A population-based 2-year longitudinal study of insomnia disorder in a Chinese population in Hong Kong

KF Chung, MRCPsych *, [1]

WF Yeung, PhD [2]

YM Yu, BSocSc [2]

YY Ho, PhD [3]

[1] Department of Psychiatry, University of Hong Kong, Hong Kong SAR, China; [2] School of Nursing, Hong Kong Polytechnic University, Hong Kong SAR, China; [3] Department of Psychology, University of Hong Kong, Hong Kong SAR, China.

Authors Details:

KF Chung: Telephone: 852-22554487, E-mail: kfchung@hku.hk

WF Yeung: Telephone: 852- 2766 4369, E-mail: jerry-wf.yeung@polyu.edu.hk

YM Yu: Telephone: 852- 2766 4369, E-mail: branda.ym.yu@polyu.edu.hk

YY Ho: Telephone: 852- 3917 7122, E-mail: hoyy@connect.hku.hk

Corresponding Author:

Dr. K.F. Chung, Clinical Associate Professor, Department of Psychiatry, University of Hong Kong, Pokfulam Road, Hong Kong SAR, China. Telephone: 852-22554487, Fax: 852-28551345, E-mail: kfchung@hku.hk

The study aimed to investigate the prognosis of insomnia in an ethnic Chinese population. The persistence, remission, relapse, and incidence of insomnia symptoms and insomnia disorders according to the Diagnostic and Statistical Manual of Mental Disorders, 4th and 5th edition (DSM-IV and DSM-5) were examined. A total of 398 community dwellers were interviewed annually for 3 years using a validated questionnaire. Normal sleepers were defined according to the DSM-5 quantitative criteria as having insomnia symptoms at most twice per week. Persistence was defined as continuance at the same status for at least 2 years. Remission was a change from insomnia at baseline to normal sleep at least once. Relapse was a return to insomnia after remission. Incidence was a change from normal sleep at baseline to insomnia at least once. Estimates were weighted against population age and sex distribution. Persistence rate was 26.3%, 26.4%, and 23.0% for insomnia symptoms, DSM-IV, and DSM-5 insomnia disorders; remission rate was 55.8%, 22.9%, and 26.1%, relapse rate was 21.8%, 1.3%, and 0%, while incidence rate was 62.4%, 19.6%, and 4.5%. The common trajectories for DSM-IV insomnia disorder were to remain the same (26.4%), followed by a change to insomnia symptoms at the second year (25.7%) and at the third year (17.3%). For DSM-5 insomnia disorder, a change to insomnia symptoms at the second year was the commonest (28.3%), followed by continuing the same (23.0%) and a change to insomnia symptoms at the third year (14.0%). Over a 2-year naturalistic follow-up, we showed that persistence of insomnia disorders was roughly 25%. Changes from insomnia disorders to insomnia symptoms were common; however, remission only occurred in about 25%, highlighting a lack of treatment, under-treatment, or resistance to treatment. Incidence of insomnia symptoms was over 60%, suggesting a high risk of developing insomnia in the general population.

Keywords: diagnosis; incidence; insomnia; persistence; prognosis; remission; sleep disorder

Introduction

Insomnia symptoms, including difficulty initiating and maintaining sleep and early morning awakening, are the most common sleep complaints. For a diagnosis of insomnia disorder, insomnia symptoms must be present for longer than one month and are associated with significant distress or impairment in functioning. A recent study in the U.S. estimated that the prevalence of insomnia disorder was 22.1% (Roth et al., 2011) according to the Diagnostic and Statistical Manual, 4th edition (DSM-IV) (American Psychiatric Association, 2000). The same prevalence of DSM-IV insomnia disorder was found in Hong Kong, while the DSM-5 insomnia disorder (American Psychiatric Association, 2013) was shown to be 10.8% (Chung et al., 2015) , due to that the DSM-5 requires the presence of insomnia symptoms for longer than three months instead of one month in the DSM-IV. Growing evidence suggests that insomnia is associated with a wide range of psychiatric and medical conditions, including depression, anxiety, alcohol and substance abuse and dependence, dementia, cardiovascular disease, diabetes, stroke, autoimmune disease, chronic kidney disease, and cancer (Fernandez-Mendoza & Vgontzas, 2013) . Higher suicidal rate and mortality are observed in subjects with chronic insomnia, compared to normal sleepers (Fernandez-Mendoza & Vgontzas, 2013; Woznica, Carney, Kuo, & Moss, 2015). In view of the high prevalence and a wide range of adverse outcomes, insomnia is a significant public health issue.

In spite of the fact that insomnia is so prevalent in the general population and has been

widely studied in the past few decades, one aspect has not been sufficiently covered, which is the prognosis of insomnia, particularly in the Asian population. It has been known that there is ethnic difference in the prevalence (R. Roberts, C. Roberts, & Chen, 2000) and severity (Ruiter, DeCoster, Jacobs, & Lichstein, 2010) of insomnia. More importantly, there is a variation in patients' preferred treatment options across races. Asian people are recognized to be less likely to seek help for their insomnia than the Westerners. Studies found that only 2-7% of Asian people reported their insomnia problems to medical practitioners (Leger & Poursain, 2005; Ohayon & Hong, 2002; Xiang et al., 2008), compared to 13-40% in Western countries (Leger & Poursain, 2005; Morin, LeBlanc, Daley, Gregoire, & Mérette, 2006). Moreover, Asian populations, especially the Chinese, are more likely to take non-prescribed medications to treat their insomnia than use prescribed medications (Xiang et al, 2008). Due to the different help-seeking behavior, one can expect that there may be an ethnic difference in the prognosis of insomnia.

Longitudinal studies on the course of insomnia in the Western population have shown that the persistence rate of insomnia disorder ranges from 44-70% (Jansson-Fröjmark & Linton, 2008; Morin et al., 2009; Morphy, Dunn, Lewis, Boardman, & Croft, 2007). Morin et al. (2009) showed that 66.1% of Canadian subjects with insomnia disorder, based on a combination of criteria from the DSM-IV and International Classification of Diseases, 10th edition (ICD-10) (World Health Organization, 1991) and the use of sleep medications,

remained the same for four consecutive annual assessments, but the persistence rate was only 37.2% for insomnia symptoms. In the same study, about 33.9% of subjects with insomnia disorder went into remission at least once, but 11.8% eventually experienced a relapse. A Swedish study, which used a definition similar to the DSM-5 criteria, showed that persistence and incidence over one year was 44.4% and 2.8%, respectively (Jansson-Fröjmark & Linton, 2008). In another study that used a definition similar to Morin's (2009) study, the cumulative incidence for insomnia symptoms and insomnia disorder over one year was 30.7% and 7.3% respectively (LeBlanc et al., 2009) . According to a longitudinal study in U.K., which defined insomnia as having at least one of the sleep problems on most nights, found that 69% of the subject with insomnia at baseline remained the same at 12-month follow-up (Morphy et al., 2007).

In Hong Kong, Zhang et al. showed that the incidence of insomnia symptoms and insomnia disorder was 3.6% and 2.3%, respectively and the respective persistence rate was 28.2% and 42.7% (Zhang et al., 2012). However, the interval between baseline and follow-up assessment in the study was 5 years and the definition of insomnia, which required at least three times per week of insomnia symptoms over the past year, was different from the diagnostic criteria that are commonly used. In Japan, Komada et al. (2012) found that the persistence rate of insomnia was 60.9%, based on a Pittsburgh Sleep Quality Index score greater than or equal to 5.5. In Korea, persistence of insomnia symptoms based on the

DSM-IV criteria over two biennial assessments was 35.4%, and the incidence rate was 25.5% for those without insomnia symptoms at baseline (Suh et al., 2014).

Differences in study design and diagnostic criteria and the small number of studies have limited the conclusion on the prognosis of insomnia. Persistence of insomnia disorder for three consecutive years was as high as 66.1% in Morin's (2009) study; however, Jansson-Fröjmark and Linton (2008) found that persistence for one year was only 44.4%. Data on remission, relapse, and incidence are quite limited and there have been no studies which use the most recent DSM-5 diagnostic criteria or studies that compare the outcomes of DSM-IV and DSM-5 insomnia disorders. This study aimed to investigate the natural course and incidence of insomnia symptoms, DSM-IV and DSM-5 insomnia disorders over two years in the general population of Hong Kong. The findings will be discussed in terms of ethnic difference in the prognosis of insomnia and public health implications.

Methods

Sample

The baseline population was derived from an epidemiological survey on the prevalence of insomnia [21]. Participants were Hong Kong residents who were ≥ 18 years and able to communicate in Cantonese or Mandarin Chinese languages. The randomization process was divided into randomization of telephone numbers and selection of respondents in households according to the next birthday rule. Telephone numbers in Hong Kong are listed in telephone

directories automatically unless customers request their numbers be withheld. We selected telephone numbers randomly from the computerized residential telephone directories, with no stratification applied and generated some unlisted numbers by adding and subtracting 1 and 2 from the selected numbers. Verbal consent was obtained from all participants and all procedures used in this study were reviewed and approved by the local institutional review board. We successfully interviewed 2,011 subjects from July 24 to December 6, 2012 (Chung et al., 2015), and 1,054 (52.4%) gave consent for further interviews. We were able to contact 566 of the 1,054 participants one year after baseline, while 398 participants completed baseline, first and second year assessments.

Measures

We used the Brief Insomnia Questionnaire (BIQ), a standardized interviewer-administered questionnaire, to derive insomnia symptoms and DSM-IV and DSM-5 insomnia diagnoses. The BIQ was first developed for use in a large-scale epidemiological study in the U.S. (Kessler et al., 2010). The BIQ enquires the frequency, severity, and duration of difficulties initiating or maintaining sleep, early morning awakening, and nonrestorative sleep in a typical week and the distress and daytime impairments that are associated with insomnia. We have translated the BIQ into Chinese and added several questions for the diagnosis of DSM-5 insomnia disorder. Classification as an insomnia disorder is based on a standardized BIQ scoring algorithms. The Chinese version of the BIQ has been shown to be valid and reliable

in deriving insomnia diagnoses (Chung et al., 2014; Chung et al., 2015).

Procedure

A lay-administered telephone interview was conducted. The first section included an introduction and verbal consent, followed by the BIQ and sociodemographic data, including age, gender, occupation, and level of education.

Sleep status groups

Normal sleepers were defined in line with the DSM-5 quantitative criteria as those with no problem sleeping or difficulties initiating or maintaining sleep, early morning awakening, or non-restorative sleep at most two times per week. Classification as DSM-IV and DSM-5 insomnia disorders were based on the BIQ algorithms. The major difference between DSM-IV and DSM-5 is that the duration of insomnia has to be at least one month for DSM-IV and three months for DSM-5. For DSM-5, insomnia symptoms have to be present at least three times per week, while the frequency of insomnia symptoms is not mentioned in DSM-IV. In this study, participants who were not normal sleepers and did not fulfill insomnia disorder diagnoses were classified as having insomnia symptoms.

Definitions of persistence, remission, relapse, and incidence

Persistence was defined as continuance at the same sleep status for at least two consecutive years. Remission was a change from insomnia symptoms or disorders at baseline to normal

sleep for at least once. Relapse was defined as a return to insomnia symptoms or disorders after remission. Incidence was an occurrence of insomnia symptoms or disorders for at least once among normal sleepers at baseline.

Data analysis

All statistical analysis was done by SPSS 21.0. Basic descriptive statistics were calculated to determine sample characteristics. All prevalence estimates were calculated by weighting the cases according to the population distribution of sex and age. Adjusted rates of persistence, remission, relapse, and incidence with 95% confidence interval were calculated.

Results

Table 1 presents the socio-demographic characteristics of the sample. Participants had a mean age of 54.4 years. About 60% were females, 70% had secondary education or above and 76.1% were married. The study sample had higher mean age, a lower proportion of people with tertiary education, and a higher proportion of married people, retirees, and homemakers, compared with the census population. The respective proportion of normal sleepers, subjects with insomnia symptoms, DSM-IV and DSM-5 insomnia disorder was 44.0%, 30.4%, 25.6%, and 14.6%.

Persistence, remission, relapse, and incidence rate

Persistence from baseline for two consecutive years was 26.3%, 26.4%, and 23.0% for insomnia symptoms and DSM-IV and DSM-5 insomnia disorder, respectively, while

persistence for at least one year was 47.6%, 51.5%, and 39.7% (Table 2). Remission at least once was 55.8%, 22.9%, and 26.1% for insomnia symptoms and DSM-IV and DSM-5 insomnia disorder, while relapse after remission was 21.8%, 1.3%, and 0%, respectively. Incidence of insomnia symptoms and DSM-IV and DSM-5 insomnia disorder at least once for subjects with normal sleep at baseline was 62.4%, 19.6%, and 4.5%, respectively.

Trajectories of DSM and DSM-5 insomnia disorder

Table 3 presents the 3 most frequent trajectories of DSM-IV and DSM-5 insomnia disorder. The most frequent trajectory for DSM-IV insomnia disorder was to remain in the same status for all 3 years (26.4%), followed by a change from DSM-IV insomnia disorder at baseline to insomnia symptoms at the first and second years (25.7%), while the third most frequent trajectory was to remain in the same status at baseline and the first year with a change to insomnia symptoms at the second year (17.3%).

The trajectories of DSM-5 insomnia disorder were quite similar to those of DSM-IV. The most frequent trajectory was for subjects with DSM-5 insomnia disorder at baseline to change to insomnia symptoms at the first and second years (28.3%), followed by having insomnia disorder during all assessments (23.0%). The third most frequent trajectory was for them to remain in the same status at the first year, but a change to insomnia symptoms at the second year (14.0%).

Discussion

This is the first systematic study examining the natural course of insomnia using the most recent DSM-5 diagnostic criteria in an Asian sample. We found that persistence of insomnia disorder was 26.4% based on DSM-IV and 23.0% by DSM-5 criteria. Our persistence rates are compatible with the 35.4% in a Korean study (Suh et al., 2014), but much lower than the 66.1% in a U.S. study (Morin et al., 2009). It is possible that participants in the U.S. study were automatically classified as having insomnia disorder if they used sleep medication, while for other studies, the natural course of insomnia was examined; hence successful treatment of insomnia might have resulted in a lower persistence rate. Persistence of DSM-IV and DSM-5 insomnia disorders for at least one year were estimated at 51.5% and 39.7% in our study, which were compatible with a 1-year follow-up study in Sweden (Jansson-Fröjmark & Linton, 2008). Persistence of insomnia symptoms and insomnia disorder were similar in our study, instead of a higher persistence rate for insomnia disorder in a U.S. study (Morin et al., 2009). However, due to differences in case definition, a definitive conclusion is not possible.

In our study, remission was higher for insomnia symptoms than for insomnia disorder. About 56% of those with insomnia symptoms had at least one remission during a 2-year period, but only about one-quarter of those with insomnia disorder experienced remission. Given the fact that remission for insomnia disorder is quite low, it is important to examine whether the problem is due to a lack of treatment, under-treatment, or a resistance to

treatment. A previous study has shown that Asian, especially the Chinese, is more likely to use non-prescribed medications to treat their insomnia (Xiang et al., 2008). As non-prescribed medications are less effective than prescribed medications for insomnia, further studies should look into the barriers to treatment-seeking among Asian, which are also common in the Western population (Stinson, Tang, & Harvey, 2006).

Compared to the 11.8% relapse rate of insomnia disorder in Morin's (2009) study, the relapse rate of DSM-IV and DSM-5 insomnia disorder in our sample is very low, estimated at 1.3% and 0%. Unlike Morin's study, which lasted for three years, our 2-year study period may be too short for relapse to occur. The incidence rate for insomnia symptoms is high in our sample, estimated at 62.4%, compared to 30.7% in a Canadian study (Morin et al., 2009), suggesting that people in Hong Kong may develop insomnia more easily than the Western population. Regarding the trajectories of insomnia disorder, we found that it is more common for insomnia disorder to change to insomnia symptoms at least once during a 2-year follow-up than to remain in the same status, but a return to normal sleep is not common. The findings suggest that the natural course of insomnia may be fluctuating, but a complete remission is uncommon.

A recent study using a monthly assessment design has also found significant fluctuations of sleep status over a 12-month period (Morin et al., 2014). Two-third of the participants changed sleep status at least once, and it was the highest for insomnia symptoms (93.4%),

followed by insomnia disorder (59.5%), and good sleepers (51.5%). Our findings agree with that changes in sleep status are common in the general population. The most common pattern in our study was a change from normal sleep to insomnia symptoms at least once over two years, which happened in 62.4% of normal sleepers at baseline. A change from insomnia symptoms to normal sleep was also common, based on the 55.8% remission for at least once over two years. Persistence of insomnia symptoms and insomnia disorders in all 3 years was roughly 25% in our study.

Contrary to our expectation that prognosis is worse if duration of insomnia is longer, we found that DSM-IV and DSM-5 insomnia disorders have similar persistence and remission rates. However, incidence of DSM-IV insomnia disorder is higher than that of DSM-5 insomnia disorder, perhaps due to the more stringent criteria in DSM-5.

A few methodological issues should be considered when interpreting our study findings. First, our sample size is small, resulting in a wide confidence interval in our estimates. Another limitation is that the sample is skewed toward older, educated, and retired people and homemakers. We used the BIQ for case definition; although it is a valid instrument, the agreement with clinical interviews is not 100% and the sensitivity of BIQ in detecting DSM-5 insomnia disorder varies substantially with the use of normal control or super-normal control samples (Chung et al., 2014). Past history of insomnia and treatment history w~~as~~ere not asked; hence we are unable to analyze ~~its~~ their impacts on the longitudinal course of insomnia. A

recent study on community-based Hong Kong Chinese subjects suggested that help-seeking behavior for insomnia was only reported in 40% of them (Liu et al., 2016), and they mostly sought help from complementary and alternative medicine but not treatments with stronger evidence base. ~~We planned to examine the natural course of insomnia; hence the use of sleep medication was not included in our survey.~~

In conclusion, there is no evidence to support that the prognosis of insomnia is markedly different between Hong Kong and the Western population. However, the incidence of insomnia is very high in Hong Kong, up to 62.4%, compared to around 30.7% in a Canadian study (Morin et al., 2009). Fluctuations of sleep status are common in the Hong Kong general population, but most of the fluctuations are between normal sleep and insomnia symptoms and between insomnia symptoms and insomnia disorder. A significant proportion of the general population is chronically affected by either insomnia disorder or insomnia symptoms. Only one-quarter of the subjects with insomnia disorder attained normal sleep during a 2-year follow-up period. A lack of treatment, under-treatment, and a resistance to treatment are issues to be tackled in a public health perspective of insomnia. Studies are needed to examine the cross-cultural difference in barriers to help-seeking for insomnia and the preferred treatments in the general population.

Declaration of Conflicting Interests

The Authors declare that there is no conflict of interest.

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Table 1. Socio-demographic characteristics of the participants who completed all assessments and sleep status at baseline.

Variables	**Completed all assessments (N = 398)**	**Hong Kong general population aged ≥ 18 yr[b] (N = 5,999,455)**
Age in yr, mean (SD)	54.4 (16.9)	46.5 (17.2)
Male/female	154/244 (1/1.16)	1/1.18
Education, N (%)		
Primary	121 (30.4)	23.7%
Secondary	191 (48.0)	48.4%
Tertiary	86 (21.6)	28.3%
Marital status, N (%)[a]		
Never married	62 (15.6)	28.8%
Married	302 (76.1)	60.1%
Divorced	12 (3.0)	4.1%
Cohabited, separated or widowed	21 (5.3)	7.0%
Occupation, N (%)[a]		
Professional and associate professional	66 (16.6)	22.0%
Skilled and semi-skilled worker	69 (17.4)	26.1%
Unskilled worker	16 (4.0)	11.8%
Retired	116 (29.2)	18.0%
Students	19 (4.8)	2.5%
Homemakers/others	101 (25.4)	17.5%
Unemployed	10 (2.5)	2.1%
Income in HK$, N (%)[a]		
No income	202 (51.9)	40.3%
< $10,000	84 (21.6)	23.2%
$10,000-19,999	52 (13.4)	20.0%
$20,000-29,999	27 (6.9)	7.3%
>$30,000	24 (6.1)	9.2%
Normal sleepers, N (%)	175 (44.0)	
Insomnia symptoms, N (%)	121 (30.4)	
DSM-IV insomnia disorder, N (%)	102 (25.6)	
DSM-5 insomnia disorder, N (%)	58 (14.6)	

[a] Difference from total N reflects omissions on reporting forms. [b] Population census 2011.

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Table 2. Persistence, remission, relapse, and incidence of insomnia symptoms and insomnia disorders.

	Baseline		
	Insomnia symptoms (N=121)	**DSM-IV insomnia disorder (N = 102)**	**DSM-5 insomnia disorder (N = 58)**
Persistence			
1-year	21.3% (14.0 - 28.6%)	25.1% (16.7% - 33.5%)	16.7% (7.1% - 26.3%)
2-year	26.3% (18.5 - 34.1%)	26.4% (17.9% - 35.0%)	23.0% (12.2% - 33.8%)
At least 1 year	47.6% (38.7 – 56.5%)	51.5% (41.8% - 61.2%)	39.7% (27.1% - 52.3%)
Remission			
At least 1 year	55.8% (47.0 – 64.7%)	22.9% (14.8% - 31.1%)	26.1% (14.8% - 37.4%)
Relapse	21.8% (14.4 – 29.2%)	1.3% (0.0% - 3.5%)	0%
	Normal sleepers at baseline (N =175)		
Incidence			
At least 1 year	62.4% (53.8% - 71.0%)	19.6% (13.7% - 25.5%)	4.5% (1.4% - 7.6%)

Rates are expressed in % (95% confidence interval) after adjustment for population distribution of sex and age.

Table 3. The top 3 trajectories for DSM-IV and DSM-5 insomnia disorders in 2 years.

Baseline with DSM-IV insomnia disorder (N = 102)	
Sleep status at baseline – 1st year – 2nd year	
Disorder – Disorder – Disorder	26.4%
Disorder – Symptoms – Symptoms	25.7%
Disorder – Disorder – Symptoms	17.3%
Baseline with DSM-5 insomnia disorder (N = 58)	
Sleep status at baseline – 1st year – 2nd year	
Disorder – Symptoms- Symptoms	28.3%
Disorder – Disorder – Disorder	23.0%
Disorder – Disorder – Symptoms	14.0%

Rates are adjusted for population distribution of sex and age