Public Health
ISSN: 2639-2925
Volume 1 - Issue 1 - 7 pages

Research Article Open Access

Clinical Investigation of Sleep Status in the Elderly Occupational Population

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Abstract

Purpose: From the clinical viewpoint, numerous factors may interfere with sleep- wake patterns in elderly population. Mild changes in sleep quality could be expected with aging, but the consequences of chronic sleep problems also should be considered and evaluated. The purpose of this study is conducted to explore the sleep status and associated factors in the elderly occupational population in Taipei, Taiwan.

Methods: A total of 3,828 (2,382 males and 1,446 females) healthy adults voluntarily admitted to a teaching hospital for a physical check-up in 2013 in New Taipei City, Taiwan. Fasting blood samples were drawn via venipuncture and interviewed with a structured questionnaire included sleeping time and sleep status from study participants by clinical nurses.

Results: The mean age of the study participants is 69.91±7.1 years. The prevalence of poor sleep status was 31.1% (95% CI: 29.6-32.6%). Female did exhibit a higher prevalence of poor sleep status than males (33.7% vs. 29.5%, p-value=0.006). Based on the logistic regression, age (OR=0.96, 95%CI: 0.93-0.99), male sex (OR=0.81, 95%CI: 0.75-0.90), sleep time less than 6 hours per day (OR=3.01, 95%CI: 2.13-4.09), alcohol drinking (OR=1.14, 95%CI: 1.03-1.27), higher BMI (OR=1.49, 95%CI:1.08-1.95), and metabolic syndrome (OR=1.67, 95%CI: 1.23-2.07) were significantly associated with poor sleep status.

Conclusion: Several associated factors were indicated pertaining to the prevalence of poor sleep status among elderly specific occupational population.

Keywords: Sleep status, Prevalence, Elderly, Agricultural and fishing population

Introduction

Insomnia and obstructive sleep apnea are two common disorders affecting elderly population [1]. Previous results indicated that 50% of elder individuals suffer from insomnia, with a higher prevalence amongst women [2]. Sleep disturbances could decrease total time of nocturnal sleep time, delay sleep onset, advance circadian phase, reduce rapid-eye-movement sleep, short daytime nap, and somnolence [3].The subjects with sleep disturbances are typically com-

bined with medical conditions include diabetes, hypertension, depression, cardiovascular and cerebrovasculardisease, and further diminish quality of life [1, 3, 4]. Due to the delayed diagnosis or appropriate treatment for this sleep disorder may account for poor prognosis and long-term utilization of medical services then increase healthcare expenditures [1], the early detection by routine screening followed by appropriate clinical intervention would offer a practical means for the prevention of condition-associated damage.

From the evidence-based medicine viewpoint, sleep disorder is matched the Wilson criteria for screening due to it is an important health problem for the elderly population [5]; the disease natural course should be explored; a recognizable latent or early symptomatic stage; a screening test is easy to perform and interpret, acceptable,accurate, reliable, sensitive and specific; an accepted treatment recognized for the disease; clinical intervention is more effective if started early; a health policy on who should be treated; diagnosis and treatment are cost-effectiveness; and case-finding should be a continuous process. With population aging, the burden of healthcare service will certainly increase amongst this demographic group at risk for developing and/or deteriorating indispositions. To the best of our knowledge, however, few clinical evidence-based studies attempted to determine the possible etiology between associated factors and poor sleep status for the elderly agricultural and fishing population of Taiwan, which also faced to the burden of health-related disease. The purpose of this study is to explore in the context of prevalence of and associated factors and poor sleep status amongst the elderly agricultural and fishing population, as determined by the application of a healthy volunteer subjects screening program health examination in New Taipei, Taiwan.

Methods

Study Design and Data Collection

This hospital-based, cross-sectional health screening was conducted with a total of 3,828 elder agricultural and fishing professional (2,382 males and 1,446 females) voluntarily admitted to one teaching hospital in New Taipei City for an annual physical check-up between January 2013 and December 2013.

The medical histories and measurements of the participants were obtained by well-trained nurses. Personal and family histories of hypertension, type 2 diabetes, cardiovascular diseases, and other chronic diseases were obtained by a structured health interview questionnaire. The personal life habits such as smoking, alcohol drinking and areca nut use were also collected. The study participants were asked to take off the shoes and any other belongings that could possibly add extra weight when they were weighed. Heights and weights were evaluated according to body mass index (BMI). Also the waist circumference was also measured at the level of the iliac processes and the umbilicus with a soft tape measure to estimate abdominal obesity.

Blood pressures for each subject were measured twice in the sitting position with an interval of 15 minutes between the measurements, by means of standard sphygmomanometers of appropriate width, after a rest period for 30 minutes. Those who taking antihypertensive therapy were considered to be known hypertension [6].

Fasting blood samples were drawn via venipuncture from study participants by clinical nurses. Overnight-fasting serum and plasma samples (from whole blood preserved with EDTA and NaF) were kept frozen (-20 °C) until ready for analysis. All procedures were performed in accordance with the guidelines of our institutional ethics committee and adhered to the tenets of the Declaration of Helsinki. All patients'information were anonymous. The anonymity of participants and confidentiality of the responses were ensured by using numerical codes for questionnaires and destroying the data at the end of study.

Measurement of Sleep Quality

The primary outcome measure was sleep quality assessed using a structured questionnaire. For the assessment of sleep quality, the question is "Over the past month, the status of your night time sleep?" The poor sleep quality was defied as when the answer included light sleep, bad dream recall, or frequent dreaming. In addition, for the evaluation of sleep duration, the question is "How much sleep time do you get per night?" Ranging from <4 hrs, 4-6 hrs, 6-8 hrs, to ≧8 hrs.

Diagnosis of Metabolic Syndrome

In this study, metabolic syndrome was diagnosed by the Adult Treatment Panel III (ATP III) criteria, based on the presence of at least 3 of the following 5 metabolic factors: (1) central obesity (waist circumference

90 cm in Asian men and 80 cm in Asian women); (2) decreased HDL-C: fasting HDL-C < 40 mg/dL or drug treatment for reduced HDL-C; (3) elevated blood pressure: systolic blood pressure 130 mmHg and/or diastolic blood pressure 85 mmHg, or antihypertensive drug treatment in a patient with a history of hypertension; (4) hypertriglyceridemia: fasting plasma triglycerides 150 mg/dL or drug treatment for elevated triglycerides; and (5) hyperglycemia: fasting glucose level 100 mg/dL or drug treatment for elevated glucose [7].

Statistical Analysis

Statistical analysis was performed using SAS for Windows, (SAS version 9.3; SAS Institute Inc., Cary, NC, USA). For univariate analysis, the χ2-test and unadjusted odds ratio (OR) was adopted to assess differences of categorical variables. Binary logistic regression was also performed to provide a set of coefficients of poor sleep status and to investigate the independence of factors associated with the prevalence of poor sleep status. A p-value of <0.05 was considered to represent a statistically significant difference among test populations.

Results

Table 1 shows the gender- and age-specific prevalence of poor sleep status amongst study-participating elderly subjects. The overall prevalence of poor sleep status for the screened population was 31.1% and revealed a statistically significant decrease with increasing subject age by means of the χ^2 trend test ($p<0.0001$). The prevalence of poor sleep status for females proved to be substantially higher than males (33.7% vs.29.5%, p value for χ^2 test = 0.006). After stratifying data by age into one of four broad (age) groups, study females exhibited a more-pronounced prevalence of poor sleep status for all age groups than was the case for the male group. The age-specific prevalence of poor sleep status revealed a significant inverse relationship with age when applying the χ^2 trend test for both male ($p<0.001$) and female ($p<0.001$) study subjects.

Table 2 presents the univariate analysis for the association between certain relevant associated factors and poor sleep status. Compared to individuals who exhibited a normal sleep status, subjects featuring a poor sleep status revealed a more-pronounced prevalence of: sleep time less than six hours (OR = 6.13, 95% CI: 5.21-7.22), obesity (OR = 3.24, 95% CI: 2.80-3.75), elevated bold pressure (OR = 2.90,95% CI: 2.48-3.38), central obesity (OR = 2.06, 95% CI: 1.79-2.38), hyperhlycemia (OR = 1.62, 95% CI: 1.41-1.86), and metabolic factor (1-2 vs. none, OR = 1.48, 95% CI: 1.12-1.80; ≧3 vs. none, OR = 2.03, 95% CI: 1.68-2.46). In addition, the poor sleep status was tended to be higher in individuals with smoking (yes vs. no, OR = 1.37, 95% CI: 1.13-1.60) or alcohol drinking (yes vs. no, OR = 1.87, 95% CI: 1.62-2.16).

The effect of independent associated risk factors of poor sleep status was examined using the binary logistic regression model. As is depicted in Table 3, subsequent to adjustment for confounding factors, age (OR = 0.97, 95% CI: 0.96-0.99), sex (male vs. female,

Table 1: The Gender- and Age-Specific Prevalence of Poor Sleep Status Among Elderly Agricultural and Fishing Screened Population Subjects (n=3,828)

Poor Sleep Status												
Age (yr)	Male (n = 2,382)				Female (n = 1,446)				Total (n = 3,828)			
	Screened No	Cases No	Prevalence (%)	p-value for χ^2-test for trend	Screened No	Cases No	Prevalence (%)	p-value for χ^2-test for trend	Screened No	Cases No	Prevalence (%)	p-value for χ^2-test for trend
60–64	650	256	39.4	<0.001	467	207	44.3	<0.001	1,117	463	41.5	<0.001
65–74	1,081	280	25.9		604	176	29.1		1,685	456	27.1	
75–84	588	153	26.0		320	89	27.8		908	242	26.7	
≧85	63	13	20.6		55	15	27.3		118	28	23.7	
Total	**2,382**	**702**	**29.5**		**1,446**	**487**	**33.7**		**3,828**	**1,189**	**31.1**	

Table 2: Univariate Analysis of Associated Factors for Poor Sleep Status Among Elderly Agricultural and Fishing Screened Population Subjects (n = 3,828)

Poor Sleep Status					
Variable		Yes	No	Odds Ratio	
		(n = 1,189)	(n = 2,639)	(95% CI)	p-value
Gender	female	487	959	1.00	----
	male	702	1,680	0.82 (0.72-0.95)	0.006
Age (yr)	60-64	463	654	1.00	----
	65-74	456	1,229	0.52 (0.45-0.62)	<0.001
	75-84	242	666	0.51 (0.43-0.62)	<0.001
	≧85	28	90	0.44 (0.28-0.68)	<0.001
Sleep time (hrs)	≧6	235	1,588	1.00	----
	<6	954	1,051	6.13 (5.21-7.22)	<0.001
Smoking	no	992	2305	1.00	----
	yes	197	334	1.37 (1.13-1.60)	0.001
Alcohol drinking	no	703	1926	1.00	----
	yes	486	713	1.87 (1.62-2.16)	<0.001
Areca nut use	no	1157	2580	1.00	----
	yes	32	59	1.21 (0.78-1.87)	0.39
Body mass index (Kg/m^2)	<25	364	1553	1.00	----
	≧25	825	1086	3.24 (2.80-3.75)	<0.001
Elevated blood pressure	no	271	1216	1.00	----
	yes	918	1423	2.90 (2.48-3.38)	<0.001
Central obesity	no	437	1439	1.00	----
	yes	752	1200	2.06 (1.79-2.38)	<0.001
Hyperglycemia	no	579	1600	1.00	----
	yes	610	1039	1.62 (1.41-1.86)	<0.001
Hypertrigly-ceridemia	no	835	1881	1.05 (0.91-1.22)	----
	yes	354	758	1.00	0.51
Low HDL-C	no	937	2141	1.16 (0.98-1.37)	----
	yes	252	498	1.00	0.09
Metabolic factors	none	204	698	1.48 (1.12-1.80)	----
	1-2	453	1045	2.03 (1.68-2.46)	<0.001
	≧3	532	896		<0.001

OR = 0.77, 95% CI: 0.64-0.90), sleep time (<6 vs. ≧6 hrs, OR = 3.49, 95% CI: 3.03-4.01), alcohol drinking (yes vs. no, OR = 1.17, 95% CI: 1.01-1.37), BMI (≧25 vs. <25 Kg/m^2, OR = 1.56, 95% CI: 1.10-1.98), elevated blood pressure (yes vs. no, OR = 1.22, 95% CI: 1.09-1.46), central obesity (yes vs. no,OR = 1.78, 95% CI: 1.24-2.51), and hyperglycemia (yes vs. no, OR = 1.48, 95% CI: 1.14-2.02) appeared to be statistically significantly related to mild NAFLD. Table 2 also showed that age (OR = 0.96, 95% CI: 0.93-0.99), sex (male vs. female, OR = 0.81, 95% CI: 0.75-0.90), sleep time (<6 vs. ≧6 hrs, OR = 3.01, 95% CI: 2.13-4.09), alcohol drinking (yes vs. no, OR = 1.14, 95% CI: 1.03-1.27), BMI (≧25 vs. <25 Kg/m^2, OR = 1.49, 95% CI: 1.08-1.95), and metabolic syndrome (yes, vs. no, OR = 1.67, 95% CI: 1.23-2.07) appeared to be statistically significantly related to poor sleep status.

Discussion

Undoubtedly, the maintenances of good health and

Table 3: Multiple Logistic Regression of Associated Factors for Poor Sleep Status Among Elderly Agricultural and Fishing Screened Population Subjects (n = 3,828)

Poor Sleep Status (Yes vs. No)		
Variable	**Odds Ratio**	
	95% CI	**p-value**
Model I		
Age (yrs)	0.97 (0.96-0.99)	0.01
Sex (male vs. female)	0.77 (0.64-0.90)	0.001
Sleep time (<6 vs. ≧6 hrs)	3.49 (3.03-4.01)	<0.001
Smoking (yes vs. no)	1.03 (0.71-1.19)	0.23
Alcohol drinking (yes vs. no)	1.17 (1.01-1.37)	0.03
Body mass index (≧25 vs. <25 Kg/m^2)	1.56 (1.10-1.98)	0.01
Elevated blood pressure	1.22 (1.08-1.46)	0.03
Central obesity	1.78 (1.24-2.51)	<0.001
Hyperglycemia	1.48 (1.14-2.02)	0.001
Hypertriglyceridemia	1.01 (0.88-1.72)	0.47
Low HDL-C	1.10 (0.91-1.43)	0.38
Model II		
Age (yrs)	0.96 (0.93-0.99)	0.02
Sex (male vs. female)	0.81 (0.75-0.90)	0.001
Sleep time (<6 vs. ≧6 hrs)	3.01 (2.13-4.09)	<0.001
Smoking (yes vs. no)	1.01 (0.89-1.50)	0.19
Alcohol drinking (yes vs. no)	1.14 (1.03-1.27)	0.02
Body mass index (≧25 vs. <25 Kg/m^2)	1.49 (1.08-1.95)	0.001
Metabolic Factors		
1-2 vs. none	1.10 (0.99-1.28)	0.07
≧3 vs. none	1.67 (1.23-2.07)	0.001

suitable training for agricultural and fishing professional are necessary. The longer and irregular working hours may cause some adverse health effects for this sub-population. In Taiwan, there would appear only few published population-based studies attempting to discuss the prevalence and possible etiology of poor sleep status for this elderly Chinese population, which also faced to the burden of sleep disorder. Due to the increased frequency of poor sleep status among elderly subjects, it is essential for identifying needs for medical services, health promotion planning, and implementing comprehensive preventive care programs for sleep disorder. Appropriated preventive health screenings are an important health promotion strategy due to they could help to identify disorder at an early stage, postpone the development of subsequent serious outcomes, and further significantly save healthcare resources and lives [8]. The negative relationship between increased age and poor sleep status in our study supported earlier results from other population-based study [1]. The possible explanation is competing causes of death, that is, a percentage of the oldest-old with poor sleep status and combined other health conditions may have died at earlier ages.In addition, our study observed females tend to have higher prevalence for poor sleep status. Previous studies indicated that estrogen deficiency, particularly during the perimenopausal period, may account for the higher number of women with insomnia [9].

Due to the agricultural and fishing population always face to the hard work, job stress,and reversed working and resting time. Irregular lifestyle and careless their own health are also major problems. This might partially explain the alcohol drinking apparently high prevalence of poor sleep status observed in our study. However, the finding may simply have been related to the different study populations.

Metabolic syndrome remains the most useful and widely accepted description of this cluster of metabolically related cardiovascular risk factors which also predict a high risk of developing diabetes [10]. In this study, the metabolic syndrome is significantly related to poor sleep status. The combination of obstructive sleep apnea and metabolic syndrome has been referred to as "syndrome Z" [11]. Although metabolic syndrome and obstructive sleep apnea may simply be concurrent syndromes, there is growing no consistent conclusion, clinical evidence that the physiological processes of obstructive sleep apnea and metabolic syndrome overlap considerably [11, 12]. The documented prevalence of poor sleep status is still clinically significant and is a wake-up call for government health practitioners and policy makers to be on the alert and also formulate policy to help curtail its impact especially by measures to reduce the components of metabolic syndrome in view of the relationship. In addition, the presence of a higher BMI was also associated with a higher risk for poor sleep status even after adjusting for other confounding factors.

Only 2-3% Asia subjects can be identified as obese according to the Western criteria for obesity and Asians have a higher proportion of visceral fat and a lower proportion of lean body mass than Caucasians with the same BMI condition [5, 10, 13]. Various studies have discussed the impact of sleep disorders on obesity, and are an important link in understanding the relationship between sleep disorders and related chronic disease [14-16]. Physical activity and exercise are essential prognostic tools in obesity and chronic disease, and numerous studies have explored the relationship between obesity, sleep disorders, and exercise [17-20]. Further epidemiological and etiological investigations are needed to clarify the pathophysiological mechanisms with metabolic syndrome, BMI and poor sleep status.

Methodological Considerations

Admittedly, there were several limitations in this study. Firstly, the potential impact on the prevalence and the study-observed sleep status-related risk factors were due to the screening of elderly population from one area, in our estimation, inevitable. The study still retained sufficient statistical power to evaluate the various risk factors for poor sleep status given the rather large sample size. Secondly, this study only included subjects who were aged subjects and may have different characteristics compared with whole population. However, this sub-population was more susceptible to have poor sleep status and easily to know the trend happened in Taiwan and take early prevention strategies. Thirdly, we only used questionnaire to identify poor sleep status, the misclassification may be occurred. Finally, our measurements were conducted at only a single point in time and, therefore, may not reflect long-term exposure to important demographic or biochemical factors [5]. The improvement to such a quandary would be to conduct a number of prospective longitudinal analogous studies to see if they would complement the cross-sectional findings of this study.

Conclusion

Several associated factors were indicated pertaining to the prevalence of poor sleep status among elderly specific occupational population. Integrative promotions of this population for metabolic function are important.

Acknowledgement

This study was supported by the grants from the National Science Council (NSC-95-2314-B-002-MY3) and (NSC-98-2314-B-350-002-MY3), and New Taipei City Hospital, Taipei, Taiwan.

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Citation: Hsi-Che Shen, Wan-Ching Chang, Zi-Hao Zhao, Yi-Chun Hu, Yu-Fen Chen and Tao-Hsin Tung, *"Clinical Investigation of Sleep Status in the Elderly Occupational Population", Global Scientific Research Journal of Public Health, 1(1), 2018, pp. 1-7.*