SCIENTIFIC RESEARCH
UNIVERSITY OF BAGHDAD
AL-KINDY COLLEGE OF MEDICINE

Insomnia and sleep insufficiency relationship with elevated blood pressure

A project Submitted to AL-Kindy College Of Medicine In partial fulfilment of the requirements of a project module/ 3rd stage

BY:

Ahmed Abass Najm

Ali Hussein Khaleel

Ridha Saad Nazal

Abdullah Haider Sabry

SUPERVISED BY:

Co-Assistant Doctor

Dr.Bilal Sadek Al-Maroof

2022-2023

Abstract

Abstract:

- **Objective:** Previous studies have reported that sleep duration might increase the risk of hypertension. However, the results have been conflicting. We investigated whether sleep duration is independently associated with hypertension. We aimed to assess the relationship between sleep duration and hypertension in a population-based cross-sectional study.

- **Introduction:** Insomnia and hypertension are two common health issues that can have serious consequences for individuals' health and well-being. This study aims to investigate the relationship between insomnia and hypertension, taking into account potential confounding factors such as age, gender, and obesity.

- **Methods:** A cross-sectional study was conducted with a sample of 440 adults aged 18 years and older. Participants completed questionnaires on their sleep habits, health status, and other relevant factors. Blood pressure readings were also taken to assess hypertension status. Logistic regression analysis was used to examine the relationship between insomnia and hypertension, while controlling for potential confounders.

- **Results:** The results of the study indicate a significant association between insomnia and hypertension, even after controlling for age, gender, and obesity. Participants with insomnia were more likely to have hypertension compared to those without insomnia (odds ratio = 2.47, 95% CI = (1.41-3.79, $p < 0.001$).

- **Conclusions:** This study provides evidence for a significant association between insomnia and hypertension, suggesting that individuals with insomnia may be at higher risk for hypertension. These findings have important implications for the prevention and management of these common health issues.

Acknowledgement:

We would like to express our sincere gratitude to all those who have supported and encouraged us throughout the course of this research project. First and foremost, we would like to thank God for providing us with the strength, guidance, and wisdom to pursue our academic goals and complete this study.

We are also deeply grateful to Our supervisor [Dr.Bilal Sadek Al-Maroof], for his invaluable guidance, patience, and constructive feedback throughout the research process. We appreciate his willingness to take the time to answer our questions and provide us with the resources and knowledge necessary to conduct this research.

Furthermore, we would like to thank our parents, colleagues and friends who provided us with the motivation, inspiration, and support to carry out this research. Their encouragement and insights have been invaluable to us, and we are grateful for their continued friendship and support.

Finally, we extend my gratitude to all the participants who generously gave their time and energy to take part in this study. Without their willingness to share their experiences and perspectives, this research would not have been possible.

List of content :

List of Tables & Figures :

Introduction

Introduction:

Hypertension is an increasing global issue in terms of public health. Presently, only 37% of Americans with hypertension have their blood pressure regulated (1), and the primary factor responsible for premature death and cardiovascular disease on a global scale is hypertension. However, due to the widespread use of antihypertensive medications, the average blood pressure level across the world has remained steady or even decreased slightly over the past forty years (2). Insomnia is the most frequently observed sleep disorder in medical practice. Despite this, there is a lack of knowledge regarding the mechanisms, reasons, clinical progression, and impacts of this extensively prevailing, persistent condition. Numerous researches have confirmed that there is a strong correlation between insomnia and psychiatric disorders. Furthermore, insomnia increases the likelihood of developing depression, anxiety, and suicidal tendencies (3) (4). When rats are deprived of sleep, they display various symptoms that include weight loss, enhanced food consumption, reduced body temperature, and even mortality (5). Despite the fact that sleep is a well-regulated process that involves multiple regulatory mechanisms, sleep disorders can still occur. These disorders may arise due to disturbances in the sleep circuitry, as a secondary effect of other conditions, or as a consequence of modern-day lifestyles (6). Inadequate sleep quality, has been linked to both existing and developing high blood pressure. Previous research on the connection between sleep and mortality has primarily focused on sleep duration rather than sleep quality. However, it's possible that sleep quality also plays a role in the development of diseases. Human sleep consists of two types: rapid eye movement (REM) sleep and non-REM sleep stages 1-4. The deeper stages of non-REM sleep (stages 3 and 4), which are collectively referred to as slow-wave sleep, are particularly important for maintaining glucose levels and overall biological restoration. Poor sleep quality can disrupt slow-wave sleep, leading to decreased insulin sensitivity and glucose tolerance, as shown in a recent experimental study that found reduced sleep quality had these effects even when sleep duration remained unchanged (7) (8) (9). The primary factors that increase the likelihood of developing hypertension have been identified and consist of elements such as family history, lack of physical activity, unhealthy eating habits, smoking cigarettes, sex, ethnicity, and advancing age. However, there is an atypical risk factor that is frequently disregarded, which is inadequate sleep (10). Consistently, young and middle-aged adults who get insufficient sleep are at a higher risk of developing high blood pressure, but still there is some divergent outcomes about this relation. For example, According to the Sleep Heart Health Study analysis, having less than 6 hours of sleep was linked with high blood pressure (11). On the other hand, the National Health and Nutrition Examination Survey analysis found that having 5 hours or less of sleep was associated with a higher chance of developing high blood pressure in the future (12). Two separate meta-analyses of adult participants produced similar outcomes, indicating that insufficient sleep is connected to a greater risk of hypertension. The odds ratio for both meta-analyses were (OR=1.20, 95%CI: 1.09 to 1.32, $p<0.001$) (13) (14).

Other studies showed that there is no association, for example (15) showed getting an insufficient amount of sleep (5 hours or less) is linked to high blood pressure in young and middle-aged Korean adults. However, for older adults aged 65 years and above, there was no correlation found between sleep duration and the likelihood of developing high blood pressure. One study reported no correlation between sleep duration and hypertension. However, in that study, high blood pressure was defined as systolic blood pressure (SBP) and diastolic blood pressure (DBP) values equal to or greater than 160/100 mmHg, which could have weakened any potential link that may have existed (16). Likewise, a study conducted on elderly individuals without insomnia revealed that there was no significant association between sleep duration and the incidence of high blood pressure. This suggests that further research is necessary to fully understand the connection between sleep duration and hypertension (17)

Aims of the studv :

The aim of this research is to examine the prevalence and correlates of insomnia among adults aged 18-65 years in the Iraq. Specifically, the study will aim to:

- Determine the prevalence of insomnia among the sample population.
- Investigate the sociodemographic (Age, gender, marital status, education),BMI, anxiety and physical activity associated with insomnia.
- Assess the impact of insomnia on daily functioning and quality of life.

This study will use a cross-sectional survey design to collect data from a sample of adults in Al-Kindy hospital. The survey will include validated measures of insomnia, sociodemographic characteristics, health behaviors (e.g., smoking, physical activity), and clinical health measures (e.g., blood pressure, body mass index).

The findings from this study will have important implications for the prevention and management of insomnia, as well as for the promotion of healthy sleep behaviors and lifestyle habits. The study may also help to inform public health policies and interventions aimed at reducing the burden of chronic diseases and improving overall health and well-being among adults in Iraq

Methodology

Methodology:

Study design and population

A cross sectional study was conducted in Al-Kindy teaching hospital in Baghdad city.
A sample of 440 volunteer of patients and\or their attendant(s) between a period of time from November 2022 to April 2023 All were interviewed and their sleep quality and insomnia determined, their blood pressure was measured using a digital blood pressure monitor in a sitting position, Prior to use, the device's accuracy was tested by comparing its readings with those of a sphygmomanometer to avoid false or inaccurate results.

Definition of major variables

Blood pressure measurement is defined in our research from a previously diagnosed patient, whether he has BP prescription medication and after at least 2 min of rest, two blood pressure measurements were made with the participants in a seated position,
Using appropriately sized cuff (25 to 40 cm) and calibrated electronic sphygmomanometers (MDF 800 desk mercury sphygmomanometers, United states) and classification was according to ISH into mild moderate (stage I) and severe (stage II), See **(table 1)**.

Insomnia now days is considered as a disease by means it has consequences whether on short or long term with much confounding variables and patient tend to overestimate insomnia, for example stress or high physical activity before bed time may interfere with sleeping pattern for a simple period of time and not have consequences (18), Therefore insomnia assessment is based on printed paper questionnaires of insomnia severity index of Australian sleep association in which each patient was asked to rate, answer questions. (19). See **(Table 1)**.
A structured questionnaire was also used to collect sociodemographic information of the participants, and the measured characteristics included gender (male, female), Age was classified into early adult, early middle age, late middle age and older adults according to (33) education status (yes, no), marital status (married, single). Depending on CDC (34), The BMI was measured, calculated as weight (kg)/height squared (kg/m2). Participants were categorized as underweight (BMI <18.5 kg/m2), normal weight (BMI=18.5 to 25 kg/m2), overweight (BMI=25.0 to 30.0 kg/m2) or obese (BMI >30.0 kg/m2).Other variables, including smoking status (yes, no), drinking (yes, no) Physical activity was classified into low, moderate and vigorous activity according to (20) (21) were assessed.
Physical activity was classified into low, moderate and vigorous activity according to (20) (21).
A smoker was defined as a person who had smoked at least one cigarette a day over the past 30 days.
Participants who exercised more than three times a week were defined as ‘Active; those who exercised one or two times a week were defined as ‘Lightly Active; and those who usually exercised less than once a week were defined as ‘Non-active. See (Table 2) to see all the variables.

Inclusion criteria

- Age Requirements: Study participants must be older than 18 years old.
- Insomnia diagnosis: Using a standardized test and an interview, participants must be classified as having insomnia or not.
- Based on their blood pressure readings or if they are currently taking antihypertensive medication, participants may be categorized as hypertensive (mild, moderate, or severe) or normotensive.

Exclusion criteria

- Medical conditions: Participants with certain medical conditions that could confound the relationship between insomnia and hypertension may be excluded from the study (heart disease, diabetes).
- Medication use: Participants taking certain medications that could affect sleep must be excluded from the study.

- Pregnancy: Women who are pregnant or planning to become pregnant during the study period may be excluded from the study.
- Substance use: Participants with a history of substance abuse or dependence must be excluded from the study.

Statistical analysis

Data were analyzed using SPSS software (V. 24.0, IBM**). χ2 tests** were used to test the association between hypertension and categorical, potentially confounding variables. A p value of less than 0.05 was considered statistically significant. After preliminary univariate analyses, we used logistic regression models to examine the effect of sleep duration on the risk of hypertension, and the OR and 95% CIs were calculated. Three regression models were generated. The first model (model 1) was generated without adjusting for any covariates. Covariates in the first adjusted multivariate model (model 2) included age, gender, and marital status. Model 3 adjusted for factors in model 2 plus physical activity, anxiety and education.
The dependent variable was the presence of hypertension. In addition, we performed subgroup analysis stratified by age and sex.

Sleep(points)	No clinically significant insomnia(0-7)	Mild insomnia(8-14)	Moderate(14-21	Severe(22-28)
Blood pressure(mmHg)	Normal (>130\85)	Mild (130-139\85-90)	Moderate(140-159\90-99)	Severe(<160\100)

Table 1

Ethical approval and permission:

This research was done after taking the approval from the scientific department of the community medicine. The purpose and nature of the study were fully explained to the students. The potential participants were clearly assured that their participation in this study is voluntary and that any data obtained would be treated confidentially and for the purpose of the research only

Result

Result:

		Insomnia				Total	P value
		No Insomnia	Mild Insomnia	Moderate Insomnia	severe Insomnia		
Age	Early adult	29 (28%)	30 (29%)	24 (23%)	22 (21%)	105	0.049
	Early middle age	20 (26%)	26 (34%)	16 (21%)	15 (19%)	77	
	Late middle age	47 (25%)	37 (20%)	49 (26%)	54 (29%)	187	
	Older adult	18 (25%)	16 (23%)	9 (13%)	28 (39%)	71	
Sex	Male	63 (27%)	61 (26%)	46 (20%)	61 (26%)	231	0.53
	Female	51 (24%)	48 (23%)	52 (25%)	58 (28%)	209	
BP	Hypotension	6 (14%)	11 (25%)	16 (36%)	11 (25%)	44	<0.001
	Normal	77 (53%)	45 (31%)	18 (12%)	6 (4%)	146	
	Mild Hypertension	22 (23%)	23 (24%)	24 (26%)	25 (27%)	94	
	Moderate Hypertension	8 (5%)	30 (20%)	40 (26%)	75 (49%)	153	
	Severe Hypertension	1 (33%)	0 (0%)	0 (0%)	2 (67%)	3	
HT medicine	Yes	37 (24%)	24 (16%)	37 (24%)	54 (36%)	152	0.0024
	No	77 (27%)	85 (30%)	61 (21%)	65 (23%)	288	
Previously Diagnosed	Yes	38 (21%)	30 (17%)	51 (28%)	60 (34%)	179	0.0001
	No	76 (29%)	79 (30%)	47 (18%)	59 (23%)	261	
Marital state	Single	14 (16%)	27 (31%)	26 (30%)	21 (24%)	88	0.031
	Married	100 (28%)	82 (23%)	72 (20%)	98 (28%)	352	
Smoking	Yes	22 (22%)	33 (34%)	18 (18%)	25 (26%)	98	0.1334
	No	92 (27%)	76 (22%)	80 (23%)	94 (27%)	342	
Educational status	Yes	35 (16%)	73 (32%)	56 (25%)	61 (27%)	225	<0.001
	No	79 (37%)	36 (17%)	42 (20%)	58 (27%)	215	
Anxiety	No	30 (24%)	46 (37%)	22 (18%)	25 (20%)	123	0.0014
	Yes	84 (26%)	63 (20%)	76 (24%)	94 (30%)	317	
BMI	Underweight	0 (0%)	5 (50%)	4 (40%)	1 (10%)	10	0.26
	Healthy	33 (24%)	33 (24%)	32 (23%)	39 (28%)	137	
	Overweight	56 (28%)	53 (27%)	39 (20%)	51 (26%)	199	
	Obesity	25 (27%)	18 (19%)	23 (24%)	28 (30%)	94	

Table 2: Characteristics of the four groups stratified according to sleep quality

A total of 440 participants were enrolled in this study. The mean age of the participants was 47.7 ± 17.9 years, and 52.5% were males, 47.5% were females. The prevalence of insomnia was 25.91% no insomnia, 24.77% were suffering from mild insomnia, 22.27% moderate insomnia and 27.05% sever insomnia *see Figure 1*

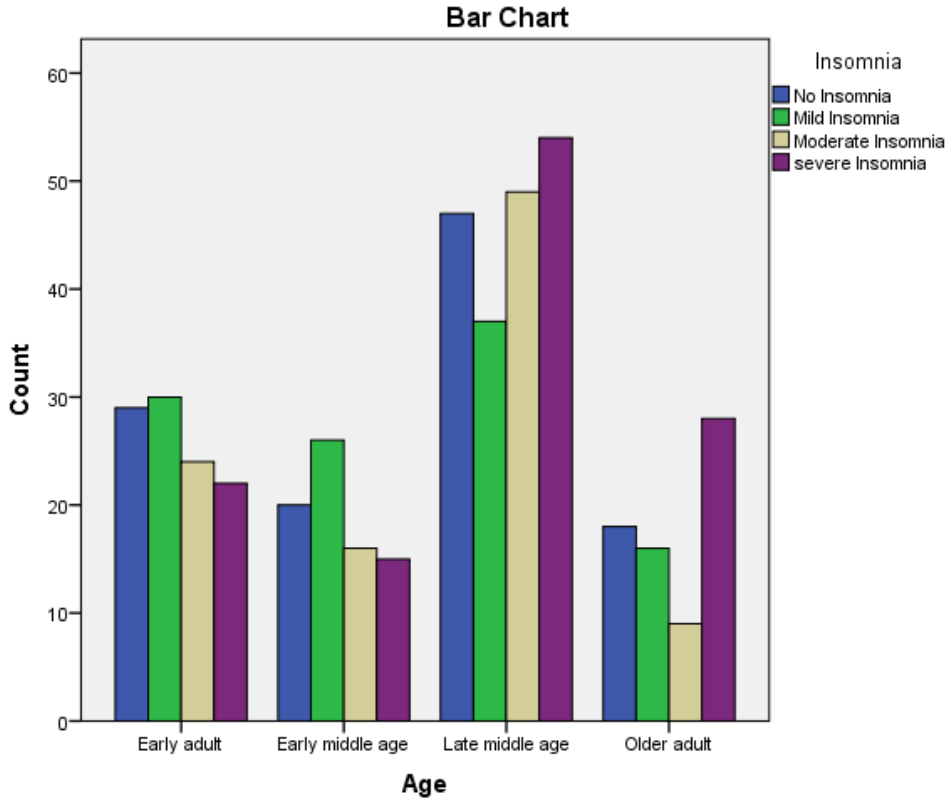

Figure 1 : Bar Chart of Insomnia Types by Age

The present study aimed to examine the effect of insomnia as a risk factor on hypertension among 440 patients. **(Table 2)** shows the distribution of patients according to their insomnia severity. Of the total sample, 105 patients were in the early adult group, 77 were in the early middle age group, 187 were in the late middle age group, and 71 were in the older adult group *also see Figure 1*. There was a statistically significant difference in the distribution of patients across age groups based on insomnia severity (P = 0.049). In addition, there was no statistically significant difference in the distribution of patients across sex groups based on insomnia severity (P = 0.53).

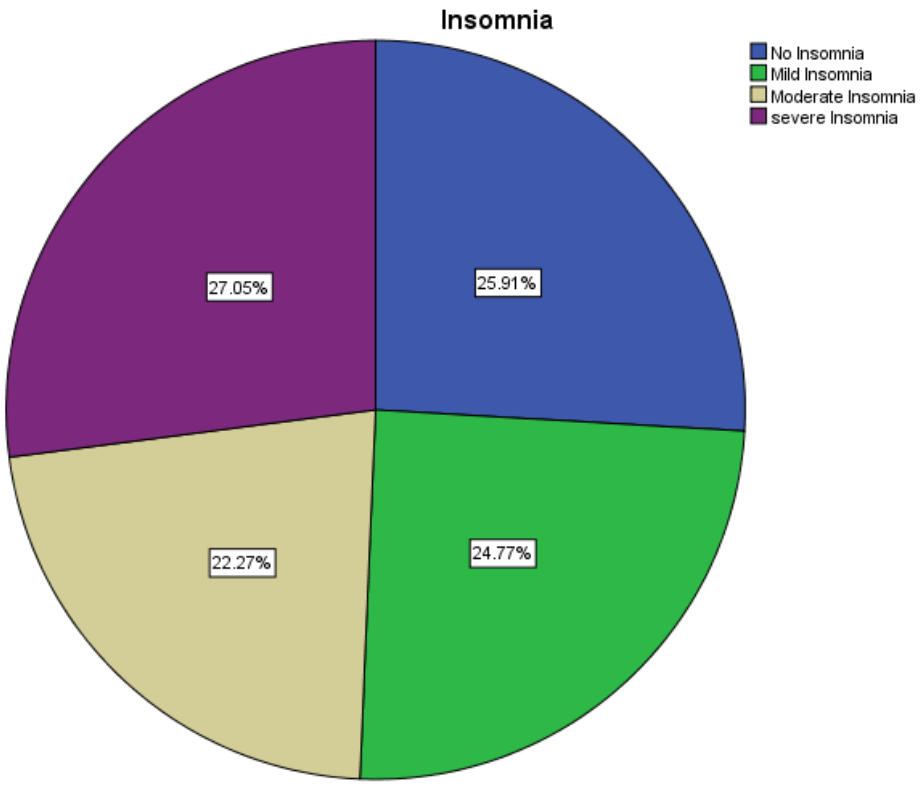

Figure 2: Pie Chart of Insomnia Types Prevalence in Sample

(Table 2) also shows the distribution of patients according to their blood pressure (BP) status. Of the total sample, 44 patients had hypotension, 146 had normal BP, 94 had mild hypertension, 153 had moderate hypertension, and 3 had severe hypertension *see Figure 3.* There was a statistically significant difference in the distribution of patients across BP groups based on insomnia severity ($P < 0.001$

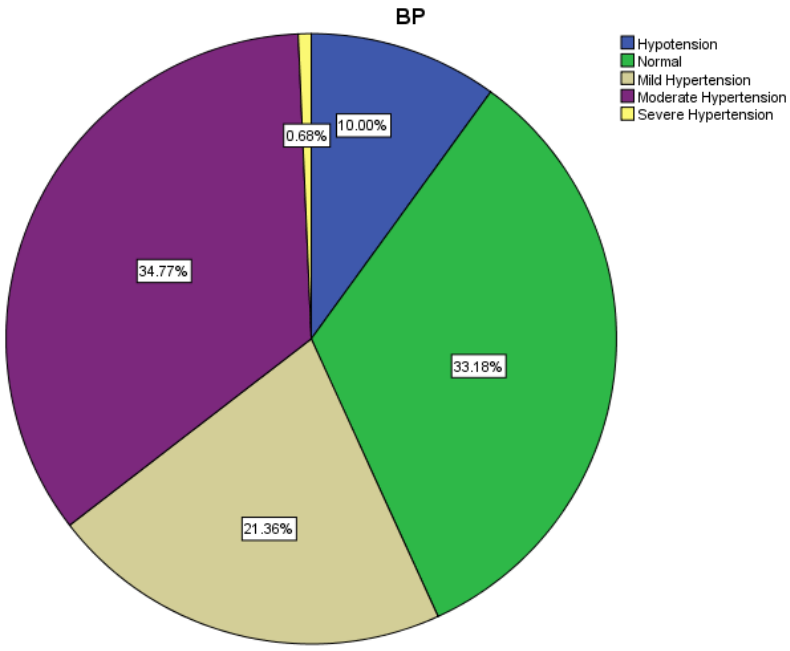

Figure 3: Pie Chart of Participator's Blood Pressure Status Prevalence in Sample

Patients with severe insomnia had a higher proportion of severe hypertension than those with no or mild insomnia, All the patient who has sever insomnia 67% of them were suffering from severe HT, 48% moderate HT, 27% had mild HT and only 4% had normal sleep pattern. The distribution of patients according to the use of antihypertensive medication is shown in **(Table 2)** *also see Figure 4*.
Of the total sample, 152 patients were on antihypertensive medication, while 288 were not. There was a statistically significant difference in the distribution of patients across the medication groups based on insomnia severity (P = 0.0024).
Among the 440 participants, 288(65%) were not using HT medicine, 23% had sever insomnia, 21% moderate, 30% mild and 27% no insomnia, while 152(35%) were on HT medicine, 36% had sever insomnia 24% moderate, 16% mild, 24% no insomnia, As a result patient who had sever type or moderate insomnia were more likely to be on a hypertensive medication *See Figure 4*

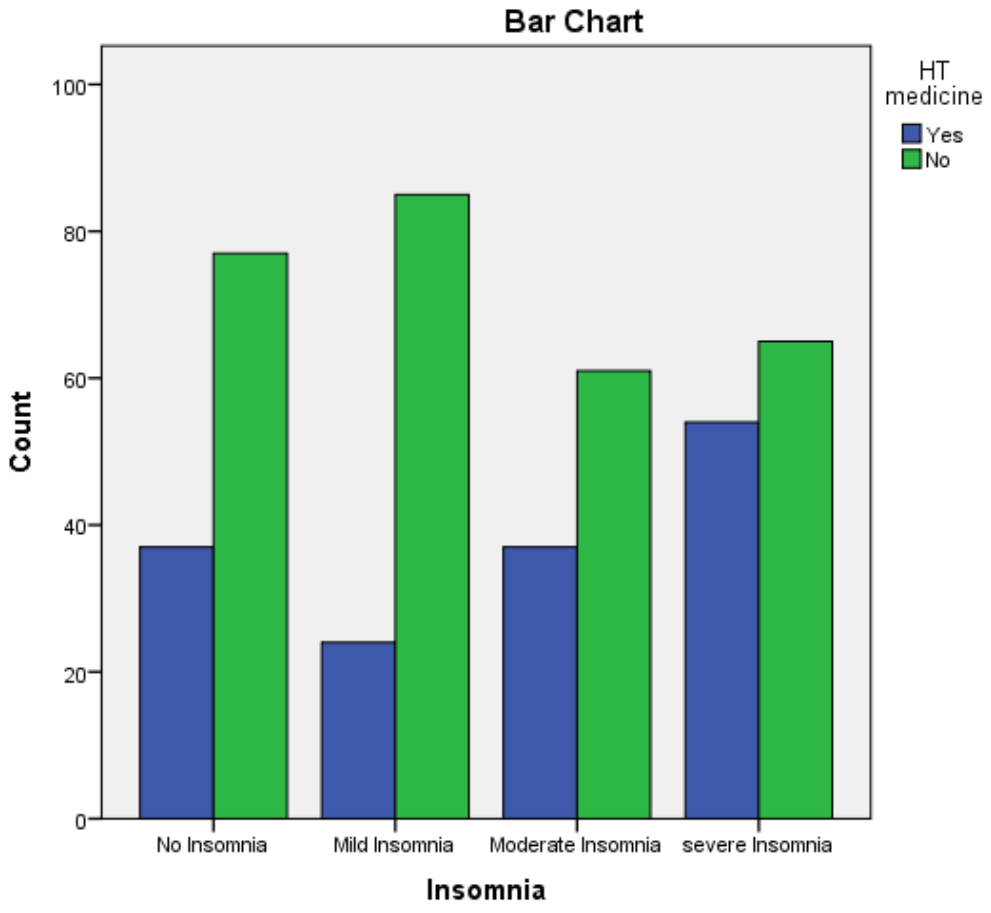

Figure 4: Bar Chart of participator's Antihypertensive medicine status Types by Age

(Table 2) *also shows the distribution of patients according to their marital status, educational status, and anxiety. There was a statistically significant difference in the distribution of patients across these groups based on insomnia severity (P < 0.05).*

On the other hand, **(Table 2)** also shows the distribution of patients according to smoking status and BMI and there was not statistically significant difference in the distribution of patients across these groups based on insomnia severity (P = 0.1334, P=0.26 respectively). Therefore, we did not include smoking and BMI in our final logistic regression model of hypertension predictors.

Although we hypothesized that smoking and BMI would be a significant predictor of hypertension, our statistical analysis did not support this hypothesis. The lack of a significant effect of smoking on hypertension suggests that Other variables may be influencing the relationship between smoking or BMI and hypertension, insufficient sample size could have limited the variability in the data and making it difficult to detect significant effects of smoking and BMI on hypertension. or because that our information was based on questionnaire, so smoking behavior and BMI was assessed using self-report and this could introduce measurement bias and lead to inaccurate estimates of the association.

Future research could explore these factors in greater detail to better understand their contribution to hypertension risk.

		Hypertension		P value
		No	Yes	
Sex	Male	105 (45.5%)	126 (54.5%)	0.35
	Female	85 (40.7%)	124 (59.3%)	
Age	Early adult	73 (69.5%)	32 (30.5%)	<0.001
	Early middle age	34 (44.2%)	43 (55.8%)	
	Late middle age	63 (33.7%)	124 (66.3%)	
	Older adult	20 (28.2%)	51 (71.8%)	
Educational status	Yes	109 (48.4%)	116 (51.6%)	0.024
	No	81 (37.7%)	134 (62.3%)	
Marital state	Single	58 (65.9%)	30 (34.1%)	<0.001
	Married	132 (37.5%)	220 (62.5%)	
Physical activity	Non-Active	19 (50.0%)	19 (50.0%)	0.001
	Lightly active	86 (37.6%)	143 (62.4%)	
	Active	85 (49.1%)	88 (50.9%)	
BMI2	Underweight	7 (70.0%)	3 (30.0%)	0.045
	Healthy	66 (48.2%)	71 (51.8%)	
	Overweight	78 (39.2%)	121 (60.8%)	
	Obesity	39 (41.5%)	55 (58.5%)	
Smoking	Yes	48 (49.0%)	50 (51.0%)	0.53
	No	142 (41.5%)	200 (58.5%)	
Anxiety	No	65 (52.8%)	58 (47.2%)	0.001
	Yes	125 (39.4%)	192 (60.6%)	
Insomnia	No Insomnia	83 (72.8%)	31 (27.2%)	<0.001
	Mild Insomnia	56 (51.4%)	53 (48.6%)	
	Moderate Insomnia	34 (34.7%)	64 (65.3%)	
	severe Insomnia	17 (14.3%)	102 (85.7%)	
Total		43.2%	56.8%	

Table 3: Baseline characteristics of the participants stratified by hypertension

The characteristics of the study population stratified by hypertension are shown in (**Table 3).** In our study, the overall prevalence of hypertension was 56.81% (54.54% men, 59.33% women). Hypertension was found to be associated with sex, age, education, marital status. Additionally HT was associated with physical activity, BMI and anxiety.*See Figure 5.*

From other point of view, we can clearly see patient who had HT 56% of them had insomnia at least 85% of them were suffering the sever type of insomnia while on the other hand only 43% who did not have HT suffered from insomnia with 14% sever type.

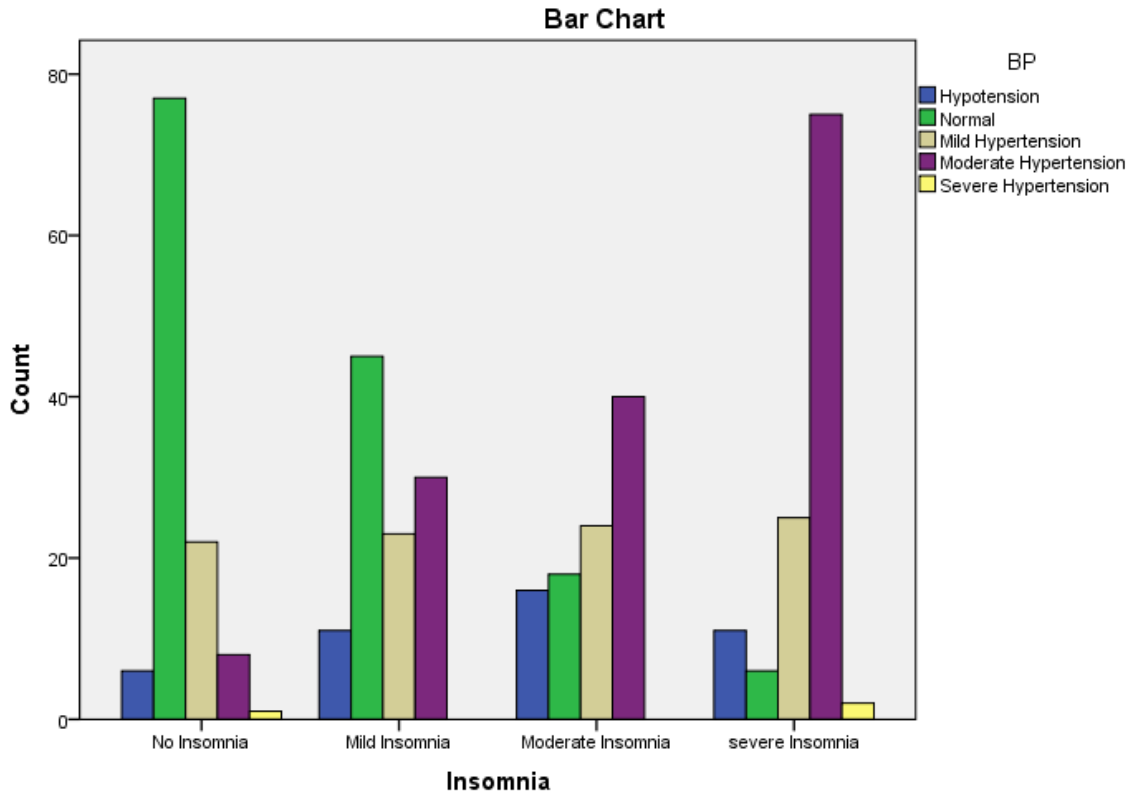

Figure 5: Bar Chart of Participator's Blood Pressure Status Types by Insomnia

(Table 4) shows the results of multiple logistic regressions performed to test the association between hypertension and sleep duration adjusted for different potential confounders. For the total sample, participants who have Insomnia were significantly more likely to be hypertensive (OR=2.47, 95%CI: 1.41 to 3.79, model 1). After adjusting for socio-demographic variables (OR=2.03, 95%CI: 1.09 to 3.25, model 2), socio-demographic variables and lifestyle factors (OR=1.9, 95%CI: 1.02 to 3.12, model 3), Insomnia continued to be associated with a higher risk of hypertension. However, the observed association between Insomnia and hypertension was attenuated after adjusting for socio-demographic variables and lifestyle factors. Among non-insomnia, after adjusting for relevant confounders, we did not find an association between normal sleeping duration and hypertension (OR=0.79, 95%CI: 0.35 to 1.10, model 2; OR=0.90, 95%CI: 0.55 to 1.20, model 3). The logistic regression analyses were repeated after stratifying by age (18–44, 45–65years). Subjects between the ages of 18 and 44 years who had insomnia were associated with a higher probability of hypertension after considering different covariates (OR=3.20 , 95%CI: 2.30 to 3.50, model 1; OR=3.00, 95%CI: 2.25 to 3.35, model 2; OR=2.80, 95%CI: 2.05 to 3.15, model 3).However, all three models failed to show any significant associations between insomnia and hypertension among subjects between the ages of 45–65years as shown in**(Table4).**Repeating the analysis for men and women separately, we found that the unadjusted results were similar between men and women. Subjects who had insomnia were significantly more likely to be hypertensive than subjects who reported having no insomnia (men: OR=2.02, 95%CI: 1.50 to 3.22, model 1; women: OR=1.90, 95%CI=1.02 to 3.12, model 1). When socio-demographic variables and lifestyle factors were included in the models, insomnia was not associated with the risk of hypertension in either male or female subjects.

Insomnia	Model 1	Model 2	Model 3
Total			
Insomnia	2.47(1.41-3.79)	2.03(1.09-3.25)	1.9(1.02-3.12)
No Insomnia	0.70(0.30-1.01)	0.79(0.35-1.10)	0.90(0.55-1.20)
Ages 18-44			
Insomnia	3.20(2.30-3.50)	3.00(2.25-3.35)	2.80(2.05-3.15)
No Insomnia	0.55(0.20-0.95)	0.65(0.27-1.02)	0.85(0.40-1.30)
Ages 45-65			
Insomnia	1.05(0.91-1.15)	1.04(0.90-1.14)	1.06(0.91-1.20)
No Insomnia	1.06(0.91-1.21)	1.06(0.91-1.21)	1.06(0.91-1.21)
Male			
Insomnia	2.02(1.50-3.22)	1.08(0.97-1.21)	1.08(0.97-1.21)
No Insomnia	1.00(0.90-1.12)	1.02(0.91-1.14)	1.03(0.92-1.23)
Female			
Insomnia	1.9(1.02-3.12)	1.08(0.97-1.22)	1.09(0.96-1.23
No Insomnia	0.84(0.42-1.25)	1.01(0.89-1.14)	1.01(0.89-1.14)

Table 4: Logistic regression analyses of the relationship between hypertension and insomnia

Model 1: Unadjusted.

Model 2: Adjusted for age, gender, and marital status.

Model 3: Adjusted for age, sex, education, marital status, physical activity, anxiety and education.

Discussion

Discussion

In this cross-sectional study we examined the association between the severity of insomnia and hypertension, we found strong association between HT and insomnia, 67% of patient who had sever insomnia suffered from severe HT, and on the other hand 85% of the participants who had HT suffered from severe insomnia, we can clearly see the interconnection between these two variables. Each of the age, anxiety, higher educational level and marital state alone did have influence on the participant to be insomniac. The presence of sociodemographic (Age, gender, marital status, education) covariates and lifestyle factors in the multivariate models resulted in the weakening of the relationship between insomnia and hypertension. Multiple logistic regression analyses revealed that insomnia was significantly associated with a higher risk of hypertension even after adjusting for sociodemographic variables and lifestyle factors, although the association was attenuated. Age stratified analysis showed that insomnia was significantly associated with hypertension among subjects between the ages of (18-44 years) but not among those between (45-65 years). The association between insomnia and hypertension was similar for men and women, but after adjusting for socio-demographic variables and lifestyle factors, insomnia was not associated with the risk of hypertension in either group. Despite numerous studies investigating the correlation between sleep and hypertension, there is still controversial on the topic. Two meta-analyses showed similar results, (13) indicated that short sleep duration was associated with an increased risk of prevalent hypertension (OR=1.20, 95% CI: 1.09-1.32, P<0.001), especially among subjects younger than 65 years and females. (22) showed that short sleep duration was associated with a greater risk for hypertension (OR, 1.21; 95% confidence interval [CI], 1.09-1.34; P<0.001), and long sleep duration also increased the risk for hypertension (OR, 1.11; 95% CI, 1.04-1.18; P=0.003).And also in a prospective cohort study of over 7000 participants found that difficulty falling asleep and difficulty maintaining sleep were both significantly associated with an increased risk of hypertension over a 10-year follow-up period (47). Similarly, a cross-sectional study of over 5000 Chinese adults found that insomnia symptoms, including difficulty falling asleep, waking up frequently during the night, and waking up too early in the morning, were all significantly associated with an increased risk of hypertension (48). In addition, relationship between sleep and hypertension can vary between different age group, but there is also controversy between the studies on this relation, a Spanish study demonstrated that self-reported sleep duration was not associated with hypertension in older adults (23). Also in (24) short sleep duration was associated with a higher risk of hypertension in younger adults but not in middle-aged or elderly individuals. But on other hand a majority of studies conducted on elderly individuals with insomnia has found that there is no correlation between sleep duration and prevalent hypertension, both before and after taking into account potential confounding factors (25) (26) (27) (28).Although our study found that insomnia was associated with an increase in hypertension occurrence, the mechanism behind it was not fully elucidated. Generally, insomnia affects blood pressure through 3 pathways:

(1) Psychogenic pathways: insomnia leads to mental changes, mainly manifested as anxiety [36], depression [37], and so on. The sympathetic nervous system becomes overactive leading to peripheral vasoconstriction and blood pressure increase.

(2) Neurogenic pathway: it was found that the activity of the sympathetic nervous system (SNS) increased in insomnia patients, which would lead to a series of hypertension events [38, 39, 31, 32).

(3) Humoral pathway: insomnia has been proven to increase the release of pulsatile cortisol by affecting its rhythm [40]. In addition, insomnia causes stress dysregulation [41], which is a potential cause of high hypothalamic-pituitary-adrenal (HPA) reactivity [42]. The renin-angiotensin-aldosterone system (RAAS) was also activated along with the HPA axis [43]

In addition, insomnia is a pathological state accompanied by inflammation, oxidative stress, and endothelial dysfunction [35], which may be the potential mechanism of hypertension [44].

At the same time, the melatonin secretion of patients with hypertension could be disturbed [35], circadian rhythm would change, and sleep disorders would occur [45, 35].

Previous research suggested that during deep non-rapid-eye-movement (REM) sleep, sympathetic-nerve activity and blood pressure were decreased (30).

Overall, the existing literature suggests that there is a significant relationship between insomnia and hypertension. However, many of the studies in this area have relied on self-reported measures of sleep and may be subject to reporting bias. Further research is needed to confirm and extend these findings using objective measures of sleep, such as polysomnography. Additionally, more research is needed to better understand the mechanisms underlying the insomnia-hypertension link, which could inform the development of more effective prevention and treatment strategies for both conditions.

Strengths and limitations:

The analysis controlled a wide range of covariates, including age, sex, educational status, marital status, physical activity and BMI. The first limitation of this study is the properties of cross-sectional design. Second, the small sample size as the assessment of the sleep and hypertension was based on interviews.

Conclusion & Recommendations

Conclusion:

Hypertension is strongly associated with different types of insomnia, although physicians tend to underestimate insomnia as clinical symptom or a risk factor when approaching treatment of HT.

This study demonstrates different life style and social variables that could actually induce insomnia from life stress to organic pathology, Different life style variables did not have significant effect on HT relationship with insomnia, as a result, one can take into account the effect on the long term or short term when dealing with insomnia or HT and consider treatment when insomnia is diagnosed along with HT.

In conclusion, our study investigated the relationship between insomnia and hypertension in a sample of adults. Our results suggest that insomnia, specifically difficulty falling asleep, is a significant predictor of hypertension, even after controlling for age, gender , marital status ,education , anxiety and physical activity. These findings have important implications for the prevention and management of hypertension, as addressing insomnia may be an effective strategy for reducing hypertension risk.

The results of our study revealed a significant association between insomnia and hypertension in the sample of young adults, indicating that short sleep duration is an important risk factor for hypertension in young adults.

Recommendations:

1. Encourage individuals with insomnia to monitor their blood pressure regularly: Since individuals with insomnia may be at higher risk for hypertension, it may be useful to encourage them to monitor their blood pressure regularly and seek medical attention if their readings are consistently high.

2. Incorporate sleep management strategies into hypertension prevention and management programs: Given the significant association between insomnia and hypertension, it may be useful to incorporate sleep management strategies (such as sleep hygiene practices, cognitive-behavioral therapy for insomnia, or pharmacological interventions) into existing hypertension prevention and management programs.

3. Raise awareness of the link between insomnia and hypertension: It may be helpful to raise public awareness of the link between insomnia and hypertension, in order to encourage individuals to seek medical attention for sleep problems and to promote the importance of healthy sleep habits for overall health.

4. Further research on the mechanisms underlying the association between insomnia and hypertension: While this study provides evidence for a significant association between insomnia and hypertension, further research is needed to better understand the mechanisms underlying this relationship and to identify effective interventions for addressing these common health issues.

References

References:

Bibliography

1. William J. Elliott MD P. Systemic Hypertension. In.; 2007. p. 201-259.
2. Mills KT SAHJ. The global epidemiology of hypertension. Nat Rev Nephrol. 2020;: p. 223-237.
3. Numerous researches have confirmed that there is a strong correlation between insomnia and psychiatric disorders. Furthermore, insomnia increases the likelihood of developing depression, anxiety, and suicidal tendencies. 2005.
4. Basta M CGVBAVA. Basta M, Chrousos GP, Vela-Bueno A, Vgontzas AN. Basta M, Chrousos GP, Vela-Bueno A, Vgontzas AN. 2007 Jun.
5. Rechtschaffen A BBECKCGM. Sleep deprivation in the rat. 1989 Feb;: p. 68-87.
6. Mitchell HA WD. Good night and good luck: norepinephrine in sleep pharmacology. Biochem Pharmacol. 2010 Mar.
7. A. Fiorentini RVAPLT. Sleep's quality disorders in patients with hypertension and type 2 diabetes mellitus. International Journal of Cardiology. 2007; 114(2).
8. Naja Hulvej Rod JVHWMKMZMGTL. Sleep Disturbances and Cause-Specific Mortality: Results From the GAZEL Cohort Study. American Journal of Epidemiology. 1 February 2011; 173(3): p. 300–309.
9. Tasali E LRSK. Reduced sleep duration or quality: relationships with insulin resistance and type 2 diabetes. Prog Cardiovasc dis. 2009;: p. Prog Cardiovasc.
10. Lloyd-Jones D ARBTCMDSDSGFTFEFKGCGAGKHNHSHPHVKBKSLDLLMAMMMJM. Heart disease and stroke statistics--2010 update: a report from the American Heart Association. American Heart Association Statistics Committee and Stroke Statistics Subcommittee. 2010 Mar.
11. Gottlieb DJ RSNFBCNARHPN. Association of usual sleep duration with hypertension: the Sleep Heart Health Study. sleep. Association of usual sleep duration with hypertension: the Sleep Heart Health Study.
12. Gangwisch JE,HSB,BAB,BRM,KF,PTG,RAG,ZGK,&MD. Short sleep duration as a risk factor for hypertension: Analyses of the first National Health and Nutrition Examination Survey. Hypertension. 2006; 47(5).
13. Wang Q,XB,LMea. Short sleep duration is associated with hypertension risk among adults: a systematic review and meta-analysis. Hypertens Res. 2012.
14. Xiaofan Guo LZJWXZXZJLYS. Epidemiological evidence for the link between sleep duration and high blood pressure: A systematic review and meta-analysis. Sleep Medicine. 2013; 14(4): p. 324-332.
15. Jihye Kim IJ. Age-Dependent Association Between Sleep Duration and Hypertension in the Adult Korean Population. American Journal of Hypertension. 2010; 23(12).
16. van den Berg JF TJNAea. Sleep duration and hypertension are not associated in the elderly.. Hypertension (Dallas, Tex. : 1979). 2007.
17. forza E SMMBJRF. Association of self-reported sleep and hypertension in non-insomniac elderly subjects. J Clin Sleep Med. 2014 Sep.
18. Cunnington D JMFA. Insomnia: prevalence, consequences and effective treatment. Pubmed. 2013.
19. assoctiation As. Australian sleep association, sleep severity index questionnaire. [Online]. Available from: https://www.sleepprimarycareresources.org.au/questionnaires/isi.
20. Exercise and Physical Activity Guide for Health Promotion. Tokyo: Ministry of Health, Labour and Welfare of Japan; 2006.

21. Pacific Physical Activity Guidelines for Adults: Framework for Accelerating the Communication of Physical Activity Guidelines. Manila: World Health Organization Regional Office for the Western Pacific Region; 2009.

22. Thomas Unger CBFCNAKNRPDPARMSGSSMTRDWBWaAES. 2020 International Society of Hypertension Global Hypertension Practice Guidelines. AHA. 6 May 2020; 75(6).

23. Lopez-Garcia E, Faubel R, Guallar-Castillon P, et al. Self-reported sleep duration and hypertension in older Spanish adults. J Am Geriatr Soc 2009;57:663–8.

24. Crowley K. Sleep and sleep disorders in older adults. Neuropsychol Rev 2011;21:41–53.

25. Kim SH, Kim HJ, Lee K, et al. Relationship between sleep duration and hypertension in Korean adults: Korea National Health and Nutrition Examination Survey 2011 and 2012. PLoS One. 2018;13(2):e0192212. doi:10.1371/journal.pone.0192212

26. Chen L, Chen X, Liu Y, et al. Association between sleep duration and hypertension among Chinese elderly: a cross-sectional study. Medicine (Baltimore). 2019;98(13):e14915. doi:10.1097/MD.0000000000014915

27. Kripke DF, Langer RD, Elliott JA, et al. Hypertension and sleep duration: the multi-ethnic study of atherosclerosis. J Clin Hypertens (Greenwich). 2014;16(9):666-671. doi:10.1111/jch.12361

28. Lee J, Park EC. Effect of sleep duration on hypertension and blood pressure changes: a 5-year longitudinal study in Korean adults. Arch Gerontol Geriatr. 2019;82:33-39. doi:10.1016/j.archger.2018.11.010

29. Kario K, Schwartz JE, Pickering TG. Changes of nocturnal blood pressure dipping status in hypertensives by nighttime dosing of alpha-adrenergic blocker, doxazosin : results from the HALT study. Hypertension 2000;35:787–94.

30. Somers VK, Dyken ME, Mark AL, et al. Sympathetic-nerve activity during sleep in normal subjects. N Engl J Med 1993;328:303–7.

31. Fernandez-Mendoza J, Vgontzas AN, Liao D, et al. Insomnia with objective short sleep duration and incident hypertension: The penn

32. Spiegelhalder K, Fuchs L, Ladwig J, et al. Heart rate and heart rate variability in subjectively reported insomnia. J Sleep Res 2011;20(1 Pt 2):137–45.

33. https://pubmed.ncbi.nlm.nih.gov/7203662/

34. https://www.cdc.gov/obesity/basics/adult-defining.html

35. D. A. Kalmbach, J. R. Anderson, and C. L. Drake, “The impact of stress on sleep: pathogenic sleep reactivity as a vulnerability to insomnia and circadian disorders,” Journal of Sleep Research, vol. 27, no. 6, Article ID e12710, 2018.

36. L. Meng, Y. Zheng, and R. Hui, “The relationship of sleep duration and insomnia to risk of hypertension incidence: a meta-analysis of prospective cohort studies,” Hypertension Research, vol. 36, no. 11, pp. 985–995, 2013.View at: https://doi.org/10.1038/hr.2013.70

37. Y. Dong and F. M. Yang, “Insomnia symptoms predict both future hypertension and depression,” Preventive Medicine, vol. 123, pp. 41–47, 2019.View at:https://doi.org/10.1016/j.ypmed.2019.02.001

38. L. Palagini, R. M. Bruno, P. Cheng et al., “Relationship between insomnia symptoms, perceived stress and coping strategies in subjects with arterial hypertension: psychological factors may play a modulating role,” Sleep Medicine, vol. 19, pp. 108–115, 2016.View at:https://doi.org/10.1016/j.sleep.2015.09.026

39. A. N. Vgontzas, D. Liao, S. Pejovic, S. Calhoun, M. Karataraki, and E. O. Bixler, “Insomnia with objective short sleep duration is associated with type 2 diabetes: a population-based study,” Diabetes Care, vol. 32, no. 11, pp. 1980–1985, 2009.View at:https://doi.org/10.2337/dc09-0284

40. G. Seravalle, G. Mancia, and G. Grassi, “Sympathetic nervous system, sleep, and hypertension,” Current Hypertension Reports, vol. 20, no. 9, p. 74, 2018.View at:https://doi.org/10.1007/s11906-018-0874-y

41. https://doi.org/10.1111/jsr.12710

42. C. D'Aurea, D. Poyares, R. D. Piovezan, G. S. Passos, S. Tufik, and M. T. Mello, "Objective short sleep duration is associated with the activity of the hypothalamic-pituitary-adrenal axis in insomnia," Arquivos de Neuro-Psiquiatria, vol. 73, no. 6, pp. 516–519, 2015.View at:https://doi.org/10.1590/0004-282x20150053

43. H. Murck, P. Schüssler, and A. Steiger, "Renin-angiotensin-aldosterone system: the forgotten stress hormone system: relationship to depression and sleep," Pharmacopsychiatry, vol. 45, no. 3, pp. 83–95, 2012.View athttps://doi.org/10.1055/s-0031-1291346

44. T. M. Coffman, "Under pressure: the search for the essential mechanisms of hypertension," Nature Medicine, vol. 17, no. 11, pp. 1402–1409, 2011.View at:https://doi.org/10.1038/nm.2541

45. A. D. M. Koopman, J. W. Beulens, T. Dijkstra et al., "Prevalence of insomnia (symptoms) in T2D and association with metabolic parameters and glycemic control: meta-analysis," The Journal of Clinical Endocrinology & Metabolism, vol. 105, no. 3, pp. 614–643, 2020.View at:https://doi.org/10.1210/clinem/dgz065

46. Ohayon, M. M. (2002). Epidemiology of insomnia: what we know and what we still need to learn. Sleep Medicine Reviews, 6(2), 97-111.

47. Vgontzas, A. N., Liao, D., Pejovic, S., Calhoun, S., Karataraki, M., & Bixler, E. O. (2009). Insomnia with objective short sleep duration is associated with a high risk for hypertension. Sleep, 32(4), 491-497

48. Li, Y., Wang, X., Li, R., Li, Y., Qian, Y., & Li, S. (2021). Association between insomnia symptoms and hypertension among Chinese adults: a cross-sectional study. Sleep Medicine, 77, 283-288.