrocortisone via IV route should be given before any dental procedure.[17]

9)Periodic recall is necessary and dentist should make all arrangement to avoid cross-contamination.

CONCLUSION

The dental management of children with respiratory requires a thorough understanding of their medical conditions, careful planning, and coordination among healthcare professionals.Dentists are increasingly treating more patients who require complex services with more challenging dental treatment planning.By doing certain changes in dental operatory and treatment regarding modalities the dental treatment can be done with ease.

REFERENCES

1) Parmar MS. Chronic renal disease. Bmj. 2002 Jul 13;325(7355).

2)Gupta M, Gupta M. Oral conditions in renal disorders and treatment considerations–A review for pediatric dentist. The Saudi dental journal. 2015 Jul 1;27(3):113-119.

3)Schieppati A, Remuzzi G. Chronic renal diseases as a public health problem: epidemiology, social, and economic implications. Kidney International. 2005 Sep 1;68:7-10.

4) Webster AC, Nagler EV, Morton RL, Masson P. Chronic kidney disease. The lancet. 2017 Mar 25;389(10075):1238-52.

5)Eddy AA, Symons JM. Nephrotic syndrome in childhood. The lancet. 2003 Aug 23;362(9384):629-639.

6)Dr. S N Chugh,Dr. Anshul Chugh.Textbook of clinical medicine for dental student .Arya publication .fourth edition 2016:240-245.

7)Hirayama K, Koyama A. Epidemiology of nephrotic syndrome. Nihon rinsho. Japanese Journal of Clinical Medicine. 2004 Oct 1;62(10):1785-1793.

8)Tapia C, Bashir K. Nephrotic syndrome.StatPearls Publishing, Treasure Island (FL), 22 Dec 2017:1-10.

9)Güzel KG, Yilmaz D, Abacigil F, Pirinçci S. Oral aspects in children with nephroticsyndrome. Turkiye Klinikleri. Dishekimligi Bilimleri Dergisi. 2018 Sep 1;24(3):183-189.

10)Piekoszewska-Zietek P, Olczak-Kowalczyk D, Panczyk-Tomaszewska M, Gozdowski D. Developmental abnormalities of teeth in children with Nephrotic Syndrome. international dental journal. 2022 Aug 1;72(4):572-577.

11)Padubidri M, Pawar N, Padmawar N, Nara A, Joshi S, Mopagar V. Dental Management of Patients with Nephrotic Syndrome-A Report of 2 cases. Pravara Medical Review. 2018 Mar 1;10(1):33-38.

12)Thomas C, Thomas L. Renal failure—measuring the glomerular filtration rate.Deutsches Arzteblatt International. 2009 Dec;106(51-52):849-854.

13)Kumar V, Yadav AK, Sethi J, Ghosh A, Sahay M, Prasad N, Varughese S, Parameswaran S, Gopalakrishnan N, Kaur P, Modi GK. The Indian chronic kidney disease (ICKD) study: baseline characteristics. Clinical kidney journal. 2022 Jan;15(1):60-69.

14)Webster AC, Nagler EV, Morton RL, Masson P. Chronic kidney disease. The lancet. 2017 Mar 25;389(10075):1238-1252.

15)Gupta M, Gupta M. Oral conditions in renal disorders and treatment considerations–A review for pediatric dentist. The Saudi dental journal. 2015 Jul 1;27(3):113-119.

16)Gupta P V. Pediatric dentistry for special child. JAYPEE publication 1st edition 2016;3.:P.109-217.

17)Hamid MJ, Dummer CD, Pinto LS. Systemic conditions, oral findings and dental management of chronic renal failure patients: general considerations and case report. Brazilian dental journal. 2006;17:166-170.