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# Assessment of Sleep Quality among Hypnotic Users in Geriatric Population – A Prospective Observational Study

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## ABSTRACT

Geriatrics accounts for 7% of the total world population. As age advances apartfrom health, sleep quality also becomes compromised in geriatrics. In addition, an increased incidenceof insomnia has been noted in the elderly. As a result geriatric population constitutes the largestconsumers of hypnotics. The aim of the study was to assess the effectiveness of hypnotics prescribedfor insomnia in the geriatric population. A prospective study for a period of ten months wascarried out in the geriatric population who consumed at least one hypnotic during their hospital stay. A total of 93 patients were included in the study. Data was collected from the patient's case report forms.The sleep quality was assessed using Pittsburgh Sleep Quality Index and the patients were categorizedbased on their PSQI score. A total of 93 patients who met the inclusion criteria were includedin the study. Among them 49(53%) were female and 44(47%) were male. 59(63%) patients of thestudy population were experiencing trouble in falling asleep, 47(51%) were complaining of lessduration of sleep and 43(46.2%) were complaining early morning awakening as their major sleepcomplaint. The analysis of sleep quality by PSQI revealed that a total of 29% (27) patients had scoredless than 5 points (PSQI score) and had good quality sleep and the rest 71% (66) patients were foundto have poor quality of sleep. Zolpidem was found to be most effective for providing fast onset of sleep,diazepam for duration of sleep and clonazepam to reduce the early morning awakening. A statisticallysignificant improvement of sleep quality was observed in alprazolam 0.5mg and 0.25mg with a p-valueof 0.001 and 0.002 respectively.

**Keywords:** Sleep, Hypnotic, Geriatric Population

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## INTRODUCTION

Several physiological and psychological changes are known to occur as age advances. The decline in sleep quality is one among the changes that occur in geriatrics. Comorbid conditions, life style changes, changes in circadian rhythm, reduced physical activity,polypharmacy may contribute to alteration in normal sleep quality. Geriatric are most vulnerable population suggesting with poor sleep quality. Sleep disorders and hence abnormal sleep quality which compel them to seek medication help to maintain normal sleep pattern[1]. Pharmacological interventions and cognitive behavioral therapy are the most commonly practiced insomnia treatment in geriatrics. Pharmacological therapy includes, a number of medications that are available to treat insomnia such as benzodiazepines (BZDs), Z-drugs (BZD-Z), melatonin agonists and antidepressants. However their ability to provide quality sleep in geriatric is questionable and the treatment risk outweigh the benefit[2]. BZDs and non-benzodiazepines with other hypnotics need a special attention in geriatric use due to their high risk of producing adverse drug event (ADE). A research study revealed that 26% of benzodiazepine intended for anxiolytic use was inappropriate in geriatrics[3]. Hypnotics can alter postural stability and equilibrium which results in increased risk of falls and hip fractures especially in geriatrics during the time of drug induced sleep. Concomitant prescription of more than one drug for insomnia would increase the risk of postural instability. BZDs are also reported to cause increased cognitive decline in the elderly[5-7]. Studies suggest a positive correlation between adverse drug reaction (ADR) rateand increasing age. Almost 80% of ADRs that lead to hospital admissions or which occurs during hospital stay are type A reactions which are predictable, dose related and therefore can be avoided. There is an increased risk of ADRs among elderly patients as they receive polypharmacy. Greater attention to drug therapy safety seems to be necessary in elderly patients. Other preventable causes of drug-related problems include, drug interactions, inadequate monitoring, inappropriate drug selection, inappropriate treatment, lack of patient adherence, over-dosage, under-prescribing and untreated medical problems. On chronic use BZDs causes psychological dependence which in turn causes difficulties in case of tapering or discontinuation of BZDs. A periodic evaluation of quality of sleep and psychiatric status must be done in geriatrics patients using hypnotic drugs. In order to prevent any ADRs in the elderly, there need to be good communication and periodic reviewing. Lack of safe and effective treatment pattern for the treatment of insomnia might be the reason for increased prevalence of adverse drug reactions (ADR) in geriatric using hypnotic[8]. The outcomes of the hypnotic use are not well documented and there is a need for further study on sleep quality of

geriatric on hypnotic use. This study aims to assess the outcomes of sleep quality and ADR in geriatric patients using hypnotics.

## MATERIALS AND METHODS

It was a prospective, observational hospital based study carried out in a 640 bed multi-specialty corporate hospital located inSouth India.The period of study was ten months, from December 2012 to August 2013.All in-patients above 65 years of age, whose hospital stay is more than 7 days and prescribed with hypnotics for primary insomnia were included in the study. However, the patients who were unwilling to participate in the study, out-patients, critically ill patients, patients with comorbidity or on drugs which can alter the sleep and patients who are unable to communicate were excluded from the study.

### Procedure

The patients who satisfied the inclusion criteria and who gave the written consent were included in the study. The data was collected from the patient's case sheet, medication charts and laboratory investigation chart. The patient's quality of sleep was assessed using Pittsburg Sleep Quality Index (PSQI).The patient were interviewed using PSQI scale on the 1$^{st}$ day and 8$^{th}$ day of completion of 7 night doses of hypnotic drug. The PSQI is a tool used to measure the sleep quality and pattern in the older adult. It distinguishes "poor" from "good" sleep by assessing seven sleep domains: subjective quality of sleep, onset of sleep, duration of sleep, habitual sleep efficiency, disturbances of sleep, medication use for sleep and daytime dysfunction. The patient self-rates each of these seven domains of sleep. Scoring based on a 0 to 3 scale, whereby 3 reflect the negative extreme. A global sum of ≥5 indicates a "poor" sleeper. The PSQI has a reliability coefficient (Cronbach's alpha) of 0.83for its seven components and internal consistency. PSQI is a highly reliable and valid scale used worldwide to assess sleep qualities. Paired-sample t-test was conducted to compare the sleep quality of geriatrics before and after hypnotic use conditions and to compare individual drug effect on sleep quality.

## RESULTS AND DISCUSSIONS

### Study population

A total of 93 patients who met the inclusion criteria were included in the study. Among them 49(53%) were female and 44(47%) were male (figure 1). A study conducted by Morgan *et al*[9] reported similar to our study that the prevalence of use of hypnotics were more in females than in males. Age categorization of the patients showed 55(59%) patients were between the age group of 65-69 years, 16 (17%) were between 70-74, 14 (15%) were between 74-79 years and 8 (9%)

were≥80 age group. The maximum age of the study population was 88 years and mean age of hypnotic users was found to be 70.2±5.77 (figure 2). In our study hypnotics were prescribed more in females which is on par with other studies[10-14].

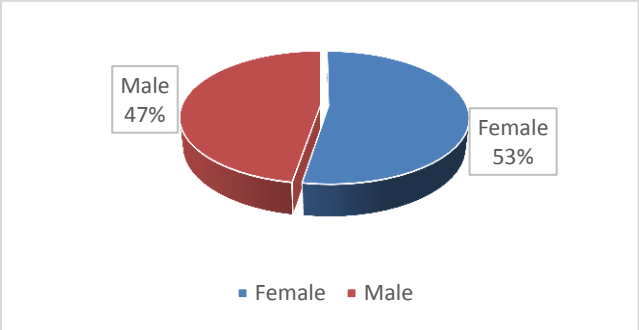


**Figure 1: Gender Categorization**

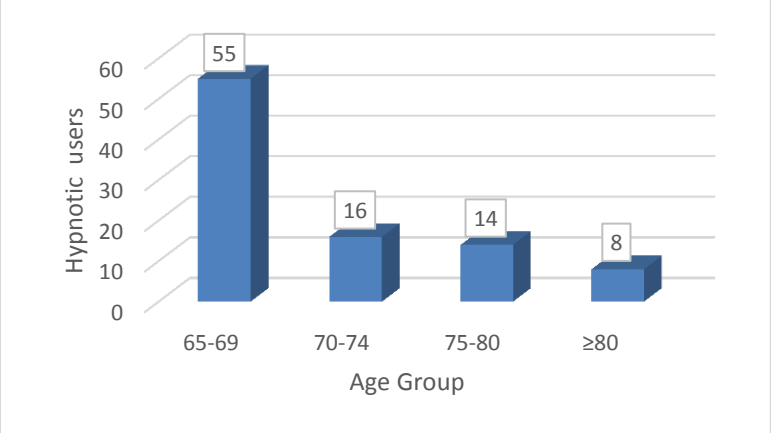


**Figure 2: Age Categorization**

**Clinical characteristics of study population**

The different clinical conditions apart from insomnia in the study population were analyzed. There were 54 (58%) suffering from hypertension, 37(40%) were suffering from diabetics mellitus, 28(30%) were suffering from cardio vascular diseases, 20(21%) were suffering from pyrexia, 16(17%) were having Dyslipidemia, 6(6%) had history of urinary tract infections, 6(6%) were suffering from acute/chronic renal failure, 5(5%) had anemia , 4(4%) were having liver disease, 2(2%) were suffering from congestive heart failure, 2(2%) had of rheumatoid arthritis and 12(13%) had other diagnosis such as allergy, spondylitis, gallstone, osteoarthritis etc. Most of the geriatrics will be having have more than one comorbid condition. The study population had more than one comorbidity. Result is consistent with other studies[15-16].

**Sleep complaints**

The study population was assessed for different sleep complaints and it was observed (figure 3) that 59(63%) patients of the study population were experiencing trouble in falling asleep (onset of

sleep), 47(51%) were complaining of less duration of sleep and 43(46.2%) were complaining early morning awakening. In the geriatric population, the most frequent sleep problems are onset of sleep or maintaining adequate amount of sleep[17]. They spend more time in bed to get sleep than usual though, the duration of sleep is slightly decreased, with an increase in early morning wake awakening and daytime napping[18].

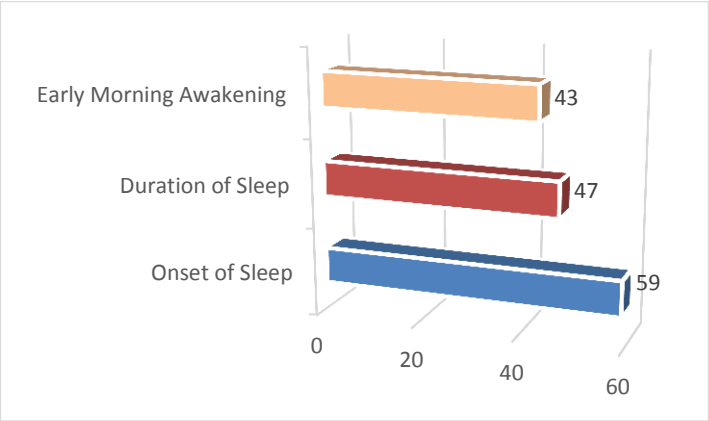


**Figure 3: Sleep Complaints among Study Population**

**Prescribing pattern of hypnotics**

Prescribing pattern of hypnotic drugs in study population were assessed and it was found that (figure 4) alprazolam 0.25mg was prescribed for 33(35%) patients, alprazolam 0.5mg for 16(17%), clonazepam 0.5mg for 15(16%), lorazepam 1mg 11(11.8%), zolpidem 5mg 11(11.8%) and diazepam 5mg 7(7.5%). A prescribing pattern study of benzodiazepine conducted by salim et alreported that the drug utilization of alprazolam and lorazepam was found to be the same (24%) of the study population. In our study alprazolam was prescribed more when compared to the former study[19].

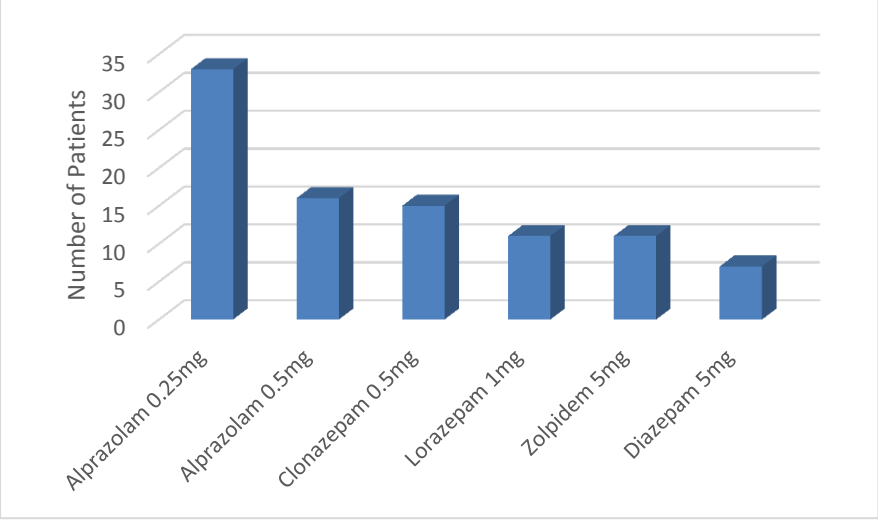


**Figure 4: Prescribing Pattern of Hypnotics**

**Assessment of sleep quality**

The assessment of sleep qualityon the day of admission of the patients showed a mean PSQI score of 11.4±3.6 with a maximum score of 21 and minimum score of 6. After 7 night doses of hypnotics, mean PSQI score of the study population was found to be 9.5±4.3 with a maximum score of 21 and minimum score of 3. According to PSQI score, after 7 night doses of hypnotics, it was observed that 22(23%) patients were good quality sleepers, who had scored less than 5 points of PSQI and 71(76%) patients were poor sleepers and had scored 5 or above in PSQI score (Table 1). Sleep complaints are common among the elderly [(1)]. After the drug use, the sleep quality increased but not enough to rate it as a good quality sleep according to PSQI[20]. More over according to Beers criteria 2012 benzodiazepines are not the drug of choice for insomnia in geriatrics[21].

**Table 1: Sleep Quality categorization**

| Sl no | Sleep Quality | Number | Percentage |
|---|---|---|---|
| 1 | Good sleep quality (Less than 5 points in PSQI scale) | 22 | 24 |
| 2 | Poor quality of sleep (Greater than or equal to 5) | 71 | 76 |

**Effect of drug in sleep quality**

The effect of drug in sleep quality were analyzed (Table 2) using PSQI scale. The difference in PSQI score was found to be maximum in alprazolam 0.5mg (2.81±2.5 reduction)followed by alprazolam 0.25 users,1.96±3.3.

**Table 2: Effect of drug in Sleep quality**

| Name of drug | PSQI Score on Admission | PSQI Score after 7 Night Dose of Drug | Difference in PSQI Score |
|---|---|---|---|
| Alprazolam 0.5 | 9.25±2.9 | 6.43±2.82 | 2.81±2.5 |
| Alprazolam 0.25mg | 12.06 ±2.5 | 10.09±3.9 | 1.96±3.3 |
| Lorazepam | 11.09±3 | 9.18±4 | 1.9±2.7 |
| Clonazepam | 12.06±4.5 | 10.6±5.3 | 1.4±5.1 |
| Zolpidem | 11.45±3.7 | 10.09±4.5 | 1.3±5.4 |
| Diazepam | 12±2.5 | 11.7±3.9 | 0.2±3.9 |

**The effect of drug in sleep complaints**

**Sleep onset**

Zolpidem was found to be most effective (1.09±0.3) among the hypnotics used (Table 3) in the study population for reducing onset of sleep severity score followed by alprazolam 0.5mg (0.53±0.6). Kudo et alreported a non-significant improvement in sleep onset latency for 68.4% of patients on zolpidem compared with 56.4% on benzodiazepine[22].

**Table 3: Onset of Sleep**

| Drug Name | Onset of Sleep severity Score on Admission | Onset of Sleep severity Score after 7 Night Dose of Drug | Difference in Onset of Sleep severity Score |
|---|---|---|---|
| Zolpidem | 2.09(±1) | 0.1(±0.5) | 1.09±0.3 |
| Alprazolam 0.5 | 2.06(±1) | 1.50(±0.9) | 0.53±0.6 |
| Clonazepam | 2.86(±0.33) | 2.40(±0.96) | 0.46±0.32 |
| Diazepam | 2.57(±0.5) | 2.14(±0.96) | 0.43±.8 |
| Alprazolam 0.25mg | 2.3(±1.1) | 1.94(±1.3) | 0.36±1.02 |
| Lorazepam | 2.36(±0.6) | 2.18(±0.5) | 0.18±0.3 |

**Duration of sleep**

Diazepam was found to be most effective (1±0.8) among the hypnotics used (Table 4) in the study population for reducing duration of sleep severity score followed by clonazepam (0.93±0.32). Diazepam having longer duration of action and longer elimination half-lifethan theother hypnotics used in the study population can be reason for providing longer duration of sleep[23].

**Table 4: Duration of Sleep**

| Drug Name | Duration of Sleep severity Score on Admission | Duration of Sleep severity Score after 7 Night Dose of Drug | Difference in Duration of Sleep severity Score |
|---|---|---|---|
| Diazepam | 2.71(±0.7) | 1.71(±0.6) | 1±.8 |
| Clonazepam | 2.73±0.66) | 1.8(±0.6) | 0.93±0.32 |
| Lorazepam | 2.54(±0.5) | 1.72(±0.5) | 0.82±0.3 |
| Alprazolam 0.5 | 1.87(±1.1) | 1.31(±0.8) | 0.56±0.6 |
| Alprazolam 0.25mg | 2.18(±0.6) | 1.72(±1.1) | 0.47±1.02 |
| Zolpidem | 2.18(±0.8) | 2(±0.5) | 0.18±0.2 |

**Early morning awakening**

Clonazepam was found to be most effective (1.08±0.4) among the hypnotics used (Table 5) in the study population for reducing early morning awakening severity score followed by diazepam (0.86±0.7). Early morning awakening reduced due to the residual effect of the drug which having longer duration of action or with longer elimination half-life[23].

**Statistical Analysis**

A paired-samples t-test was conducted to compare the sleep quality of geriatrics before and after hypnotic use conditions (Table 6).There was a significant difference in the scores for sleep quality before (Mean = 11.3, SD= 3.6) and after hypnotic use (Mean = 9.5, SD = 4.4) conditions; t (92)=

4.46, p ~ 0.00. These results suggest that hypnotic really does have an effect in quality of sleep. Specifically, our results suggest that hypnotics increases the sleep quality in geriatrics. But when individual drug taken into consideration (Table 7), even though all hypnotics improved sleep quality, a statistically significant improvement observed only in alprazolam 0.5mg and 0.25mg with a p-value of 0.001 and 0.002 respectively.

**Table 5: Early Morning Awakening**

| Drug Name | Onset of Sleep severity Score on Admission | Onset of Sleep severity Score after 7 Night Dose of Drug | Difference in Onset of Sleep severity Score |
|---|---|---|---|
| Clonazepam | 2.54(±0.5) | 1.46(±0.6) | 1.08±0.4 |
| Diazepam | 2.57(±0.4) | 1.71(±0.8) | 0.86±0.7 |
| Alprazolam 0.5 | 2.18(±1) | 1.68(±0.7) | 0.58±0.6 |
| Lorazepam | 2.45(±0.4) | 2(±0.5) | 0.45±0.4 |
| Alprazolam 0.25mg | 2.42(±0.9) | 2.03(±1.4) | 0.39±1.1 |
| Zolpidem | 2.46(±1) | 2.36(±0.4) | 0.1±0.2 |

**Table 6: Paired T-Test- sleep quality of geriatrics before and after hypnotic use**

| | Paired Differences | | | | | T | Df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|
| | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | Lower | Upper | | | |
| Before - After | 1.82796 | 3.95250 | .40986 | 1.01395 | 2.64196 | 4.460 | 92 | .000 |

**Table 7: Paired T-Test sleep quality of geriatrics before and after drug use**

| | | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | | Lower | Upper | | | |
| Pair 1 | Clonazepam before – clonazepam after | 1.46667 | 5.35679 | 1.38312 | -1.49983 | 4.43316 | 1.060 | 14 | .307 |
| Pair 2 | Zolpidem before – Zolpidem after | 1.36364 | 5.69689 | 1.71768 | -2.46359 | 5.19086 | .794 | 10 | .446 |
| Pair 3 | Lorazepam before – Lorazepam after | 1.90909 | 2.91392 | .87858 | -.04850 | 3.86669 | 2.173 | 10 | .055 |
| Pair 4 | Diazepam before – Diazepam after | .28571 | 4.23140 | 1.59932 | -3.62768 | 4.19911 | .179 | 6 | .864 |

| | | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | | Lower | Upper | | | |
| Pair 5 | Alprazolam 0.5mg before– alprazolam 0.5mg after | 2.81250 | 2.61327 | .65332 | 1.41999 | 4.20501 | 4.305 | 15 | .001* |
| Pair 6 | Alprazolam 0.25mg before– Alprazolam 0.25mg after | 1.96970 | 3.44134 | .59906 | .74945 | 3.18994 | 3.288 | 32 | .002* |

*statistically significant

**Adverse Drug Reactions (ADR)**

A total of 7 ADRs related to alprazolam induced somnolence was noted. Followed by 5 ADRs related to zolpidem, 4 ADRs related to clonazepam, 2 ADRs each related to lorazepam and chlordiazepoxide was seen (Table 8). In a meta-analysis carried out by Glass J et al [(24)] a total of 16 studies were analyzed in which the most common adverse events observed were drowsiness or fatigue, headache, nightmares, nausea or gastrointestinal disturbances. Cognitive effects were significantly more common with sedative use. Psychomotor-type side effects such as dizziness or postural instability were more common after treatment.

**Table 8: Adverse Drug Reactions**

| SlNo | Drug | Number of Incidents | ADR |
|---|---|---|---|
| 1 | Alprazolam | 7 | Somnolence |
| 2 | Clonazepam | 4 | Confusion, Hallucinations, Somnolence |
| 3 | Zolpidem | 5 | Sedation, Dizziness, Reduced day time alertness |
| 4 | Lorazepam | 2 | Dizziness, Daytime sleepiness, Reduced response |
| 5 | Chlordiazepoxide | 2 | Drowsiness, Somnolence |

ADR: Adverse Drug Reactions

## CONCLUSION

Geriatrics are the most predisposed age groups who suffering from varies sleep complaints and altered sleep quality. Drug used for treating insomnia does not necessarily increase the sleep quality.It is essential to develop appropriate guidelines to treat insomnia in geriatrics. In our study the hypnotics used for treating insomnia does not produce expected quality of sleep in majority of patients. Thus there is a need for identifying individual patient`s sleep complaints and selecting appropriate drugs for improving sleep quality rather than conventional method.

REFERENCE


1. FoleyDJ, Monjan AA, Brown SLet al.Sleep complaints among elderly persons: an epidemiologic study of three communities. Sleep 1995; 18:425-32.
2. National Institutes of Health State of the Science Conference Statement on Manifestations and Management of ChronicInsomnia in Adults. Jun 13-15, 2005. Sleep,28:1049-57.
3. Berg C, Skurtveit S, Neutel CI.2012. What is the point of guidelines? Benzodiazepine and z-hypnotic use by an elderly population.Sleep.Med 2012; 13:893-897.
4. Harvey AH, Baker SP. Fall injuries in the elderly. Clin.Geriatr.Med 1985; 1:501–8.
5. FinkleWD, Greenland S, Der JS. Risk of fractures requiring hospitalization after an initial prescription of zolpidem, alprazolam, lorazepam or diazepam in older adults. J. Am.Geriatr.Soc 2011; 59(10): 1883-1890.
6. PaternitiS,Alperovitch A,Dufouil C. Long-term benzodiazepine use and cognitive decline in the elderly: the Epidemiology of Vascular Aging Study. J.Clin.Psychopharmacol 2002; 22: 285-293.
7. Allain H et al. Postural instability and consequent falls and hip fractures associated with use of hypnotics in the elderly: a comparative review. Drugs Aging 2005; 22(9): 749-765.
8. Roth T.Insomnia: Definition, prevalence, etiology, and consequences. J.Clin.Sleep 2007; 3(5): S7–10.
9. Morgan K, Dallosso H, Ebrahim S et al. Prevalence, frequency, and duration of hypnotic drug use among the elderly living at home. B.M.J (Clinical Research Ed)1988;296:601–602.
10. Bjmdal A, Andrew M,Forbruk.Utilization of psychotropic drugs in primary health care. In: Bjarndal A. Valuable therapy or social problem? The utilization of psychotropic drugs in Norway. Enlish summary. Report no. 4.Oslo: SIFF Gruppe for helsetjenesteforslrning.1988.
11. Baker MI, Oleen MA. The use of benzodiazepine hypnotics in the elderly. Pharmacotherapy 1988; 8:241-7.
12. Holm M.Prescription of benzodiazepine hypnotic sedatives in general practice. English summary. Ugeskr kger1990; 152, 20268
13. Damsgaard JJ, Follce PE, Launsa L et al.Effects of local interventions towards Prescribing of psychotropic drugs. J. Soc. Admin. Pharm 1992; 9179-84.
14. Van der Waals FJ,Mohrs J,Foets M.Sex differences among recipients of benzodiazepines in Dutch general practice. B.M.J 1993; 307, 363-6.

15. Trang Vu, Caroline FF, Lesley D. Patterns of comorbidity in community-dwelling older people hospitalised for fall-related injury: A cluster analysis. B.M.J 2011; 11.
16. Fried LP, Wallace RB.The complexity of chronic illness in the elderly: From clinic to community. The Epidemiologic Study of the Elderly. New York: Oxford University Press Inc 1992; pp:10–19.
17. Ancoli, S, Ayalon. Diagnosis and treatment of sleep disorders in older adults. Am. J.Geriatr. Psychiatry 2006;14(2):95-103.
18. Prepared by Angela G., Chief Editor: IqbalA.Geriatric Sleep Disorder 2012; Available from: http://emedicine.medscape.com/article/292498-overview#aw2aab6b2b6
19. Iqbal SP et al. Benzodiazepine use among adults residing in the urban settlements of Karachi, Pakistan: A cross sectionalstudy. Subst Abuse Treat Prev Policy 2011; 6:19.
20. Buysse D, Reynolds C, Monk T, Berman R. The Pittsburgh Sleep Quality Index (PSQI): A new instrument for psychiatric research and practice. Psychiatry. Res 1989; 28(2) : 193-213
21. American Geriatrics Society 2012 Beers Criteria Update Expert Panel. American Geriatrics Society updated Beers Criteria for potentially inappropriate medication use in older adults. J. Am.Geriatr.Soc 2012; 60(4): 616–631.
22. Kudo Y, Kawakita Y, Saito M et al. Clinical efficacy andsafety of zolpidem on insomnia: a double-blind comparative study with zolpidem and nitrazepam.Rinsyoiyaku Geriatric Sleep Disorder; .9:79–105.
23. Riss J, Cloyd J, Gates Jet at Benzodiazepines in epilepsy: pharmacology and pharmacokinetics. ActaNeurologicaScandinavica2008; 118 (2): 69–86.
24. Glass J, Lanctôt KL., Hermann,N. Sedative hypnotics in older people with insomnia: meta-analysis of risks and benefits. BMJ 2005. 331:1169.