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Sleep disturbance and its relationship with quality of life in older Chinese adults living in nursing homes

Running head: Sleep disturbances in older adults

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Conflict of interest

We declare that the authors have no competing interests.

ABSTRACT

PURPOSE: To examine sleep disturbances in older adults in Macau and Guangzhou, China and their associated factors.

DESIGN AND METHODS: 437 subjects in Guangzhou and 244 subjects in Macau were interviewed.

FINDINGS: In total, 681 older adults participated in the study, and 27.8% reported sleep disturbance, with 43.9% in Macau and 18.8% in Guangzhou. Physical quality of life was negatively associated with sleep disturbances. Severe depressive symptoms were positively related but living in Guangzhou were negatively related to sleep disturbances. Sleep disturbances are more common in Macau compared to Guangzhou.

PRACTICE IMPLICATIONS: Appropriate screening and treatment strategies are needed to address sleep disturbance in this population.

Keywords: older, life quality, depression

INTRODUCTION

The proportion of older population is rapidly growing worldwide (Petersen & Yamamoto, 2005) and by 2025 there will be an estimated 1.2 billion older people living in the developing countries alone (Xie, Zhang, Peng, & Jiao, 2010). In older adults, sleep disturbance such as insomnia, sleep-breathing disorders, hypersomnia, sleep movement disorders and circadian rhythm disorders (Gooneratne & Vitiello, 2014), is a major health public issue. Sleep disturbance is associated with both physical and psychiatric problems, and also with increased risk of mortality (Luyster, Strollo, Zee, & Walsh, 2012; Smagula, Stone, Fabio, & Cauley, 2016). Understanding the pattern of sleep disturbance and its contributing factors could help develop appropriate interventions, rationalize health resource distribution and improve health outcomes.

The prevalence of sleep disturbance varies greatly across different geographical regions. For example, in the USA 36%–69% of older adults reported sleep disturbances (D. Foley, Ancoli-Israel, Britz, & Walsh, 2004), while the corresponding figure was 24% in Europe (Gindin et al., 2014). In China, studies on the patterns of sleep disturbance in older people have reported wide variation although a recent meta-analysis of 36 studies found that 60.9% of older adults sleep poorly (Lu et al., 2017).

There are a range of factors related to sleep disturbance in older adults, such as chronic physical diseases, psychiatric problems, bereavement due to loss of spouse, life changes (such as retirement) and change of living environment (such as moving to nursing home) (D. J. Foley et al., 1995; D. J. Foley, Monjan, Simonsick, Wallace, & Blazer, 1999; Lichstein & Riedel, 1994). Advanced age and female gender were among the most common demographic variables related to the occurrence of sleep disturbance (Breslau, Roth, Rosenthal, & Andreski, 1996; Ford & Kamerow, 1989).

In recent decades, QOL has become an important outcome measure to assess the quality of health care. In older adults, sleep disturbance may lead to impaired daily function, physical and mental problems, and personal suffering, all of which can reduce QOL (Cahan & Baharav, 2014). It should be noted however that both sleep disturbance and QOL can be influenced by cultural factors, therefore the prevalence of sleep disturbance and its association with QOL should be explored in different sociocultural settings (Y. T. Xiang, Chiu, & Ungvari, 2010; Y.-T. Xiang et al., 2008).

China has been facing a rapidly aging population. It was estimated that by 2030 more than a quarter of the world's older people will live in

China. (Chu & Chi, 2008) Due to the 35 year history of the “one child family policy” in China, aging parents are often being placed in nursing homes because their adult children are unable to support them at home (Xie et al., 2010). As there were no previous studies on the association between sleep disturbances and QOL in older people in nursing homes in China, we set out to explore the pattern of sleep disturbance in this population, and their associated factors and QOL. These two sites in southeastern region of China including Macau, a former colony of Portugal, and Guangzhou, a metropolis in mainland China, have different sociocultural and economic contexts.

METHOD

Study Site

This cross-sectional study was carried out from September, 2015 to November2016 (Kuok et al., 2017). In Macau there are 20 nursing homes; we randomly selected eleven to participate in this study. In Guangzhou, only a large public nursing home with around 1,200 older residents was included. Older adults in each of the participating nursing homes were screened and interviewed if they were aged of 60 years or above, Chinese ethnicity and had the ability to understand the contents

of the interview. Those with dementia were excluded. This study proposal was submitted and approved by the IRB of University of the Macau and informed consent was obtained from all participants.

Assessment

Social-demographic and clinical characteristics, such as age, gender, marital status, education level, religion, financial perception and presence of major medical conditions, were recorded by a review of medical records and confirmed by a face-to-face interview. Trained (RAs) research assistants conducted the interview.

Assessment tools and procedures

Three basic questions were used to measure sleep disturbances in the previous week: “Did you ever have difficulties in initiating sleep? (DIS)” “Did you ever have difficulties in maintaining sleep? (DMS)” and “Did you ever wake up in the midnight and having difficulties in sleeping again (EMA)?” Each question was answered on a three options scale (0=never; 1= sometime; 2=often). If a participant answered “often” to any of the questions, then he/she was considered as ‘reporting sleep disturbances’ (X. Liu, Uchiyama, Okawa, & Kurita, 2000).

Depressive symptoms were measured by the Patient Health Questionnaire (PHQ-9) (Kroenke, Spitzer, & Williams, 2001). The WHO Quality of Life brief version–WHOQOL-BREF (WHO, 1998) with 26 items that covers physical, psychological, social and environmental domains was used to measure QOL. A higher score indicates higher QOL.

Data analysis

SPSS 20.0 for Windows was used to analyze data. Comparisons between Guangzhou and Macao cohorts and also between those with and without sleep disturbances in demographic and clinical data were conducted by univariate analyses. QOL between sleep disturbance and no sleep disturbance groups was compared using analysis of covariance adjusting for covariates. The independent demographic and clinical contributing factors including the study site of sleep disturbance were determined by multivariate logistic regression analyses. Two-tailed test with significance of 0.05 was used.

RESULTS

In total, 708 subjects were approached and invited, and 681 (244 in Macau and 437 in Guangzhou) fulfilled the entry criteria and were included in this study. The prevalence of any type of sleep disturbance in

the whole sample was 27.8%, with 18.8% in Guangzhou and 43.9% in Macau. Of the whole sample, the prevalence of DIS was 16.5%, DMS was 23.5%, and EMA was 19.5%. Demographic and clinical data are shown in Table 1. There were significant site differences in gender, education, family history of psychiatric disorders, religion, financial perception, presence of major medical conditions and prevalence of sleep disturbances.

Table 2 compares demographic, clinical data and QOL between sleep disturbance and no sleep disturbance groups. Compared to those without sleep disturbance, participants with sleep disturbances were less likely to be male, living in Guangzhou, and have lower educational level, while more likely to have a religion and suicide-related behaviours. In addition, participants reporting sleep disturbances were older and had more severe depressive symptoms. After adjusting for covariates, there were significant group differences in the physical ($F_{(6.674)} = 4.01$, $P<0.05$), psychological ($F_{(6.674)} = 0.76$, $P=0.38$), social ($F_{(6.674)} = 0.04$, $P=0.85$) and environmental ($F_{(6.674)} = 0.04$, $P=0.84$) QOL domains. Table 3 shows sleep disturbances by age and gender; 19% of females and 11% of males reported DIS, while the corresponding figures were 26% and 16% in DMS, and 22% and 15% in EMA, respectively.

Due to collinearity between study site and depressive symptoms, multiple logistic regression analyses were conducted twice. In the first logistic regression analysis where the variables that significantly differed between participants with and without sleep disturbance in univariate analyses except study site were entered as independent variables, severe depressive symptoms were positively related to more frequent DIS, DMS and EMA (Table 4). In the second logistic regression analysis where the variables that significantly differed between participants with and without sleep disturbance in univariate analyses except depressive symptoms were entered as independent variables, older adults in Guangzhou were less likely to have sleep disturbance than those in Macau (DIS: OR=0.57, 95%CI=0.35-0.94; DMS: OR=0.36, 95%CI=0.23-0.55; EMA: OR=0.43, 95%CI=0.27-0.68; all p values<0.05).

DISCUSSION

This was the first survey to examine the pattern of sleep disturbances and their impact on QOL in older adults in Macau and Guangzhou. In this study the prevalence of sleep disturbance was 27.8% in the whole sample, with 43.9% in Macau and 18.8 % in Guangzhou. The figure in the whole sample was higher than that in older adults living in rural

areas (7.6%) in Sichuan province (Dai et al., 2013), but was lower than the figure (37.8%) in older patients with diabetes in Hebei province, China (Sun et al., 2016). In contrast, the prevalence of DIS was 16.5%, DMS was 23.5%, and EMA was 19.5% in this study, which were higher than the figures (5.7%, 7.2%, and 6.8% respectively) in older adults in rural areas in China (Dai et al., 2013). The differences observed could be due to several reasons. First, the definitions, instruments, timeframe and cut-off values of sleep disturbances were different across studies (Billings et al., 2014; Ohayon, 2002). Second, compared to those living in the community, older adults in nursing homes or other long-term care facilities had more frequent physical diseases and cognitive impairment (Choi, Ransom, & Wyllie, 2008; Fox, Raina, & Jadad, 1999), all of which could increase the risk of sleep disturbances. Third, family and social supports and living conditions in nursing homes are usually poorer than that are found at home. For example, in the nursing home environment most residents have relatively restricted autonomy and common shared spaces with others, which could increase the risk of sleep disturbances.

There are significant site differences in certain demographic and clinical variables, which could explain the difference in prevalence of sleep disturbances between sites. In addition, the relative lack of the

access to public education on sleep hygiene and also to treatment in sleep clinics in Macau compared to Guangzhou where sleep clinics have been established in most major hospitals could also explain the higher risk of sleep disturbance in Macau (43.9% vs. 18.8%).

Our study found that a positive association between severe depressive symptoms and sleep disturbance, which confirms previous findings (Lee et al., 2013; Maglione et al., 2014; Smagula et al., 2016). However, the causal relationship between sleep disturbance and depressive symptoms could not be examined because this study was cross-sectional. Due to the adverse consequences of sleep disturbance on health and personal well-being, participants with sleep disturbance were expected to have a poorer QOL. As expected, those with sleep disturbance reported poorer physical QOL.

There are several limitations to this study. First, the causal relationship between sleep disturbance and other factors cannot be examined as this is a cross-sectional study. Second, there were no validated standardized screening tools on sleep disturbance in China, thus in line with previous studies (X. Liu et al., 2000) sleep disturbance was only assessed by basic standardized questions. Third, we could not exclude the likelihood of recall bias on the sleep disturbance. Fourth, the

Chinese version of the world health organization quality of life instrument-older adults module (WHOQOL-OLD) (Liu et al., 2013) was not used. However, the WHOQOOL-BREF is a widely used generic scale on QOL and it could be used in all populations. Finally, specific factors of sleep disturbance, such as environmental noise and coffee or tea consumption, was not collected.

In conclusion, sleep disturbances in older adults living in nursing homes, were common in Macau compared to Guangzhou. Considering the adverse consequences of sleep disturbance and its negative impact on QOL, appropriate screening and treatment strategies are needed to address sleep disturbance in older adults in nursing homes.

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Table 1. Basic demographic and clinical characteristic of the whole sample

	The whole sample (n=681)		**Guangzhou sample (n=437)**		**Macau sample (n=244)**		**Statistics**		
	N	**%**	**N**	**%**	**N**	**%**	**X^2**	**df[a]**	**P**
Male gender	193	28.34	160	36.61	33	13.52	41.1	1	**<0.001**
Married/cohabitating	151	22.17	87	19.91	64	26.23	3.63	1	0.06
Secondary school or above	243	35.68	198	45.31	45	18.44	49.24	1	**<0.001**
Religion Believer	301	44.20	132	30.21	169	69.26	96.84	1	**<0.001**
Financial perception							39.35	2	**<0.001**
Bad	173	25.40	83	18.99	90	36.89			
Fair	328	48.16	210	48.05	118	48.36			
Good	180	26.43	144	32.95	36	14.75			
Family history of psychiatric disorders	28	4.11	10	2.29	18	7.38	10.28	1	**0.001**
Having verbal or	64	9.40	36	8.24	28	11.48	1.93	1	0.17

physical abuse									
Health perception							1.98	2	0.37
Good	122	17.91	84	19.22	38	15.57			
Fair	436	64.02	282	64.53	154	63.11			
Bad	118	17.33	71	16.25	47	19.26			
Presence of major medical conditions	652	95.74	430	98.40	222	90.98	21.11	1	**<0.001**
DIS	112	16.45	56	12.81	56	22.95	11.71	1	**0.001**
DMS	160	23.49	72	16.48	88	36.07	33.43	1	**<0.001**
EMA	133	19.53	64	14.65	69	28.28	18.52	1	**<0.001**
Any type of sleep disturbance	189	27.75	82	18.76	107	43.85	79.42	1	**<0.001**
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**T/Z**	**df[b]**	**p**
Age (year)	80.53	8.26	81.51	8.27	78.80	7.97	-4.20	679	**<0.001**
PHQ-9 total	3.10	4.18	1.57	2.85	5.84	4.76	-14.76	---[c]	**<0.001**

[a] χ^2 text; [b] Two sample independent t-text; [c]=Mann-Whitney U test; Bolded values: p<0.05; PHQ-9=Patient Health Questionnaire-9; DIS=Difficulty initiating sleep; DMS=Difficulty maintaining sleep; EMA=Early morning awakening

Table 2. Comparison between older adults with and without any type of sleep disturbance with respect to basic demographic and clinical characteristics

	No sleep disturbance (n=492)		**Any type of sleep disturbance (n= 189)**		**Statistics**		
	N	**%**	**N**	**%**	**χ^2**	**df[a]**	**p**
Male gender	157	31.91	36	19.05	11.12	1	**0.001**
Married/cohabitating	112	22.76	39	20.63	0.56	1	0.55
Secondary school or above	197	40.04	46	24.34	14.67	1	**<0.001**
Religion Believer	199	40.42	102	53.97	10.12	1	**0.001**
Financial perception					1.59	2	0.45
Bad	119	24.19	54	28.57			
Fair	243	49.39	85	44.97			
Good	130	26.42	50	26.46			
Family history of psychiatric disorders	17	3.46	11	5.82	1.94	1	0.16
Living in nursing home in Guangzhou	355	72.15	82	43.39	49.15	1	<**0.001**
Health perception					1.63	2	0.44

Good	83	16.87	39	20.63			
Fair	322	65.45	114	60.32			
Bad	86	13.82	32	16.93			
Presence of medical conditions	470	95.53	182	96.30	0.20	1	0.66
Physical or Verbal abuse	41	8.33	23	12.17	2.36	1	0.13
Any current suicide	9	0.02	13	0.07	11.14	1	**0.001**
	Mean	**SD**	**Mean**	**SD**	**T / Z**	**df[b]**	**p**
Age(year)	80.36	8.61	80.99	7.29	-0.89	679	**0.004**
PHQ-9	1.91	2.96	6.21	5.21	-11.62	---[c]	**<0.001**
Physical QOL	13.44	1.95	12.22	2.38	6.88	679	**<0.001**
Psychological QOL	13.78	1.90	12.74	2.58	5.79	679	**<0.001**
Social QOL	13.67	1.88	13.37	2.31	1.76	679	**0.03**
Environmental QOL	13.61	1.76	13.20	2.14	2.56	679	**0.01**

[a] χ^2 text; [b] Two sample independent t-text; [c]=Mann-Whitney U test; Bolded values: p<0.05; PHQ-9=Patient Health Questionnaire-9; QOL= quality of life

Table 3. Prevalence of sleep disturbance by age and sex in older adults in Macao

Age (years)	DIS (n=112)			DMS (n=160)			EMA (n=133)		
	Female % (95%CI.)	Male % (95%CI.)	Total % (95%CI.)	Female % (95%CI.)	Male % (95%CI.)	Total % (95%CI.)	Female % (95%CI.)	Male % (95%CI.)	Total % (95%CI.)
50-64	12	9	11	6	18	11	12	18	14
	(0-29)	(0-27)	(0-21)	(0-18)	(0-45)	(0-25)	(0-29)	(0-45)	(4-29)
65-74	20	7	15	23	11	18	19	9	15
	(11-29)	(0-13)	(9-22)	(14-31)	(2-22)	(12-26)	(10-29)	(2-18)	(9-22)
75-84	19	15	18	29	20	27	23	19	22
	(14-25)	(8-22)	(13-22)	(23-36)	(12-30)	(21-31)	(18-29)	(11-28)	(17-27)
>=85	18	8	16	27	12	24	22	10	19
	(12-24)	(2-16)	(12-21)	(20-34)	(4-20)	(19-30)	(15-28)	(2-18)	(14-24)
Total	19	11	16	26	16	23	22	15	20
	(15-22)	(7-16)	(14-19)	(22-30)	(11-22)	(20-27)	(18-25)	(10-20)	(17-23)

CI= Confidence interval; DIS=Difficulty initiating sleep; DMS=Difficulty maintaining sleep; EMA=Early morning awakening; DIS=Difficulty initiating sleep; DMS=Difficulty maintaining sleep; EMA=Early morning awakening

Table 4. Socio-demographic correlates of sleep disturbance in older adults in nursing home in Macau and Guangzhou (logistic regression analysis) *

	DIS			DMS			EMA		
	p	OR	95%CI	*p*	OR	95%CI	*p*	OR	95%CI
Male gender	0.18	0.67	0.35-1.21	0.30	0.76	0.46-1.27	0.55	0.85	0.49-1.46
Married statues	0.95	1.02	0.57-1.82	0.87	0.96	0.58-1.59	0.62	0.87	0.50-1.51
Education level	0.32	0.76	0.44-1.31	0.23	0.75	0.48-1.19	0.49	0.84	0.51-1.38
Religion believer	0.12	0.67	0.41-1.11	0.81	1.05	0.69-1.60	0.49	0.85	0.54-1.35
Finical perception	0.44	0.81	0.47-1.39	0.57	0.87	0.55-1.39	0.38	0.80	0.49-1.31
Family history psychosis	0.37	1.58	0.58-4.32	0.89	0.93	0.36-2.43	0.38	1.53	0.59-3.97
Physical or Verbal abuse	0.78	1.11	0.53-2.33	0.47	0.78	0.39-1.54	0.41	1.33	0.68-2.61
Health	0.12	0.63	0.36-1.12	0.76	0.92	0.55-1.56	0.16	0.68	0.40-1.16

perception									
Age (years)	0.42	1.01	0.98-1.04	0.051	1.03	1.00-1.05	0.06	1.03	1.00-1.06
PHQ-9 Total scores	**<0.001**	**1.26**	**1.20-1.32**	**<0.001**	**1.23**	**1.17-1.29**	**<0.001**	**1.25**	**1.19-1.31**

* Due to collinearity, study site was not entered in the logistic regression

Bolded values: p<0.05; CI= Confidence Interval; DIS=Difficulty initiating sleep; DMS=Difficulty maintaining sleep; EMA=Early morning awakening; PHQ-9=Patient Health Questionnaire-9; QOL=quality of life