Association of sleep duration with sleep disturbances, quality of life, and socio-demographic factors in outpatient clinics of general hospital patients

Running title: Sleep duration and quality of life

[1] Wei Zheng, MD, Resident Psychiatrist

[1] Xin-Ni Luo, MD, Resident Psychiatrist

[1] Hai-Yan Li, MD, Resident Psychiatrist

[1] Xiao-Yin Ke, MD, Resident Psychiatrist

[1] Qing Dai, MD, Resident Psychiatrist

[1] Chan-Juan Zhang, MD, Resident Psychiatrist

[2] Chee H. Ng, MBBS, MD, Professor

[3] Gabor S. Ungvari, MD, PhD, Professor

[4*] Yu-Tao Xiang, MD, PhD, Professor

[1*] Yu-Ping Ning, MD, PhD, Professor

1. The Affiliated Brain Hospital of Guangzhou Medical University (Guangzhou Huiai Hospital), Guangzhou, China;
2. Department of Psychiatry, University of Melbourne, Melbourne, Victoria, Australia;
3. University of Notre Dame Australia / Graylands Hospital, Perth, Australia;
4. Unit of Psychiatry, Faculty of Health Sciences, University of Macau, Macao SAR, China

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*Address correspondence to Dr. Yu-Ping Ning, the Affiliated Brain Hospital of Guangzhou Medical University (Guangzhou Huiai Hospital), Guangzhou, China; Email address: ningjeny@126.com; or Dr. Yu-Tao Xiang, 3/F, Building E12, Faculty of Health Sciences, University of Macau, Avenida da Universidade, Taipa, Macau SAR, China. Fax: +853-2288-2314; Phone: +853-8822-4223;
E-mail: xyutly@gmail.com;

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Conflict of interest

We declare that the authors have no competing interests.

ABSTRACT

PURPOSE: To examine sleep duration and its demographic and clinical correlates in patients attending outpatient clinics attached to general hospitals.

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DESIGN AND METHODS: 4,399 outpatients participated in the study. Sleep duration (short sleep: <7 hours/day; long sleep: >8 hours/day; and medium sleep: 7-8 hours/day) was assessed.

FINDINGS: The proportion of short and long sleep duration were 39.5% and 10.3%, respectively. Significant associations between short sleep and any type of sleep disturbances, age, education level, depressive symptoms and rural residence were found. Long sleep was associated with age, education level, unemployment and depressive and anxiety symptoms.

PRACTICE IMPLICATIONS: Short sleep duration is common among Chinese outpatients in general hospitals. Due to its negative effects, screening and interventions for short sleep are needed in this population.

Key words: Chinese, outpatients, sleep duration, quality of life

INTRODUCTION

Sleep duration is recognized to be closely linked with health problems. For example, studies have identified a U-shaped relationship between mortality and sleep duration (Ferrie et al., 2007; Heslop, Smith, Metcalfe, Macleod, & Hart, 2002); both short and long sleep could increase mortality risk, while medium sleep confers the lowest risk. Recently the association between sleep duration and quality of life (QOL) has been the focus of research interest (Lu et al., 2017). Both short and long sleep durations are associated

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with increased physical (e.g. hypertension (Krueger & Friedman, 2009)) and psychiatric (e.g. depression (Buxton & Marcelli, 2010; Krueger & Friedman, 2009)) conditions, which could lead to poor QOL. Examining the patterns of sleep duration and its impact on QOL is critical to address unhealthy sleep habits, implement preventive measures and rationalize health resource allocations.

Findings of the association between different sleep duration and QOL are inconclusive. For example, there was negative association between both short and long sleep duration and QOL in a cohort of 3,834 subjects(Kripke et al., 2001), but this result was not confirmed (Jean-Louis, Kripke, & Ancoli-Israel, 2000). The association between sleep patterns and QOL are strongly influenced by ethnic and socio-cultural factors, and therefore it is important to examine their relationship in different sociocultural contexts (Hou et al., 2017).

Several studies have examined the association between sleep duration and QOL in both general in China (Chiu et al., 2013; Pan et al., 2017) and specific populations, including schizophrenia (Hou et al., 2016), but the findings have been inconsistent. For example, Chiu et al. (Chiu et al., 2013) found that short sleep duration was associated with lower QOL, while others (Hou et al., 2016) did not confirm this finding . QOL is an important health outcome measure that provides a comprehensive view of the effectiveness

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of inpatient treatment (Kaplan, 2002). To date, there have been no publications on the relationship between sleep patterns and QOL in inpatients in China.

The aim of this study was to examine the mean total sleep time (TST), including the proportion of those with short, medium and long sleep duration and their relationship with demographic and clinical characteristics and quality of life (QOL) in patients attending outpatients clinics attached to general hospitals in China. In China, outpatient clinics are usually attached to general hospitals, rather than in the community alone.

METHODS

Study setting and sampling

This cross-sectional study was conducted in the outpatient clinics of four major general hospitals (First Affiliated Hospital of Guangzhou University of Traditional Chinese Medicine, Panyu Central Hospital, Southern Medical University, and the Third Affiliated Hospital of Sun Yet-Sen University) in southern China between March 15, and June 30, 2016. Patients who attended the neurological, cardiovascular, gastrointestinal, and gynecological outpatient clinics attached to the above four hospitals and fulfilled the following inclusion criteria participated in the study: (1) age

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above 18 years; (2) ability to communicate in Chinese (Mandarin or Cantonese) and comprehend the contents of the research interview; (3) willingness to give informed consent.

The Human Research and Ethics Committee of the Affiliated Brain Hospital of Guangzhou Medical University approved the study protocol. All participants provided written informed consents.

Procedures and measures

Patients were consecutively referred, invited to participate and screened by postgraduate and undergraduates clinical psychology students following a two-day training session on the purpose and procedures of the study. General information, including basic socio-demographics and clinical characteristics including QOL were obtained during a face-to-face interview and recorded on a standardized data collection form.

To measure expected and actual TST in the preceding month, the respective two questions were asked: “How many hours of sleep per night do you think you need?” and “How many hours did you sleep each night on average?”. As there is no gold standard definition of short, medium and long sleep duration, , the Heslop et al.’s criteria (short sleep: <7 hr per day; long sleep: >8 hr per day; and medium sleep: 7-8 hr per day) (Heslop et al.,

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2002) was selected in line with other studies (Grandner & Kripke, 2004; Xiang et al., 2009). The 9-item Patient Health Questionnaire (PHQ-9) was used to identify and measure the presence and severity of depressive symptoms (Kroenke, Spitzer, & Williams, 2001; W. Wang et al., 2014), while the 7-item Generalized Anxiety Disorder scale (GAD-7) identified and measured the presence and severity of anxiety (He, Li, Qian, Cui, & Wu, 2010; Spitzer, Kroenke, Williams, & Lowe, 2006). The 12-item Medical Outcomes Study Short Form (SF-12) was used to assess physical and mental QOL (Jenkinson & Layte, 1997; Lam, Tse, & Gandek, 2005). The Chinese versions of PHQ-9 (W. Wang et al., 2014), GAD-7 (He et al., 2010) and SF-12 (Lam et al., 2005) have been validated in Chinese populations. The SF-12 covers eight domains: physical functioning, role physical, bodily pain, general health, vitality, social functioning and mental health, which generates composite physical and mental component scores for analyses. A higher score on SF-12 indicates higher QOL, while higher scores on PHQ-9 and GAD-7 indicate more severe depressive and anxiety symptoms, respectively.

Three types of sleep disturbances during the preceding month were assessed based on the following structured questions (Liu, Uchiyama, Okawa, & Kurita, 2000; Liu & Zhou, 2002): '*Do you have difficulties in falling sleep?*' for difficulty initiating sleep (DIS); '*Do you have difficulties in*

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maintaining sleep?' for difficulty maintaining sleep (DMS); and '*Do you wake up in the middle of the night or early morning and have difficulties in falling asleep again?*' for early morning wakening (EMA). Any patient who reported having any type of sleep disturbances was rated as "having sleep disturbances" (Liu et al., 2000; Liu & Zhou, 2002; Xiang et al., 2009).

Statistical analysis

Data were analyzed using the SPSS, Version 24.0 statistical software (SPSS Inc., Chicago, United States). Comparisons of socio-demographic and clinical characteristics between short, medium, and long sleep durations were conducted using analysis of variance (ANOVA) and chi-square tests, as appropriate. Analysis of covariance (ANCOVA) was used to compare QOL between short, medium, and long sleep durations after controlling for the variables that significantly differed in the univariate analyses. Multinomial logistic regression analysis with medium sleep duration as the reference group was performed to determine the independent correlates of short and long sleep durations, with sleep duration as the dependent variable and variables that significantly differed in the univariate analyses as independent variables. Significance level was set at 0.05 with two-tailed test.

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RESULTS

Of the 5,284 outpatients screened, 4,399 met the study entry criteria and completed the assessment, giving a participation rate of 81.8%. In the whole sample, the mean actual TST was 6.9±1.6 (95%CI: 6.8-6.9) hours/day, while the mean expected TST was 7.8±1.3 (95%CI: 7.8-7.9) hours/day. The mean actual TSTs of short, medium, and long sleep duration were 5.4±1.1 (95%CI: 5.3-5.4) , 7.5±0.5 (95%CI: 7.5-7.5), and 9.4±0.9 (95%CI: 9.3-9.4) hours/day, respectively.

Sleep duration in demographic and clinical parameters

The socio-demographic and clinical characteristics of the whole sample and separately according to sleep duration are shown in Table 1. Significant differences were found between the three groups in terms of the proportion of male gender, age, education level, marital and employment status, place of residence, income, health insurance, family history of psychiatric disorders, DIS, DMS, EMA, and any type of sleep disturbances, and the GAD-7 and PHQ-9 total scores. There were no significant differences between short, medium, and long sleep durations with regard to the

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physical ($F_{(13,\ 4385)}$=1.32, p=0.269) and mental ($F_{(13,\ 4385)}$=2.04; p=0.130) QOL domains.

Sleep duration related risk factors

The independent demographic and clinical correlates of short and long sleep duration are displayed in Table 2. Compared to medium sleep duration, short sleep duration was positively associated with any type of sleep disturbances (OR=4.07), older age (OR=1.03), lower education level (OR=0.97), and higher PHQ-9 total score (OR=1.04), but negatively associated with rural residence (OR=0.82). In contrast, long sleep duration was positively associated with PHQ-9 total score (OR=1.08) and unemployment (OR=1.73), but negatively associated with education level (OR=0.93), GAD-7 total score (OR=0.93) and age (OR=0.98).

DISCUSSION

This was the first study to examine the percentage of short, medium, and long sleep duration and their clinical correlates including QOL in patients attending outpatient clinics attached to general hospitals in China. The main findings were that the mean actual TST was shorter than expected TST (6.9 vs. 7.8 hours/day), while short and long sleep durations were 39.5% and

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10.3%, respectively. In addition, age, education level and depressive symptoms were independently associated with both short and long sleep durations. Finally, no associations between QOL and short or long sleep duration were observed.

The finding of the mean actual TST (6.9 hours/day) being shorter than the expected TST is consistent with the reported figures in Chinese (7.1-8.3 hours/day) (Chiu et al., 2013; Ko et al., 2007; Xiang et al., 2008), Japanese (7.4-7.8 hours/day) (Amagai et al., 2004), and American (8.1-8.9 hours/day) general populations. Although the proportions of short (39.5%) and long (10.3%) sleep durations are   to the corresponding figures in a survey of older Chinese population (45.2% and 14.8%, respectively) (S. Wang et al., 2017), these results are not consistent with those found in community-dwelling older populations in Japan (25.9% and 10.1%, respectively) (M. Kim, 2015) or in the general population in the United States (28.1% and 14.3%, respectively) (Gangwisch et al., 2008). The possible reasons for the shorter actual TST and more frequent short sleep duration in this study population are likely to be related to co-existing physical diseases as well as the confounding effects caused by different sample sizes, sampling methods, interview questions and the definitions of short and long sleep durations.

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Both short and long sleep duration are significantly associated with mental health problems (Buysse & Ganguli, 2002; Xiang et al., 2009), which is also confirmed by this study. Patients with short and long sleeper durations had more severe depressive symptom, although long sleep duration was less likely to be associated with severe anxiety symptom.

In this study, higher education level was a protective factor for both short and long sleep duration. It is possible that higher education confers better knowledge of the harmful effects of unhealthy sleep patterns and results in better sleep hygiene. In addition, patients with lower education are more likely to be unemployed, which is associated with short and long sleep duration (Hou et al., 2016; Park et al., 2010).

The finding that age was positively associated with short sleep durations and negatively associated with long sleep is consistent with the notion that sleep duration decreases with age (K. Kim, Uchiyama, Okawa, Liu, & Ogihara, 2000; Park et al., 2010; Xiang et al., 2009). Further, findings of the association between having sleep disturbances and short sleep duration (Xiang et al., 2009) and the lack of association between smoking/drinking and short or long sleep duration (S. Wang et al., 2017), were also observed in this study. Patients living in rural areas were less likely to have short sleep duration compared to urban residents. Factors that are likely to be related to longer outdoor physical activities and exposure to daylight, and

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less stressful life event including noisy environments in rural areas (Gu, Sautter, Pipkin, & Zeng, 2010; Hale & Do, 2007), all of which could improve sleep duration and quality (Ursin, Bjorvatn, & Holsten, 2005).

Due to the negative effects of short and long sleep durations on physical and mental health, a decrease in QOL had been expected. However, no association between QOL and sleep duration was found. Given that SF-12 is a generic rather than a sleep-specific scale on QOL, it is possible that the scale was not sufficiently sensitive to detect minor QOL changes related to short and long sleep durations.

The strengths of this study include its large sample size and use of standardized instruments. However, there are several methodological limitations. First, the study involved only patients attending different specialist outpatient clinics in four general hospitals in southern China, therefore the sample was heterogeneous, which reduces the internal validity of the findings and limits their generalizability. Second, sleep duration was self-reported, thus the possibility of recall bias could not be excluded. Third, some important variables associated with sleep duration, such as environmental noise, caffeine consumption and sleep quality, use of psychotropic medications including sleeping pills, medical conditions, and work schedule (i.e. shift work), were not available. In addition, overall the depressive and anxiety symptoms were mild because those having

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moderate and/or severe symptoms were probably receiving treatment in psychiatric settings. Third, as this was a cross-sectional study, the causality between sleep duration and other variables could not be examined. Fourth, polysomnography (PSG), the gold-standard of assessing sleep problems (Esbensen, Hoffman, Stansberry, & Shaffer, 2018) was not available; due to logistical reasons, relevant data on sleep were recorded only by self-reports, which limits the accuracy of the results.

In conclusion, short sleep duration is common among Chinese patients attending outpatient clinics attached to general hospitals. In China sleep problems are traditionally screened and measured by mental health professionals, particularly psychiatric nurses in outpatient clinics of general hospitals because of shortage of specialized sleep clinics and skilled staff. Regular screening of short sleep duration (e.g., with the Pittsburgh Sleep Quality Index) and educating and training nurses to make the assessment of sleep disturbances including sleep duration as routine part of nursing care are important. Furthermore, basic aspects of pharmacotherapy and non-pharmacological interventions (e.g., relaxation training) should be widely taught to frontline health professionals. Longitudinal studies are needed to understand the impact of sleep duration on a variety of medical and psychiatric conditions.

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Table 1 Comparison of socio-demographic and clinical variables between short, medium, and long duration

Variables	Total sample (n=4399)		Short sleep (n=1739)		Medium sleep (n=2208)		Long sleep (n=452)		Statistics[a]		
	N	%	N	%	N	%	N	%	χ^2	df	*p*
Male gender	1503	34.2	635	36.5	739	33.5	129	28.5	11.1	2	**0.004**
Marital status									56.5	4	**<0.0001**
Single	728	16.5	223	12.8	408	18.5	97	21.5			

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Married	3528	80.2	1429	82.2	1749	79.2	350	77.4			
Divorce/widow	143	3.3	87	5.0	51	2.3	5	1.1			
Rural residence	2631	59.8	973	56.0	1360	61.6	298	65.9	20.7	2	**<0.001**
Employment status									139.3	4	**<0.001**
Employed	2900	65.9	1010	58.1	1589	72.0	301	66.6			
Unemployment	800	18.2	332	19.1	353	16.0	115	25.4			
Retirement	699	15.9	397	22.8	266	12.0	36	8.0			
Living alone	415	9.4	169	9.7	208	9.4	38	8.4	0.7	2	0.697
Personal monthly income>/=6000 (Yuan)	951	21.6	331	19.0	522	23.6	98	21.7	12.2	2	**0.002**
No health insurance	2825	64.2	1047	60.2	1453	65.8	325	71.9	26.2	2	**<0.001**
Family history of psychiatric disorders	217	4.9	110	6.3	88	4.0	19	4.2	11.9	2	**0.003**
Current drinking	959	21.8	379	21.8	477	21.6	103	22.8	0.3	2	0.857
Current smoking	594	13.5	250	14.4	284	12.9	60	13.3	1.9	2	0.381
DIS	628	14.3	461	26.5	139	6.3	28	6.2	351.7	2	**<0.001**
DMS	711	16.2	523	30.1	154	7.0	34	7.5	410.9	2	**<0.001**
EMA	544	12.4	429	24.7	99	4.5	16	3.5	402.0	2	**<0.001**
Any type of sleep disturbances	973	22.1	673	38.7	251	11.4	49	10.8	459.1	2	**<0.001**
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F	df	*p*
Age (years)	41.8	15.9	46.4	16.2	39.1	14.9	36.9	15.1	134.3	2	**<0.001**
Education (years)	10.3	4.2	9.6	4.3	10.9	4.1	10.3	3.9	46.6	2	**<0.001**
GAD-7 total score	3.2	4.2	3.7	4.7	2.9	3.8	2.8	3.8	24.4	2	**<0.001**
PHQ-9 total score	3.6	4.3	4.3	4.8	3.1	3.8	3.7	4.4	38.9	2	**<0.001**
SF-12 physical	62.0	15.2	62.0	15.6	62.2	14.9	61.3	14.6	0.7	2	0.514

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SF-12 mental	53.7	16.8	53.9	17.3	53.6	16.4	53.6	17.1	0.2	2	0.781

[a]Comparison between short, medium, and long sleep duration; Bolded values $p<0.05$. DIS=difficulty initiating sleep; DMS=difficulty maintaining sleep; EMA=early morning awakening; GAD-7=Generalized Anxiety Disorder Scale-7; PHQ-9=Patient Health Questionnaire-9; SF-12=Medical Outcomes Study Short Form 12.

Table 2. Demographic and clinical correlates independently associated with short and long sleep duration (multinomial logistic regression analysis with medium sleep as the reference group)

Characteristics	Short sleep (n=1739) vs. medium sleep (n=2208)				Long sleep (n=452) vs. medium sleep (n=2208)			
	Wald $\chi 2$	*p*	OR	95%CI	Wald $\chi 2$	*p*	OR	95%CI
Male sex	2.40	0.12	1.12	0.97-1.31	0.86	0.35	0.89	0.71-1.13
Marital status								
Single			1.0				1.0	
Married	1.91	0.17	0.86	0.69-1.07	0.23	0.63	0.93	0.69-1.25
Divorced/widowed	0.04	0.85	0.96	0.61-1.50	2.18	0.14	0.48	0.18-1.28
Rural residence	**6.47**	**0.01**	**0.82**	**0.70-0.95**	0.16	0.69	0.95	0.75-1.21
Employment status								
Employed			1.0				1.0	
Unemployment	0.45	0.50	1.07	0.88-1.31	**15.71**	**<0.001**	**1.73**	**1.32-2.26**
Retirement	0.06	0.81	0.97	0.75-1.26	0.13	0.72	1.09	0.68-1.76
Personal monthly income>/=6000 (Yuan)	0.13	0.72	0.97	0.80-1.16	1.49	0.22	1.18	0.90-1.56
No health insurance	3.47	0.06	0.86	0.74-1.01	0.44	0.51	1.08	0.85-1.38
Family history of psychiatric disorders	2.16	0.14	1.27	0.92-1.76	0.07	0.79	1.07	0.64-1.81
Any type of sleep disturbances	**239.68**	**<0.001**	**4.07**	**3.41-4.86**	1.21	0.27	0.83	0.59-1.16

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Age (years)	**50.25**	**<0.001**	**1.03**	**1.02-1.04**	**9.54**	**<0.001**	**0.98**	**0.97-0.99**
Education (years)	**8.37**	**<0.001**	**0.97**	**0.95-0.99**	**16.02**	**<0.001**	**0.93**	**0.90-0.97**
GAD-7 total score	1.12	0.29	1.01	0.99-1.04	**11.97**	**<0.001**	**0.93**	**0.89-0.97**
PHQ-9 total score	**7.10**	**0.01**	**1.04**	**1.01-1.06**	**16.81**	**<0.001**	**1.08**	**1.04-1.12**

Bolded values $p<0.05$; CI=confidence interval; GAD-7=Generalized Anxiety Disorder Scale-7; OR=odd ratio; PHQ-9=Patient Health Questionnaire-9.

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