Original Article

Public Health Section

Prevalence of Insomnia and its Associated Factors among Aged Population in an Urban Locality of Bengaluru, Karnataka, India- A Cross-sectional Study

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ABSTRACT

Introduction: Insomnia is a major public health concern among the aged population due to its impact on quality of life and raises an economic burden to the family and community. However, in the Indian scenario, the lack of information from community-based studies, stresses the need to assess the prevalence and factors associated with insomnia.

Aim: To find out the prevalence of insomnia and its associated factors, among aged population in an urban locality of Bengaluru, Karnataka, India.

Materials and Methods: This cross-sectional study was conducted in the urban field practise area of a Medical College in Bengaluru, Karnataka, India, with 880 elderly subjects, from October 2016 to March 2017. Using Probability Proportional to Size (PPS), study subjects were surveyed in eight urban localities under Urban Health Training Centre. Insomnia was assessed by using {Difficulty in Maintaining Sleep (DSM)-IV-TR} diagnostic criteria. Variables

associated with insomnia such as socio-personal characteristics and financial status was also assessed. The data was analysed using Chi-square test.

Results: The mean age of study subjects was 67.5 ± 3.4 years and 455 (51.7%) were females and 425 (48.3%) were males. The prevalence of insomnia among aged population was 571 (64.9%) and prevalence of insomnia was more among females (p<0.001), Hindu by religion (p=0.001), unemployed (p<0.001), single (p<0.001), those with poor Self-Perceived Health (SPH) status (p<0.001), chronic diseases (p<0.001), history of stressful life events (p<0.001), with financial dependency (p<0.001) and social assistance (p<0.001).

Conclusion: The present study revealed high prevalence of insomnia in female, Hindu religion, unemployment, single, poor SPH status, presence of chronic diseases, history of stressful life events, presence of financial dependency and social assistance found to be significantly associated with insomnia.

INTRODUCTION

Sleep is a recurrent state of reduced attention to the surrounding environment, which is essential to restore body functions, memory and cognitive performance. It also plays a vital role in the normal functioning of the endocrine and immune systems [1]. An average individual requires 7-9 hours of good quality sleep daily, thereby spending around one-third of his life span in sleep [1].

Ageing brings about changes in deep and restorative sleep. Hence, the number and duration of overnight arousal periods increase the risk of insomnia among aged people [2]. Insomnia is one of the most common sleep disorders and an indicator of poor mental health among the aged population [3]. It is characterised by subjective complaints of difficulty in initiating sleep, maintaining sleep and early morning awakenings. This is associated with significant daytime consequences such as fatigue, decreased energy, problems with cognitive functions and mood disturbances, which can produce distress and functional impairments, especially among the aged [4].

Insomnia is associated with a wide range of adverse health effects including increased risk of hypertension, diabetes mellitus, obesity, immune deficiency, coronary heart disease, and stroke. Conversely, aged individuals with any of these diseases are at higher risk of developing insomnia [5]. It is also associated with higher rates of relationship difficulties, poor quality of life and substance abuse [6]. These evidences show that insomnia is a multifactorial geriatric health condition that requires both preventive and curative approaches.

The studies on insomnia among the aged population have shown that the prevalence of insomnia ranges from 22-70% [7,8]. This wide

difference may be due to variation in the use of definition, assessment methods and demographic characteristics of the study population. In India, the aged population which accounted for 8.6% of the total population in 2011 is expected to increase to 19.5% by 2050 [9]. This demographic transition further increases the burden of insomnia and can become a serious public health challenge in the near future.

Extensive review of literature has found few studies on insomnia in developing country like India [10,11], but present study was first of its kind which involved gold standard internationally accepted DSM-TR criteria for diagnosis of insomnia [12]. Hence, the present study was undertaken with an aim to find out the prevalence and factors associated with insomnia among the aged population from the urban part of Bengaluru, Karnataka, India, where urbanisation poses a threat to their physical and mental well-being.

MATERIALS AND METHODS

A cross-sectional study was conducted in an urban field practise area of a Medical College, Bengaluru, Karnataka, India, from October 2016 to March 2017. A study was commenced, after approval from the Institutional Ethics Committee (IEC number-KIMSIEC/D-13/2015) and informed written consent was obtained from all the study subjects.

Inclusion criteria: Subjects aged ≥60 years, who were residing in the locality for more than six months and willing to participate in the study, were included.

Exclusion criteria: Those with cognitive impairment, speech and hearing difficulty were excluded.

Sample size calculation: The sample size was estimated using the formula $n=4pq/d^2$. The prevalence of insomnia "p" among elderly was 49% with relative precision of 10%. The sample size was estimated to be 880, by using a design effect of two and the addition of a 10% error [13].

By employing Probability Proportion to Size (PPS) technique, 880 aged subjects were enrolled from eight localities. (Yarab nagar-253, Bhavani nagar-77, Teachers colony-65, Umar bhag-95, Gangadhar nagar-84, Pragathi pura-126, Sarbhande palya-114, Hari colony-66) totally accounting to the population of 43059.

Study Procedure

In the study, insomnia was assessed by using DSM-IV-TR diagnostic criteria [12]. It includes prominent complaint of: a). Difficulty in initiating sleep for ≥30 minutes; b) Difficulty in maintaining sleep-waking three or more times at night; c) Waking too early in the morning-30 or more minutes early; d). Suffering from non restorative sleep (feeling of unrefreshed sleep) for ≥3 days a week in atleast one month. Insomnia was defined as presence of any one of above criteria. The validity and reliability of the DSM-IV-TR diagnostic criteria was adopted based on the previous study which found Cronbach's coefficient alpha of 0.95 [14].

Data on variables such as socio-personal characteristics (age, gender, religion, education, employment status, marital status, type of family, living arrangement, standard of living index (five criteria such as house type, source of lighting, toilet facility, financial status, main fuel for cooking and source of drinking water-these were given score and divided into three category-Low: 0-14, Medium: 15-24, High: 25-27) [15], social assistance, ownership of the property), substance use (currently using chewable and smoked tobacco, alcohol and beverages, physical exercise practices (engaging in minimum of five days/week). SPH status (subjective expression of current health status), chronic diseases lasting more than three months based on clinical examination and physician's report, central obesity using waist circumference (>90 and >80 cm for men and women, respectively for Asian Indians) [16] and stressful life events in the past one year (any loss or death or diagnosis of new disease) and details on current financial condition of study subject were collected.

The households of the subjects were visited by an investigator who underwent training for evaluation of insomnia in the department of psychiatry. After briefing the purpose of the study and getting informed consent, the subjects were interviewed using a pretested, semi-structured proforma consisting 37 questions, which was designed by consulting experts from community medicine and psychiatry, and pilot tested. At the end of the interview, every subject was educated on consequences of insomnia and importance of sleep hygiene.

STATISTICAL ANALYSIS

The data was collected, analysed using STATA/MP 14.0 and interpreted in terms of descriptive statistics such as percentage, range, mean, and standard deviation and inferential statistics such as Chi-square test to find out the association between insomnia and selected variables. Differences at a p-value of ≤0.05 were considered statistically significant.

RESULTS

In the present study, out of 880 aged subjects, 455 (51.7%) were females and 425 (48.3%) were males. The mean age of study subjects was 67.5±3.4 years with a range of (60-95 years).

Socio-personal characteristics of the aged subjects showed that the majority 584 (66.3%) belonged to the age group of 60-69 years, 499 (56.7%) were Hindu by religion, 527 (59.9%) of subjects were literates, 628 (71.4%) unemployed, 654 (74.3%) married, 497 (56.5%) were in non nuclear family. A total of 799 (90.8%) of the

study subjects were living with family members. 691 (78.5%) belong to high standard of living index, 845 (96%) of subjects were on substance use, and 806 (91.6%) were central obese [Table/Fig-1].

Variables	Category	Frequency (%)
Age (years)	60-69	584 (66.3)
	70-79	254 (28.9)
	≥80	42 (4.8)
Gender	Female	455 (51.7)
	Male	425 (48.3)
Religion	Hindu	499 (56.7)
	Non Hindu	381 (43.3)
Education	Illiterate	527 (59.9)
	Literate	353 (40.1)
Employment status	Unemployed	628 (71.4)
	Employed	252 (28.6)
Marital status	Married	654 (74.3)
	Single	226 (25.7)
Type of family	Nuclear	383 (43.5)
	Non nuclear	497 (56.5)
Living arrangement	Living alone	81 (9.2)
	Living with family	799 (90.8)
Standard of living Index	High	691 (78.5)
	Medium	188 (21.4)
	Low	1 (0.1
Substance use	Yes	845 (96)
	No	35 (4)
Central obesity	obese	806 (91.6)
	Non obese	74 (8.4)

[Table/Fig-1]: Socio-personal characteristics of study subjects (N=880).

The prevalence of insomnia was 571 (64.9%), of whom 329 (72.3%) were females and 242 (56.9%) were males according to Diagnostic and Statistical Manual of Mental Disorders, fourth edition, Text Revision (DSM-IV-TR) criteria. Regarding the types of insomnia, majority, 480 (54.5%) had difficulty in initiating sleep, followed by 367 (41.7%) difficulty in maintaining sleep and 166 (18.9%) had early morning awakening [Table/Fig-2].

Types of insomnia	Category	Frequency (%)
Insomnia	Yes	571 (64.9)
	No	309 (35.1)
Difficulty Initiating Sleep (DIS)	Yes	480 (54.5)
	No	400 (45.5)
Difficulty Maintaining Sleep (DMS)	Yes	367 (41.7)
	No	513 (58.3)
Early Morning Awakening (EMA)	Yes	166 (18.9)
	No	714 (81.1)
Non Restorative Sleep (NRS)	Yes	328 (37.3)
	No	552 (62.7)

[Table/Fig-2]: Prevalence and type of insomnia among study subjects (N=880).

The prevalence of insomnia was significantly more among females 329 (72.3%) compared to males 242 (56.9%) and significantly more among subjects from Hindu religion 346 (69.3%) compared to non Hindu 225 (59%), out of total 571 subjects with insomnia, majority 446 (71.0%) were unemployed, 385 (58.9%) were married and those with poor SPH status 419 (76.5%) compared to good health status 152 (45.8%), presence of chronic diseases 405 (75.1%) compared to those without 166 (48.7%) and history of stressful events 260 (87.8%) compared without 311 (53.3%) had significantly more prevalence of insomnia (p-value <0.001) [Table/Fig-3].

Variables	Category	Total (N=880)	Insomnia (N=571)	No insomnia (N=309)	p-value
Age (years)	60-69	584	378 (64.7)	206 (35.3)	0.9
	≥70	296	193 (62.2)	103 (37.8)	
Gender	Female	455	329 (72.3)	126 (27.7)	<0.001
	Male	425	242 (56.9)	183 (43.1)	
Religion	Hindu	499	346 (69.3)	153 (30.7)	0.001
	Non hindu	381	225 (59.0)	156 (41.0)	
Education	Illiterate	527	344 (65.3)	183 (34.7)	0.8
	Literate	353	227 (64.3)	126 (35.7)	
Employment status	Employed	252	125 (49.6)	127 (50.4)	<0.001
	Unemployed	628	446 (71.0)	182 (29.0)	
Marital status	Single	226	186 (82.3)	40 (17.7)	<0.001
	Married	654	385 (58.9)	269 (41.1)	
Type of family	Nuclear	383	243 (63.4)	140 (36.6)	0.4
	Non nuclear	497	328 (66)	169 (34)	
Living arrangement	Alone	81	48 (59.3)	33 (40.7)	0.3
	With family	799	523 (65.5)	276 (34.5)	
Substance use	Yes	845	547 (64.7)	298 (35.3)	0.7
	No	35	24 (68.6)	11 (31.4)	
Physical exercise practices	No	640	407 (63.6)	233 (36.4)	0.2
	Yes	240	164 (68.3)	76 (31.7)	
Self-perceived health	Good	332	152 (45.8)	180 (54.2)	<0.001
	Poor/average	548	419 (76.5)	129 (23.5)	
Chronic diseases	No	341	166 (48.7)	175 (51.3)	<0.001
	Yes	539	405 (75.1)	134 (24.9)	
Central obesity	Obese	806	531 (65.9)	275 (34.1)	0.05
	Non obese	74	40 (54.0)	34 (46.0)	
Stressful life events	No	584	311 (53.3)	273 (46.7)	<0.001
	Yes	296	260 (87.8)	36 (12.2)	

[Table/Fig-3]: Association between insomnia and socio-personal characteristics.

Similarly, majority who had financial dependency 515 (67%) and presence of social assistance 389 (70.7%) were also found to be significantly associated with insomnia (p-value <0.001). Subjects with high standard of living index 453 (65.6%) had more prevalence of insomnia but the difference was not found significant (p-value=0.40) [Table/Fig-4].

Variables	Category	(n=880)	Insomnia (n=571)	No insomnia (n=309)	p-value
Standard of living index	High	691	453 (65.6)	238 (34.4)	0.40
	Low	189	118 (62.4)	71 (37.6)	
Financial dependency	Yes	769	515 (67.0)	254 (33.0)	<0.001
	No	111	56 (50.5)	55 (49.5)	
Social assistance	Yes	550	389 (70.7)	161 (29.3)	<0.001
	No	330	182 (55.2)	148 (44.8)	
Ownership of property	Yes	281	175 (62.3)	106 (37.7)	0.3
	No	599	396 (66.1)	203 (33.9)	

[Table/Fig-4]: Association between insomnia and financial status.

DISCUSSION

The present study revealed that the prevalence of insomnia among the aged population was 64.9%. Similarly, Jaussent I et al., observed a prevalence of 70% [8]. These findings strengthen the evidence that insomnia is a highly prevalent and serious health concern among the aged population. Types of insomnia showed that Difficulty in Intimating Sleep (DIS) was most prevalent (54.5%). The result is consistent with the study by Allah ESA et al., [17]; and contrary to these results Jaussent I et al., found DMS was most common

[8]. Available evidence shows that DMS is the most common type of insomnia among the elderly due to sleep fragmentation caused by ageing changes in the physiology of sleep patterns [18]. These results need to be probed further.

Insomnia was significantly associated with gender where prevalence was high among females. The result is consistent with a study by Gouthaman R and Devi R [10]. This may be due to the high level of concern and anxiety expressed by females due to responsibilities in household activities. Interestingly, insomnia was more among subjects from Hindu religion which needs to be probed further in future research.

The present study revealed significant association between insomnia and employment, where prevalence was high among the unemployed. The result is consistent with studies carried out by Dangol M et al., and Ogunbode AM et al., [19,20]. These facts strengthen the evidence that employment is an important determinant of income and usually unemployment is associated with poor physical and mental health leading to insomnia.

Association of insomnia with marital status found that prevalence of insomnia was high among living single. The finding is in line with a study undertaken by Gouthaman R and Devi R and Das S et al., [10,11]. This association could be due to a lack of emotional and social support. Insomnia was significantly associated with SPH status where insomnia was high among poor/average SPH status. Similarly, a study by Silva J et al., and Magee CA et al., observed that insomnia was strongest predictor of poor SPH [21,22]. This may be because frail aged subjects with poor familial and social support will evaluate their health negatively thereby increasing the risk of insomnia.

Association between insomnia and chronic conditions was found significant. This result is in agreement with a study by Koyanagi A et al., involving nine nations [23]. Probably, the association could be due to disturbance in the Non Rapid Eye Movement (NREM) sleep leading to derangement in physiological, neurological, and hormonal processes due to chronic diseases. In the present study, association between insomnia and stressful life events were found to be significant. This could be due to mental stress caused by these events and also increased activation of the Locus-Coeruleus Norepinephrine (LC-NE) system and Hypothalamic-Pituitary-Adrenocortical (HPA) axis during the stressful period which can increase excitability leading to insomnia [24,25].

The present study observed that financial dependency was significantly associated with insomnia. Similar results were observed in a study conducted by Dangol M et al., [18]. The prevalence of insomnia was higher among (66.1%) of the study subjects, who did not own any property. This could be due to anxiety and distress caused by financial insecurity. Interestingly, the study revealed that the elderly getting social assistance were also at risk of insomnia. In this regard, further research is needed to confirm the results.

Limitation(s)
There is a possibility of recall bias because of the retrospective nature of enquiry about sleep-related information from past weeks.

CONCLUSION(S)

The study revealed nearly two-thirds of the aged population were suffering from insomnia and associated with factors such as female gender, Hindu by religion, unemployment, single, poor SPH, presence of chronic diseases, stressful life events and financial status. In this context, early detection and appropriate intervention coupled with education on sleep hygiene at primary care will ensure the quality of life among the aged and primary care physicians should be sensitised to consider risk factors for insomnia. There

is a need for similar large sampled research in different settings to confirm study results.

Acknowledgement

REFERENCES

[1] Zadeh SS, Begum K. Comparison of nutrient intake by sleep status in selected adults in Mysore, India. Nutr Res Pract. 2011;5(3):230-35.

[2] Fortier-Brochu E, Morin CM. Cognitive impairment in individuals with insomnia: Clinical significance and correlates. Sleep. 2014;37(11):1787-98.

[3] Grandner MA, Alfonso-Miller P, Fernandez-Mendoza J, Shetty S, Shenoy S, Combs D. Sleep: Important considerations for the prevention of cardiovascular disease. Curr Opin Cardiol. 2016;31(5):551-65.

[4] Roth T. Insomnia: Definition, prevalence, etiology, and consequences. J Clin Sleep Med. 2007;3(5):S7-10.

[5] Chakravorty S, Vandrey RG, He S, Stein MD. Sleep management among patients with substance use disorders. Med Clin North Am. 2018;102(4):733-43.

[6] Roth T, Coulouvrat C, Hajak G, Lakoma MD, Sampson NA, Shahly V, et al. Prevalence and perceived health associated with insomnia based on DSM-IV-TR; International Statistical Classification of Diseases and Related Health Problems, Tenth Revision; and Research Diagnostic Criteria/International Classification of Sleep Disorders, Second Edition criteria: Results from the America Insomnia Survey. Biol Psychiatry. 2011;69(6):592-600.

[7] Kim WH, Kim BS, Kim SK, Chang SM, Lee DW, Cho MJ, et al. Prevalence of insomnia and associated factors in a community sample of elderly individuals in South Korea. Int Psychogeriatr. 2013;25(10):1729-37.

[8] Jaussent I, Dauvilliers Y, Ancelin ML, Dartigues JF, Tavernier B, Touchon J, et al. Insomnia symptoms in older adults: Associated factors and gender differences. Am J Geriatr Psychiatry. 2011;19(1):88-97.

[9] Longitudinal ageing study in India (LASI)-Wave 1. India Report, 2020. https://www.iipsindia.ac.in/sites/default/files/LASI_India_Report_2020_compressed.pdf. (Accessed on 01.06.2020 at 11:30 am).

[10] Gouthaman R, Devi R. Descriptive study on sleep quality and its associated factors among elderly in urban population: Chidambaram. Int J Community Med Public Health. 2019;6:1999-2003.

[11] Das S, Roy RN, Das DK, Chakraborty A, Mondal R. Sleep quality and its various correlates: A community-based study among geriatric population in a community development block of Purba Bardhaman district, West Bengal. J Family Med Prim Care. 2020;9:1510-16.

[12] Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition: DSM-IV-TR. American Psychiatric Association. Washington, DC. 2005. file:///D:/FINAL%20TOSHIBA%20LAPTOP%20CONTENT%20%2030.06.18/THESIS%20GUIDE%20%20SAI%20RAM/THESIS%20GUIDE/5TH%20THESIS%20%20Dr%20THEJASWINI/RESEARCH%20ARTICLES/JCDR/DSM_IV_TR_Diagnostic_and_statistical_man%20(1).pdf. (Accessed on 07.10.2022 at 1:30 pm).

[13] Sanjay TV, Jahnavi R, Gangaboraiah B, Lakshmi P, Jayanthi S. Prevalence and factors influencing depression among elderly living in the urban poor locality of Bengaluru city. Int J Health Allied Sci. 2014;3:105-09.

[14] Stinchfield R, McCready J, Turner NE, Jimenez-Murcia S, Petry NM, Grant J, et al. Reliability, validity, and classification accuracy of the DSM-5 diagnostic criteria for gambling disorder and comparison to DSM-IV. J Gambl Stud. 2016;32(3):905-22.

[15] Muniyandi M, Ramachandran R, Gopi PG, Chandrasekaran V, Subramani R, Sadacharam K, et al. The prevalence of tuberculosis in different economic strata: A community survey from South India. Int J Tuberc Lung Dis. 2007;11:1042-45.

[16] Babu MS. Can waist circumference be a screening tool for obesity? APIK J Int Med. 2020;8:02-03.

[17] Allah ESA, Abdel-Aziz HR, El-Seoud ARA. Insomnia: Prevalence, risk factors and its effect on quality of life among elderly in Zagazig City, Egypt. J Nur Edu Pract. 2014;4(8):52-69.

[18] Li J, Vitiello MV, Gooneratne NS. Sleep in normal aging. Sleep Med Clin. 2018;13(1):01-11.

[19] Dangol M, Shrestha S, Rai Koirala SK. Insomnia and its associated factors among older people of selected ward of Banepa municipality, Nepal. Nurs Open. 2019;7(1):355-63.

[20] Ogunbode AM, Adebusoye LA, Olowookere OO, Owolabi M, Ogunniyi A. Factors associated with insomnia among elderly patients attending a geriatric centre in Nigeria. Curr Gerontol Geriatr Res. 2014;2014:780535.

[21] Silva J, Truzzi A, Schaustz F, Barros R, Santos M, Laks J. Impact of insomnia on self-perceived health in the elderly. Arq Neuropsiquiatr. 2017;75(5):277-81.

[22] Magee CA, Caputi P, Iverson DC. Relationships between self-rated health, quality of life and sleep duration in middle aged and elderly Australians. Sleep Med. 2011;12(4):346-50.

[23] Koyanagi A, Garin N, Olaya B, Ayuso-Mateos JL, Chatterji S, Leonardi M, et al. Chronic conditions and sleep problems among adults aged 50 years or over in nine countries: A multi-country study. PLoS One. 2014;9(12):e114742.

[24] Leggett A, Burgard S, Zivin K. The impact of sleep disturbance on the association between stressful life events and depressive symptoms. J Gerontol B Psychol Sci Soc Sci. 2016;71(1):118-28.

[25] Li Y, Gu S, Wang Z, Li H, Xu X, Zhu H, et al. Relationship between stressful life events and sleep quality: Rumination as a mediator and resilience as a moderator. Front Psychiatry. 2019;10:348.

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