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Prevalence Of Sleep Disordered Breathing In Children With Chronic Kidney Disease A Single Center Cross Sectional Study

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Objectives : Children with end stage kidney disease are at high risk for developing sleep disordered breathing (SDB). In view of scarcity of data of SDB in chronic kidney disease children, we performed this study to estimate its prevalence and severity using PSG
Methods : A Cross-sectional study conducted in the Paediatric nephrology outpatient clinic and Sleep medicine lab in CMC Vellore from March to December 2023. Children aged 5-18 years, with CKD stage ≥3, dialysis dependent and 3 months post renal transplantation were the cases (n=18) while equal number of children with CKD 2 served as control. Filling of the Epworth Sleepiness Scale questionnaire for Children and Adolescents , followed by PSG from which the prevalence of OSA was determined. Diagnosis of OSA was made with the age specific cut-off's for apnoea hypopnea index (AHI). OSA is taken as a measure of SDB.
Results : Amongst the 36 CKD children analyzed for SDB, males predominated (75%). Of the total, 4 (11.11%) were overweight, 3 (8.33%) were obese and 4 (11.11%) were undernourished. Hypertension was noted in 12 (33.33%). Only 2 children (5.55%) were symptomatic for sleep disturbance. However , the study demonstrated overall OSA prevalence of 72% (n=36) with 67% (n= 12) in CKD ≥3,dialysis dependent and ≥3 months post renal transplantation and 78 % (n=14) in those with CKD stage 2. Increasing severity was found with increasing stages of CKD
Conclusions : SDB is present in CKD children at a higher prevalence, with no significant difference between CKD 2 and CKD stage ≥3, dialysis dependent and 3 months post renal transplantation combined. However it is seen with greater severity in higher stages of CKD and with lesser severity in 3 months post renal transplant children. This emphasizes the need for vigilant monitoring for the symptoms of sleep disturbances and intervening at the earliest.

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Table 1: Baseline parameters of the population

Characteristics	Total cohort (n = 36)	CKD 2 (n = 18)	CKD 3-5T (n = 18)
Age at enrolment (months)	154 (114, 179)	136 (114,166)	157 (114, 187)
Males (%)	27 (75)	13 (72)	14 (78)
Height, Z score*	-0.9 (-1.5, -0.1)	-0.6 (-1.0, 0.0)	-1.2 (-1.6,-0.5)
BMI, Z score*	-0.4 (-1.3, 0.4)	-0.4 (-1.4, 0.4)	-0.4 (-1.1, 0.4)
eGFR, ml/min per 1.73 m2	64 (30, 80)	79 (71, 83)	30 (16, 61)$
CAKUT/ monogenic diseases	23 (64)	10 (56)	13 (72)
Iron parameters			
Hemoglobin, g/dL	11.2 (10.1, 12.9)	12.6 (10.8, 13.7)	10.3 (9.6, 11.2)$
Ferritin, ng/ml	66 (20, 175)	30 (19, 91)	165 (43, 306)$
Transferrin saturation, %	21 (12, 29)	13 (6, 22)	28 (16, 32)$
Vitamin B12, pg/mL	515 (363,662)	387 (291, 550)	588 (427, 786)
Folic acid, ng/mL	11 (6,20)	8 (5, 20)	20 (11, 20)
Medications			
Antihypertensives	11 (31)	1 (6)	10 (56)
Anticholinergics	4 (11)	1 (6)	3 (17)
Corticosteroids	9 (25)	0	9 (50)
Excessive daytime sleepiness	2 (7)	0	2 (11)

BMI- Body mass index, CAKUT congenital anomalies of kidney and urinary tract, eGFR- estimated glomerular filtration rate

**Z scores determined by revised IAP growth charts for height, weight and BMI for 5-18 year old Indian children.[13]*

$ P value <0.05

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Table 2: Comparison of Polysomnogram parameters between cases and controls.

Characteristics	Overall (n = 36)	CKD 2 (n = 18)	CKD 3-5T (n = 18)	p value
Total sleep time (min)	386 (334, 412)	397 (348, 427)	359 (322, 406)	0.14
Sleep efficiency (%)	88 (81, 95)	89 (82, 95)	86 (80, 94)	0.61
Sleep onset (mins)	15 (7, 33)	12 (4, 27)	19 (7, 48)	0.51
Desaturation index (/hr)	3 (1, 6)	3 (0, 4)	4 (1, 8)	0.16
Baseline SpO2	99 (99, 99)	99 (99, 100)	99 (98, 99)	0.02
Average sleep SpO2	97 (96, 98)	97 (96, 98)	97 (94, 98)	0.30
Lowest SpO2	88 (83, 93)	88 (86, 93)	89 (77, 92)	0.49
Arousal Index	7 (4, 11)	7 (5, 11)	7 (2, 12)	0.58
REM Index	5 (0, 13)	4 (0, 9)	6 (0, 12)	0.60
Non REM Index	3 (1, 6)	3 (2, 4)	4 (1, 8)	0.90
PLMI	51 (23, 121)	50 (27, 101)	80 (16, 127)	0.90
Total OSA	26 (72)	14 (78)	12 (67)	0.49
Moderate to severe OSA	11 (31)	4 (22)	7 (39)	0.31

OSA- obstructive sleep apnea, REM- Rapid eye movement sleep, Non REM- Non rapid eye movement sleep, PLMI- periodic leg movement index, EDS- excessive daytime sleepiness, SpO2 peripheral oxygen saturation