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A Case Study

**HYPERTENSION AND SLEEP QUALITY; A CASE CONTROL STUDY**

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**Abstract:**

**Background:** Impaired sleep has significant negative impact on health. Adequate sleep duration not only maintains body function, but also prevents adverse cardiovascular outcomes. For instance, inadequate sleep has been associated with hypertension. **Objective:** to determine sleep quality among hypertensive patients and the point out the score differences between hypertensive and control groups using the Pittsburgh Sleep Quality Index on patients living in the central area of Saudi Arabia. **Methods:** case control study conducted among 73 already physician diagnosed hypertensive patients and 73 matched control non-hypertensive group from the central area of Saudi Arabia, during the period from 1 January to 31 May, 2018. Data were collected by personal interview with the hypertensive and control group and filling the questionnaire. We used the Arabic Pittsburgh Sleep Quality Index (A-PSQI). **Results:** About two thirds (67.1%) of hypertensive patients were females and almost the proportions (68.5% Vs. 31.5%) in the control group. By using Pittsburgh Sleep Quality Index (PSQI) we found that, among hypertensive patients 71.2% had poor sleep quality and only 28.8% had good sleep quality. While in the control group 20.5% had good sleep quality and 79.5% poor sleep quality and there was insignificant difference in sleep quality between hypertensive patients and control ( $P=0.249$ ). The Mean  $\pm$  S.D sleep quality global score was  $8 \pm 4.33$  in hypertension patients and  $7.16 \pm 3.6$  in the control group but the difference was statistically insignificant ( $P=0.370$ ). **Conclusion:** from this study we concluded that By using Pittsburgh Sleep Quality Index (PSQI) we found that, there was insignificant difference in sleep quality between hypertensive patients and control ( $P=0.249$ ).

**Keywords:** Hypertension; PSQI; Sleep quality

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## INTRODUCTION:

Hypertension or High Blood Pressure (HBP) is a non-transmissible chronic disease, and considered one of the major challenges for public health around the world [1]. It accounts for about 13% of all global deaths and affects approximately 25% of the world population, with a 60% increase of estimated cases by 2025 [2, 3]. Sleep is a vital reparative, restorative and physiological phenomenon, and impaired sleep has significant negative impact on health [4]. Adequate sleep duration not only maintains body function, but also prevents adverse cardiovascular outcomes. For instance, inadequate sleep has been associated with hypertension [5].

In recent years, many studies have found a relationship between poor sleep quality and /or short sleep duration with high incidence and prevalence of hypertension. In a study carried out in China, to show the sleep duration and sleep quality in hypertension, it was found that, Sleep duration shorter than 8 hours was found to be associated with increased hypertension, with odds ratios of 1.25 for 7 hours, 1.41 for 6 hours, and 2.38 for <6 hours. Using very good sleep quality as the reference, good, poor, and very poor sleep quality were associated with hypertension, with odds ratios of 1.20, 1.67, and 2.32, respectively [6].

In USA a study was conducted to Analyze the quality of sleep of hypertensive patients, it was reported that, the prevalence of poor sleep quality among hypertensive patients was 67.9% and there was a high rate of using medication for sleeping [7].

The study aimed at determining sleep quality among hypertensive patients and the point out the score differences between hypertensive and control groups using the Pittsburgh Sleep Quality Index in the central area of Saudi Arabia.

## PATIENTS AND METHODS:

**Study Design:** This was a case control study included 146 studied participants; 73 of them already physician diagnosed hypertensive patients and 73 matched control non-hypertensive group from the central area of Saudi Arabia, during the period from 1 January to 31 May, 2018.

**Data collection:** We designed a simple questionnaire to collect data from the two study groups. Data were collected by personal interview with the hypertensive and control group and filling the questionnaire. We used the Arabic version of Pittsburg Sleep Quality Index (A-PSQI) which is an effective instrument used to measure the quality and patterns of sleep in adults. Patients and controls were classified into two groups according to PSQI: Poor-sleeper group (PQSI > 5) and good-sleeper group (PQSI ≤ 5) [8]. The questionnaire included

the relevant questions to collect the relevant data to fulfill the study objective; Socio-demographic characteristics of the patients and control including age, marital status and educational status. It includes also, questions about the comorbidities associated with hypertension. Height and weight. The BMI was calculated. Normal weight was defined as BMIo25 kg/m<sup>2</sup>, overweight as 25rBMIo30 kg/m<sup>2</sup>, and obesity as BMIZ30 kg/m<sup>2</sup>. Questions specific to Pittsburg Sleep Quality Index (PSQI) from each cases and control was addressed in the questionnaire.

## Ethical considerations:

Participants were informed that participation is completely voluntary. No names were recorded on the questionnaires and protection of confidentiality and all questionnaires were kept safe.

## Statistical analysis

Data were analyzed using IBM SPSS Statistics for Windows version 23.0. Quantitative data were expressed as mean ± standard deviation, median and range. Qualitative data were expressed as number and percentage. The data were tested for normality using Shapiro-Wilk test. The nonparametric Mann–Whitney test was used for data which wasn't normally distributed. Chi-square ( $\chi^2$ ) test and Fisher's Exact Test were used for comparison regarding qualitative variables as appropriate. A 5% level was chosen as a level of significance in all statistical tests used in the study.

## RESULTS:

Table (1) illustrates the distribution of the studied patients and control by socio-demographic and anthropometric measures. About two thirds (67.1%) of hypertensive patients were females and almost the proportions (68.5% Vs. 31.5%) in the control group. Thirty (41.1%) of Hypertensive patients were 20 -39 years and 42.5% were 40- 59 years. Mean± S.D of the BMI was 25.42± 5.52 in hypertensive patients and 30.43 ± 8.16 in the control group.

Table (2) shows the distribution of the studied patients and control suffering comorbidities. It is clear from the table that from hypertensive patients, 35.6% had diabetes, no one had coronary heart disease and 41.1% had obesity. Regarding the control group, 20.5% were obese, no one was diabetic and no one had coronary heart disease

Table (3) reveals the comparison of sleep quality among the studied hypertensive patients and non-hypertensive (control) group. By using Pittsburgh Sleep Quality Index (PSQI) we found that among hypertensive patients 71.2% had poor sleep quality and only 28.8% had good sleep quality. While in the

control group 20.5% had good sleep quality and 79.5% poor sleep quality and there was insignificant difference in sleep quality between hypertensive patients and control (P=0.249).

Table (4) illustrates comparison of sleep quality score among hypertension patients and the control. The Mean $\pm$  S.D sleep quality global score was 8  $\pm$

4.33 in hypertension patients and 7.16  $\pm$  3.6 in the control group but the difference was statistically insignificant (P=0.370).

Table (5) shows the mean and median of scores of the seven components and the global score of the PSQI.

**Table (1): Distribution of the studied patients and control by socio-demographic and anthropometric measures (No. = 146)**

Parameter	Hypertensive (N= 73)	Non-hypertensive (control) (N= 73)	P-value
<b>Gender</b>			
Female	49 (67.1%)	50 (68.5%)	0.859
Male	24 (32.9%)	23 (31.5%)	
<b>Age</b>			
12-19 years	2 (2.7%)	6 (8.2%)	< 0.001
20 -39 years	30 (41.1%)	61(83.6%)	
40- 59 years	31 (42.5%)	6 (8.2%)	
$\geq$ 60 years	10 (13.7%)	0 (0.0%)	
<b>Education</b>			
Primary	10 (13.7%)	0 (0.0%)	< 0.001
Secondary	8 (11%)	5 (2.8%)	
University	43 (58.9%)	68 (93.2%)	
Non-educated	8 (11%)	0 (0.0%)	
Intermediate education	4 (5.5%)	0 (0.0%)	
<b>Marital status</b>			
Widow	8 (11%)	0 (0.0%)	< 0.001
Single	20 (27.4%)	47 (64.4%)	
Married	38 (52.1%)	25 (34.2%)	
Divorced	7 (9.5%)	1 (1.4%)	
<b>Occupation</b>			
Not working	47 (64.4%)	27 (37%)	0.001
Working	26 (35.6%)	46 (63%)	
<b>Weight (Kg)</b>			
Mean $\pm$ S.D.	68.3 $\pm$ 18.71	81.29 $\pm$ 22.68	<0.001*
Median (Range)	65 (44 – 155)	78 (38 – 130)	
<b>Height (cm)</b>			
Mean $\pm$ S.D.	163.36 $\pm$ 9.55	163.21 $\pm$ 9.27	0.751*
Median (Range)	160 (147 – 195)	163 (145 – 194)	
<b>BMI</b>			
Mean $\pm$ S.D.	25.42 $\pm$ 5.52	30.43 $\pm$ 8.16	<0.001*
Median (Range)	24.58 (17.51– 50.04)	29.69 (16.67– 57.78)	

P-value is calculated by Chi-Square Test

\*P-value is calculated by Mann-Whitney U Test

P-value <0.05 is statistically significant

**Table (2): Distribution of the studied patients and control suffer comorbidities**

Parameter	Hypertensive (N= 73)	Non-hypertensive (control) (N= 73)	P-value
<b>Diabetes</b>			
No	47 (64.4%)	73 (100%)	< 0.001
Yes	26 (35.6%)	0 (0.0%)	
<b>Obesity</b>			
No	43 (58.9%)	58 (79.5%)	0.007
Yes	30 (41.1%)	15 (20.5%)	
<b>Coronary heart disease</b>			
No	73 (100%)	73 (100%)	NA
Yes	0 (0.0%)	0 (0.0%)	

P-value is calculated by Chi-Square Test

P-value <0.05 is statistically significant

NA (not applicable)

**Table (3): comparison of sleep quality among the studied hypertensive patients and Non-hypertensive (control) group**

Parameter	Hypertensive N= 73)	Non-hypertensive (control) N= 73)	P-value
Sleep quality			
Good	21 (28.8%)	15 (20.5%)	0.249
Poor	52 (71.2%)	58 (79.5%)	

P-value is calculated by Chi-Square Test

**Table (4): comparison of sleep quality score among hypertension patients and the control**

Sleep quality global score	Hypertensive N= 73)	Non-hypertensive (control) N= 73)	P-value
Mean± S.D.	8 ± 4.33	7.16 ± 3.6	0.370
Median (Range)	7(2 – 20)	7 (1 – 16)	

P-value is calculated by Mann-Whitney U Test

**Table (5): score of sleep quality**

Score of sleep quality	Summary statistics
Component 1 Mean± S.D. Median (Range)	0.98 ± 0.87 1 (0 – 3)
Component 2 Mean± S.D. Median (Range)	1.47 ± 0.92 1 (0 – 3)
Component 3 Mean± S.D. Median (Range)	1.19 ± 1.07 1 (0 – 3)
Component 4 Mean± S.D. Median (Range)	0.75 ± 1.15 0 (0 – 3)
Component 5 Mean± S.D. Median (Range)	1.57 ± 0.63 2 (0 – 3)
Component 6 Mean± S.D. Median (Range)	0.32 ± 0.8 0 (0 – 3)
Component 7 Mean± S.D. Median (Range)	1.3 ± 0.87 1 (0 – 3)
Global score Mean± S.D. Median (Range)	7.58 ± 3.99 7 (1 – 20)

## DISCUSSION:

This was a case control study included 146 studied participants, among which 73 were hypertensive and 73 non-hypertensive control group from Central Saudi Arabia. The study aimed at determining sleep quality among hypertensive patients and points out the score differences between hypertensive and control groups using the Pittsburgh Sleep Quality Index.

By using Pittsburgh Sleep Quality Index (PSQI) we found that among hypertensive patients 71.2% had poor sleep quality and only

28.8% had good sleep quality. Closed result was reported in non-hypertensive group, 79.5% had poor sleep quality and 20.5% had good sleep quality with no different significance ( $p= 0.249$ ). A study conducted among 280 hypertensive patients, the global PSQI score showed that 55.7% of the hypertensive patients had bad sleep quality and 44.3% had good sleep quality [9]. In contrast to our results, in China a across sectional study carried out among 660 participants; 57.2% had hypertension from them 58.7% had well sleep quality, 19% had fairly sleep quality and

22.22% had poor sleep quality [9]. In normal group similar results were reported, 57.8% had well sleep quality, 19.9% had fairly sleep quality and 22.34% had poor sleep quality but there was no association between sleep quality and blood pressure [9]. In Nigeria, a case-control study conducted among 132 consecutive patients with hypertension and 122 normal subjects, (42.4%) hypertensive subjects were “poor sleepers” (global PSQI > 5) this was significantly more than 17.3% of control subjects, good sleeper reported by 57.6% in hypertensive group and 82.7% in controls, there was a significant difference between sleep quality and hypertension ( $p=0.001$ ) [10].

In Turkey, a cross-sectional study was conducted in a convenience sample of patients with hypertension demonstrated that poor sleep quality is common in older adults with hypertension, the majority of the participants (63.3%) had poor sleep quality, with a mean global PSQI score of 7.49 [11]. Bansil *et al.* reported in their study, (30.2%) of the studied sample had hypertension, from them (52.4%) had poor sleep quality which was more than reported in normal group but there was no difference in the prevalence of poor sleep ( $P=.78$ ) [12]. Fiorentini *et al.* found that the prevalence of hypertension was 87.1% in “poor sleepers” subjects versus 35.1% in “good sleepers” subjects ( $p<0.0001$ ), this results permit to conclude that the sleep's quality disorders, evaluated by PSQI, are associated with significant comorbidities as hypertension [13]. In China a population based study reported that hypertensive subjects had a higher prevalence of poor sleep quality than study subjects without hypertension (36.02% vs 16.29%) and there was significant associations between hypertension and poor sleep quality which measured by global PSQI scores ( $P<0.001$ ) [14].

Regarding to other chronic diseases associated with hypertension, this study found that from hypertensive patients 35.6% had diabetes and no one had coronary heart disease and obesity was 41.1%. Another study reported that half of the participants with hypertension had cardiac disease (54.7%), diabetes (48.4%) and (35.2%) had anemia [11]. Another study reported that 17.5% of hypertensive patients had diabetes, which was the most common [12]. Another

study found that among hypertensive patients obesity represent 60.1%, diabetes 14.7% and cardiovascular disease 3.6% [15]. In China a study reported the most important three comorbidities among patients with hypertension were 69.36% for diabetes mellitus, 77.39% for hyperlipidemia, and 57.32% for coronary heart disease [16]. Another study reported that the top of four comorbidities of hypertension were coronary heart disease, diabetes, hyperlipemia and arteriosclerosis, whose detection rates were 21.71%, 16.00%, 13.81% and 12.66% respectively [17].

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