

## Excessive Daytime Sleepiness among Chronic Kidney Disease Patients

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### ABSTRACT:

**Background:** Excessive daytime sleepiness is defined as the incapacity to keep alert or awake during the major waking activities of the day, causing unintentional pauses of drowsiness or sleep. Chronic kidney disease patients commonly suffer from excessive daytime sleepiness which in turn affects their quality of life.

**Objectives:** This prospective cross-sectional study was conducted to evaluate the prevalence of excessive daytime sleepiness among chronic kidney disease patients.

**Patients and methods:** The study was carried out on one hundred patients with known chronic kidney disease who attended Aswan University hospital during the period between May 2017 and March 2020; 42.0% males and 58.0% females with a mean age of  $53.9 \pm 16.97$  years. We evaluated day time sleepiness among those patients using Epworth Sleepiness Scale (ESS); the standardized score for the assessment of daytime sleepiness.

**Results:** We found that 56% of the patients had excessive daytime sleepiness (ESS > 10) with the median ESS of the participants was 10.0. There was no statistically significant correlation between the ESS and each of serum urea, serum creatinine, and eGFR.

**Conclusion:** Excessive daytime sleepiness is common among CKD patients with a prevalence of 56% that may affect their quality of life.

**Keywords:** Excessive daytime sleepiness, Epworth Sleepiness Scale, Chronic kidney disease.

### INTRODUCTION:

Excessive day sleepiness (EDS) is defined as the incapacity to keep alert or awake during the major waking activities of the day, causing unintentional pauses of drowsiness or sleep (Andreas and Patrick, 2011). EDS can be quantified clinically as

unintended falling asleep during either active (like during conversation or driving) or passive (like watching TV or reading) circumstances. EDS can be further evaluated by Epworth Sleepiness questionnaire; the standardized score for the assessment of daytime sleepiness. The sequelae of EDS can

vary from reduced efficiency at work to an increased risk of motor car accidents (Andreas and Patrick, 2011). Treatment of EDS is principally focused on the underlying cause that can include clinical entities such as inadequate sleep, sleep disturbance from a concomitant sleep disorder such as restless leg movement, sleep apnea, narcolepsy, periodic leg movement, a complication of sedating drugs, and chronic psychiatric and medical illnesses (Hanly et al., 2003). We conducted this study to evaluate the prevalence of excessive daytime sleepiness among chronic kidney disease patients.

**Patients and methods**

This cross-sectional study was carried out on one hundred patients with known chronic kidney disease who attended Aswan University hospital during the period between May 2017 and March 2020. Our study included chronic kidney disease patients of all stages. According to **KDIGO clinical practice guidelines (2012)**, CKD is classified into 5 stages according to eGFR as shown in table (1). Patients with comorbidities (like liver cell failure, chronic chest disease, and diabetes) and patients who received drugs that may cause excessive daytime sleepiness were excluded from the study by clinical history, examination, pulmonary function tests, laboratory and radiological

investigations. All patients were subjected to full medical history, anthropometric assessment (weight, height, BMI), and renal function tests (serum creatinine and serum urea).

**Table 1.** Stages of Chronic Kidney Disease

Stages of chronic kidney Disease		eGFR
Stage (1)	Kidney damage with normal kidney function	90 or higher
Stage (2)	Kidney damage with mild loss of kidney function	89 to 60
Stage (3a)	mild to moderate loss of kidney function	45 to 59
Stage (3b)	Moderate to severe loss of kidney function	30 to 44
Stage (4)	Severe loss of kidney function	15 to 29
Stage (5)	Kidney failure	Less than 15

We evaluated excessive daytime sleepiness among CKD patients using the Epworth Sleepiness Scale (ESS); the standardized score for the assessment of daytime sleepiness. ESS is a self-administered 8 items questionnaire that is a trustable scale for quantifying excessive daytime sleepiness (Johns, 1991). However, it cannot help in identifying the underlying causative disease of sleepiness (Hardinge et al., 1995). We

asked the patients of the study to score themselves on ESS which consisting of 8 ratings of 0-3, each of them quantifying how tendency they could fall asleep in certain circumstances and daytime activities (Table 2).

**Table 2.** Epworth sleepiness scale:

Eight situations are described on a questionnaire:

- Sitting and reading
- Watching television
- Sitting inactively in a public place
- Riding as a passenger in a car for one hour without a break
- Lying down to rest in the afternoon when circumstances permit
- Sitting and talking with someone
- Sitting quietly after lunch without alcohol
- Sitting in a car as the driver, while stopped for a few minutes in traffic

Each situation receives a score of zero to three, which is related to the likelihood that sleep will be induced:

0 = would never doze

1 = slight chance of dozing

2 = moderate chance of dozing

3 = high chance of dozing

The ESS scale varies from 0-24: the higher the scale, the somnolent the individual (Johns, 1993). ESS scale  $\geq 10$  is

considered to denote a significant excessive daytime sleepiness. The scale is accomplished independently by both the patient and their partner as the patient may misjudge the severity of their sleepiness (Leslie et al., 2010).

**Statistical analysis**

Data were analyzed using SPSS version 25 (IBM Inc., Armonk, New York, USA). Descriptive statistics: Means, standard deviations, medians, ranges, and percentages were calculated. The correlation between different parameters was done using Pearson correlation analysis. P-value  $< 0.05$  was considered significant.

**Ethical considerations**

Approval for this study was obtained from the Faculty of Medicine Ethics Committee, Aswan University hospital (IRB, 150/7/17). In addition, informed written consent was obtained from patients.

**Results**

This study was conducted on one hundred CKD patients; 42.0% males and 58.0% females. The mean age was  $53.9 \pm 16.97$  years. Our study included CKD patients of all stages with mean eGFR of  $16.2 \pm 15.77$  ml/min/1.73m<sup>2</sup> (ranging from 2.2- 95.5 ml/min/1.73m<sup>2</sup>); only one case was stage 1. The rest of the demographic

data was illustrated in Table (3).

**Table 3.** Demographic data of the study population

Demographic data	Chronic kidney disease patients (no= 100)	
<b>Sex:</b>		
Male	42 (42%)	
Female	58 (58%)	
<b>Age:</b>		
Mean $\pm$ SD	53.9 $\pm$ 16.97	
Range	19 – 90	
<b>Smoking:</b>		
Non-smoker	82 (82%)	
Current smoker	9 (9%)	
Ex-smoker	9 (9%)	
<b>Hypertension</b>	64 (64%)	
<b>Ischemic heart disease</b>	11 (11.0%)	
<b>Previous cerebrovascular stroke (CVS)</b>	4 (4.0%)	
<b>Renal Functions</b>	Urea:	
	• Mean $\pm$ SD	116.44 $\pm$ 49.55
	• Range	(21.5-244.0)
	Creatinine:	
	• Mean $\pm$ SD	5.92 $\pm$ 3.51
	• Range	(1.4-17.0)
Glomerular filtration rate (GFR):		
	• Mean $\pm$ SD	16.2 $\pm$ 15.77
	• Range	(2.2- 90.5)

Evaluation of excessive daytime sleepiness among CKD patients of our study using

Epworth sleepiness scale revealed high ESS (ESS > 10) in 56% of CKD patients denoting excessive daytime sleepiness with a median ESS of 10.0 (Table 4).

**Table 4.** Epworth sleepiness scale among CKD patients

Epworth Sleepiness Scale	CKD patients	
	Mean ± SD	11.09 ± 4.8
	Median(Range)	10.0 (4.0-22.0)
	ESS ≥ 10	56 (56%)

There was no statistically significant correlation between the ESS and each of serum urea, serum creatinine and eGFR (Table 5).

**Table 5.** Correlation between Epworth Sleepiness Scale and renal function tests in CKD patients

Renal Function Tests	Epworth Sleeping Scale	
	r- value	P-value
Serum Urea level	-0.076	0.452
Serum Creatinine level	-0.070	0.488
eGFR	0.001	0.993

Also, there were no statistically significant differences in the mean (median and range)

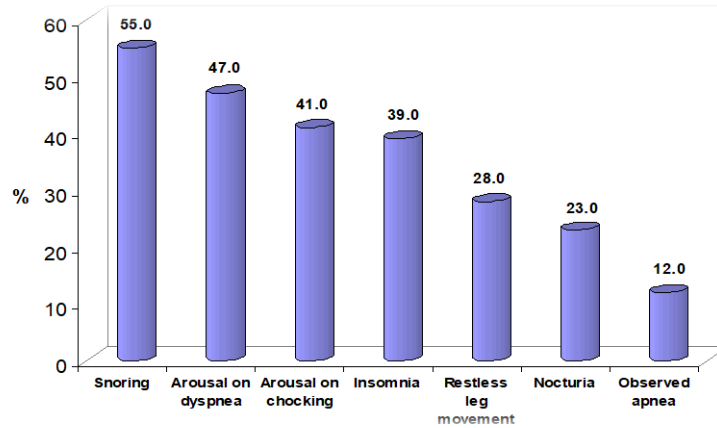
of the ESS between the hypertensive and the normotensive CKD patients (Table 6).

**Table 6.** Epworth Sleepiness Scale in hypertensive CKD and normotensive CKD patients

Epworth Sleepiness Scale	Hypertensive CKD (n= 64)	Normotensive CKD (n= 36)	P-value
Mean (±SD)	10.98 ±4.856	10.33 ± 4.729	0.138
Median (range)	10 (4 – 22)	9 (3 – 20)	

Our study revealed that CKD patients presented with clinical symptoms suggesting sleep-disordered breathing other than excessive daytime sleepiness. The most frequent symptoms were snoring (55%), nocturnal arousal on dyspnea (47%), and nocturnal arousal on choking (41%), insomnia (39%), restless leg movement (RLM) (28%), nocturia (23%) and observed apnea (12%) (Fig1). There was statistically significant correlation between RLM and each of serum creatinine level (P= 0.003) and eGFR (P= 0.015) with no statistically significant correlation between other sleep-disordered breathing symptoms and renal

function tests (Table 7).



**Figure (1):** symptoms of sleep-disordered breathing among CKD patients

**Table 7.** Sleep-disordered breathing symptoms among different CKD stages

Sleep-disordered breathing symptoms	CKD stages						P value
	1	2	3a	3b	4	5	
<b>Total no.</b>	1	4	7	13	30	45	
<b>Arousal on dyspnea</b>	0	0	2	6	12	24	0.23
<b>Arousal on choking</b>	0	2	1	4	9	23	0.18
<b>Nocturia</b>	0	1	1	1	5	11	0.61
<b>snoring</b>	0	3	1	8	15	25	0.23
<b>Insomnia</b>	0	0	4	6	9	19	0.28
<b>Restless leg movement</b>	0	2	0	0	7	18	0.014
<b>Observed apnea</b>	0	0	1	2	3	5	0.9

**Discussion**

Excessive daytime sleepiness (EDS) is defined as the incapacity to keep alert or

awake during the major waking activities of the day, causing unintentional pauses of drowsiness or sleep. The squeals of EDS can vary from reduced efficiency at work to an

increased risk of motor car accidents (Andreas and Patrick, 2011). This study was conducted on 100 patients with known chronic kidney disease, 42.0% males and 58.0% females. The mean age was  $53.9 \pm 16.97$  years. On screening of our study patients for excessive daytime sleepiness using Epworth Score (ESS), we found that 56% of CKD patients complained of excessive daytime sleepiness with  $ESS > 10$ . The median ESS of the participants was 10.0. These results are consistent with Mohamed Eltawdya, et al. who studied sleep disorders in CKD patients and found that the ESS score was greater than 10 in nearly a third of CKD patients (35%), which signified the presence of EDS (Mohamed Eltawdya et al., 2016). Also, Hanly et al. evaluated 24 hemodialysis subjects and found that subjective sleepiness using the Epworth Sleepiness Scale was reported in 50% of patients (Hanly et al., 2003).

In contrast to our results, Chu et al. studied 107 hemodialysis patients to assess the risk factors of sleep-disordered breathing (SDB) and to identify useful assessment tools to detect SDB in this population. They measured excessive daytime sleepiness using the ESS. They expected to observe a high prevalence of EDS, however, they found that the rate of self-reported daytime sleepiness

was relatively low and was not correlated to the presence of SDB detected by polysomnography (Chu et al., 2019).

We found no statistically significant correlation between the Epworth Sleepiness scale and each of serum urea, serum creatinine, and eGFR. In contrast to our study, Hanly et al. evaluated 24 unselected patients treated with hemodialysis and reported that sleepiness was associated with a higher urea level (Hanly et al., 2003). A possible explanation for the differences in results is that ESS is subjective, and patients' estimation of their particular degree of sleepiness can be influenced by factors such as being accustomed to chronic fatigue, disease denial, or employment pressure (Bhatet al., 2016; Vanet al., 2003). Also, many reports had regular daytime naps and/or sleeping through their dialysis treatments and EDS may not be noticed by patients in this context (Chu et al., 2019).

Our study revealed that CKD patients presented with clinical symptoms suggestive of sleep-disordered breathing other than excessive daytime sleepiness. The most frequent symptoms were snoring (55%), nocturnal arousal on dyspnea (47%), nocturnal arousal on choking (41%), insomnia (39%), restless leg movement

(28%), nocturia (23%) and observed apnea (12%). Our results agreed with Mohamed Eltawdya *et al.* who studied sleep disturbances in CKD patients, and found that all patients had sleep complaints in the form of excessive daytime sleepiness, difficulty falling asleep, early morning awakening, jerking leg movements, and fragmented sleep (Mohamed Eltawdya et al., 2016). Also, De Santo et al. studied 52 patients with CKD and found that the prevalence of sleep disorder was 80.7% of patients, and patients with sleep disorders complained of increased sleep latency (42.6%), frequent awakenings (62.9%), early awakenings (57.4%), no refreshing sleep (50%), and snoring (12.9%) (De Santo et al., 2006). So, Management of EDS in CKD patients is principally focused on the underlying cause that can include inadequate sleep, sleep disturbance caused by a concomitant sleep disorders such as restless leg movement, sleep apnea, narcolepsy and periodic leg movements, complication of sedating drugs, and chronic psychiatric and medical illnesses (Hanly et al., 2003).

We reported a statistically significant correlation between RLM and CKD stages ( $P= 0.014$ ). This is agreed with Walker et al. who studied sleep complaints in a dialysis unit and found that restless leg movement

was related to serum creatinine and urea levels (Walker et al., 1985).

### CONCLUSION:

Excessive daytime sleepiness is common among CKD patients with a prevalence of 56%, which may affect their quality of life. EDS may be caused by inadequate sleep and concomitant sleep disorders such as restless leg movement, sleep apnea, snoring, frequent nocturnal arousal on dyspnea, choking, and nocturia.

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### Abbreviations:

BMI: Body Mass Index

CKD: Chronic kidney disease

EDS: Excessive day sleepiness

eGFR: estimated glomerular filtration rate

ESS: Epworth Sleepiness Scale

RLMs: Restless Leg Movements

SDB: Sleep Disordered Breathing

### Disclosure and Potential of Interest:

All authors declare that there exist no commercial or financial relationships that could lead to a potential conflict of interest.

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