Original Article

The effect of sleep restriction treatment on quality of sleep, sleep medication intake, and daytime function among the elderly who were members of Jahandidegan center in Shiraz, in 2010

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Abstract

Background: Studies showed that poor quality of sleep is a common problem among the elderly. Because of drug complications and side effects such as drug dependency and resistance and decrease of sleep depth in long-term intake of sleep medication, cognitive-behavior therapy including sleep restriction therapy which does not cause these problems is more considered.

Materials and Methods: This is a quasi-experimental study on 38 elderly who were members of Jahandidegan center in Shiraz. The subjects were selected according to the inclusion criteria and were divided into experimental and control groups. The Pittsburgh Sleep Quality Index (PSQI) was used for evaluation of sleep quality. A 4 week sleep restriction therapy was implemented for experimental group and finally both groups were compared. The data were analyzed by Kolmogorov-Smirnov test, independent and dependent *t*-tests in significance level of 0.05.

Results: Mean sleep quality decreased from 14.21 to 11.26 after the intervention in the experimental group while it was 13 before intervention and decreased to 12.78 after the intervention in the control group. Independent *t*-test showed a significant difference after the intervention ($P = 0.038$). Mean of sleep medication intake and daytime dysfunction after intervention were 0.947, 1.94 in experimental group and 0.894, 1.63 in control group respectively, which showed no significant difference ($P = 0.903$, $P = 0.272$).

Conclusions: This study indicated that sleep restriction therapy can improve quality of sleep, but the amount of sleep medication intake and daytime dysfunction did not show a significant difference after intervention.

Key words: Cognitive behavior therapy, daytime function, elders, Iran, quality of sleep, use of sleeping drugs

Introduction

Aging is a part of life occurring after middle age and is counted as a natural inevitable biological phenomenon.[1] Based on statistics reported by WHO, there will be 800 million elderly over 65 years of age all over the world by 2025 of whom 2/3 will be in developing countries.[2] In Iran, based on national census record of 2006, population of the elderly over 60 years and over has been estimated to reach 7.27%. The elderly population in Iran is expected to be notable after 2031 so that the population over 60 years in that year includes 25-30% of whole population.[3] With regard to the elderly population growth, the necessity of paying attention to these people is highlighted.[4] The prevalence of insomnia symptoms generally increases with age.[5] The prevalence of sleep disorders among the elderly has been estimated between 20 and 54%.[6] Over 40% of people over 60 years of age have low quality sleep.[7] The types of sleep disturbances among the elderly include problems in falling sleep (10-39%), midnight awake (18-60%), early morning wake ups (12-33%), and a need for daily nap (18-36%).[8] In fact, the deepest parts of sleep (the third and fourth Non- REM sleep) which are related to sleep quality are reduced through aging. At higher ages, although the time in bed increases, total sleep time is diminished. At the age of 70 years, the stage of delta (periods of deep sleep) gets less than 10% of total sleep time compared to adolescents and youngsters (25-50%). Meanwhile, researches conducted on sleep are low in number due to various reasons. From 1983 to 2002, the percentage of Iranian articles published about sleep in IranMedex and IranPsych data bases were 13 and 31%, respectively, which are very low.[9] There were no statistics concerning investigation of incidence and prevalence of sleep disorders. Insomnia is among common sleep disorders in the elderly,[4] which is seen in two types

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of primary and secondary insomnia. Primary insomnia, focused in the present study, is a disorder which is not resulted from other mental disorders, physical disorders, or drug abuse. The chief complaint is in the start of sleep, sleep length, and lack of feeling refreshed after sleep at least for 1 month.[10] Sleep disorders in the elderly may result in depression, falling down on the ground, memory disorders, problems in concentration, irritability, low quality of life, dementia, fatigue, moodiness, and anxiety etc.[9,11]

Although there are various ways to cope with sleep disorders, the elderly usually prefer to take sleep medication. In fact, about 39% of sleep medication is used by the people over 60 years of age.[12] Sleep medication lowers sleep disturbances temporarily, and most of them diminish REM sleep which is necessary for mental function and relief of tensions.[13] In a systematic review of Yah *et al.*, it was shown that cognitive behavior therapies are as helpful as medications, and even have more effect in longer period of time. They also have no side effects such as medication tolerance and dependency. One of cognitive behavior therapy methods is sleep restriction therapy.[14]

Based on previous studies, in group of the elderly, sleep restriction therapy has the highest percentage of reduction in sleep latency and length of midnight wake ups. Promotion of sleep (quality) is seen few weeks after beginning the therapy, imposes no specific cost, and is simple and applicable. Although behavior therapy methods in combination can show positive effects, sleep restriction is a unique behavior therapy method which is effective if applied alone.[13] Sleep restriction method tries to organize sleep cycle in the elderly and makes a fixed and stable sleep–wake up cycle among them. Since no studies had been previously conducted on the effect of cognitive behavior therapies including sleep restriction treatment on quality of sleep among the elderly in Iran, and with regard to the high prevalence of sleep disturbances among the elderly referring to Shiraz Jahandidegan canter, the present study aimed at investing the effect of sleep restriction treatment on sleep quality, amount of sleep medication intake, and elderly daytime function.

Materials and Methods

This is a quasi-experimental study conducted on all members of Shiraz Jahandiegan canter (5000 elderly). This canter is a daytime canter holding educational classes such as Quran, painting, sports, and recreational programs to make a dynamic elderly time for its member.

Sample size was calculated from 12 subjects in each group (power 85%, CI 95%) and with regard to possible subjects' drop; finally 25 subjects were assigned to each group. After complete explanation of the study to the elderly and consideration of inclusion criteria, using convenient sampling method, 50 subjects were selected and assigned to experimental and control groups through randomized blocks.

Inclusion criteria were at least 60 years of age, being a member of Shiraz Jahandidegan center, suffering from primary insomnia based on the diagnosis in subjects' medical records, ability to write and being interested to join the study, sleep adequacy of less than 80%, sleep quality index score of five and over, and smoking of cigarettes less than ten sticks daily. Exclusion criteria were secondary insomnia due to medical problems and subjects' lack of cooperation and death.[15]

Total of twelve subjects including six from each group were left out of the study (four in experimental group due to not delivering their sleep report; two due to daytime fatigue after being in intervention and control groups; one due to taking a trip; two due to beginning sleeping medication after intervention had started; two due to not delivering sleep report and one due to hospitalization). Finally, 38 elderly (24 women and 14 men) with mean age of 65 years were assigned to experimental and control groups (19 experimental, 19 control). Sleep charts were distributed in both groups and the subject were explained about how to fill the charts. The subjects were reminded to fill the charts through phone calls. Sleep restriction treatment was conducted for experimental group in a four-week program. In sleep restriction therapy method, the reason for insomnia and low sleep quality is supposed to be the time the person is in bed but awake. The goal of sleep restriction therapy is to lower this time interval. In this case, it is tried to make the persons' time in bed as close as possible to total sleep time. In this method, firstly mean total sleep time of a person is calculated with the help of a 2-week sleep chart (this period of time is different from the time in bed. Time in bed includes the sleep time plus the time the person is in bed but not sleep).

In the first session, the subjects were recommended to make the time in bed almost as equal as their mean total sleep time.

The normal difference between these two time intervals is 15-20 min (the ideal interval), which is the ultimate goal.[15] This normal time interval, in fact, includes sleep latency time plus night awake time. For instance, for a person whose mean total sleep time is 5.83 h based on a 2-week sleep chart, time in bed is calculated as 6:00 h.[10]

Then, mean sleep adequacy is weekly calculated (sleep adequacy% = sleep time ¸ time in bed). Appropriate mean

sleep adequacy among elderly is ≥80% in each week of a 4- week intervention. If mean sleep adequacy in the past week has been ≥90%, 15-20 min are added to individuals' time in bed, this extra time is either in the form of earlier bed time or late wake up in the morning (for instance, if they had been recommended to go to be at 12th week before, this week they go to bed at 11:40, or if they were supposed to wake up at 7:00, this week, they wake up at 7:20). If mean sleep adequacy was 80-90%, the same schedule of the past week is repeated for the following week, and, if mean sleep adequacy is less than 80%, 15-20 minutes is decreased from individuals' time in bed (for instance, if they had been suggested to go to bed at 12:00 PM, they would go to bed at 12:20 this week, and if they were supposed to wake up at 7:00 AM, this week they wake up at 6:40).

In this method, the individuals are asked to keep their habits and routine life style as much as possible to be able to follow the program better.

They are never recommended to be in bed less than 4 h. In some subjects, reduction of time in bed is made by delayed time of going to bed and early wake up in the morning and in some other by one of these components. For example an individual who is used to staying in bed after wake up is recommended to leave the bed as soon as he/she wakes up to reduce time in bed. At the end of the 4th week, Pittsburgh Sleep Quality Questionnaire was filled for both groups. The data were analyzed by independent and dependent *t*-tests in significance level of 0.05. The data collection tools were Pittsburgh Sleep Quality Questionnaire and sleep chart. Validity and reliability of Pittsburgh questionnaire and its ability (sensibility) to investigate sleep quality indexes had been confirmed in domestic and international studies (alpha = 89.6, correlation coefficient 0.88).[16] While reviewing the questions in the questionnaire, the researcher found out that some questions could be more understandable although the validity had been already confirmed. Therefore, the validity of the questionnaire was calculated, and finally the questions were modified and revised. Persian version of Pittsburgh sleep quality questionnaire together with the details of study goals were distributed among ten academic members who were experienced in research, and finally, it was revised. Pittsburgh index is a self assessment questionnaire to investigate the sleep in the past month. The items investigated by this questionnaire include subjective sleep quality (self concept from one's sleep), sleep latency, sleep quality, sleep disturbances, sleep duration, amount of sleeping medications, and daytime dysfunction. The items in the questionnaire were scored 0-6. Scores of 0, 1, 2, and 3 were assigned to normal, minor problem, average problem, and acute problem.[16] All the common ethical considerations in the humanity research were observed and also were approved by Ethical Research Center of social welfare and rehabilitation science. This study was sponsored and Funded by social welfare and rehabilitation science.

Results

Kolmogorov – Smirnov test was adopted to check normal distribution for all variables of the study, and then, independent and paired *t*-tests were employed after normal distribution of the variables had been confirmed. The subjects had no significant difference concerning pre-tests of sleep quality, subjective sleep quality, sleep latency, sleep adequacy, sleep disturbances, sleep duration, amount of sleeping medications, and day time dysfunction (the groups were identical). After intervention, there were significant differences in sleep quality, subjective sleep quality, sleep latency, sleep adequacy, and sleep disturbances between both groups ($P = 0.38$, $P = 0.005$, $P = 0.031$, $P = 0.006$, $P = 0.001$, respectively) [Table 1]. In intervention group, paired *t*-test showed a significant difference between pre-test and post-test in sleep quality, subjective sleep quality, sleep latency, sleep adequacy, and sleep disturbances ($P = 0.001$, $P = 0.001$, $P = 0.031$, $P = 0.001$, $P = 0.004$, respectively). Amount of sleeping medication, daytime dysfunction, and total sleep time showed no significant differences ($P = 0.205$, $P = 0.999$, $P = 0.187$, respectively) [Table 2]. In control group, after intervention, sleep quality, subjective sleep quality, sleep latency, sleep adequacy, sleep disturbances, amount of sleeping medications, and daytime dysfunction showed no significant differences compared to pre-test ($P > 0.05$), but showed a significant difference in subjective sleep quality ($P = 0.02$) [Table 3].

Discussion

The findings showed that treatment of sleep restriction in the elderly can promote sleep quality ($P < 0.05$), but there was no significant difference in amount of sleeping medication and daytime dysfunction. The findings of the present study are consistent with those of Riedel and Lichstein in investigation of sleep restriction treatment strategies efficiency in the elderly reporting sleep restriction to promote sleep quality, adequacy, and latency ($P < 0.01$).

There was no significant difference in daytime dysfunction. Daytime dysfunction can occur as a result of tiredness and daytime drowsiness in the first weeks of treatment with sleep restriction due to the delayed time of going to bed.[15]

In the present study, there was no significant difference in total sleep time. In other similar former studies, there was no significant difference in total sleep time after cognitive behavior therapies.[15,17-19] The present study

Table 1: Comparison of mean pre-test post-test scores of sleep quality and its sub-scales in intervention and control groups

Dependent variable	Group	Pre-test				Post test			
		Mean	SD	Statistical *t*-test	*P*	Mean	SD	Statistical *t*-test	*P*
Sleep quality	Intervention	14.21	2.67	1.43	0.16	11.26	2.05	−2.16	0.038
	Control	13	2.53			12.78	2.29		
Subjective sleep quality	Intervention	2.05	0.705	1.43	0.16	1.47	0.611	−2.97	0.005
	Control	1.73	0.653			2	0.471		
Sleep latency	Intervention	2.84	0.374	1.83	0.06	2.47	0.611	−2.23	0.031
	Control	1.98	0.54			2.84	0.374		
Total sleep time	Intervention	2.21	0.787	1.27	0.21	1.94	0.705	1.54	0.132
	Control	1.63	0.737			1.57	0.768		
Sleep adequacy	Intervention	1.84	0.898	0.851	0.41	1	0.471	−2.97	0.006
	Control	1.63	0.597			1.68	0.885		
Sleep disturbance	Intervention	2.21	0.535	1.07	0.290	1.68	0.477	−3.65	0.001
	Control	2	0.666			2.31	0.582		
Use of sleeping medication	Intervention	1.10	1.32	0.24	0.812	0.947	1.35	0.123	0.903
	Control	1	1.37			0.894	1.28		
Daytime dysfunctions	Intervention	1.94	1.02	0.754	0.455	1.94	1.02	1.11	0.272
	Control	1.73	0.653			1.63	0.683		

Table 2: Comparison of pre-test post-test mean scores of sleep quality its sub scales in intervention group

Dependent variable	Test	Mean	SD	Statistical *t*-test	*P*
Sleep quality	Pre-test	14.21	2.67	7.95	0.001
	Post test	11.26	2.05		
Subjective sleep quality	Pre-test	2.05	0.705	4.15	0.001
	Post test	1.47	0.611		
Sleep latency	Pre-test	2.84	0.374	2.34	0.031
	Post test	2.47	0.611		
Total sleep time	Pre-test	2.21	0.787	1.31	0.205
	Post test	1.94	0.705		
Sleep adequacy	Pre-test	1.84	0.898	4.80	0.001
	Post test	1	0.471		
Sleep disturbances	Pre-test	2.21	0.535	3.29	0.004
	Post test	1.68	0.477		
Use of sleeping medications	Pre-test	1.10	1.32	1.37	0.187
	Post test	0.947	1.35		
Daytime dysfunction	Pre-test	1.94	1.02	0.001	0.999
	Post test	1.94	1.02		

Table 3: Comparison of pre-test mean scores of sleep quality and its sub-scales in control group

Dependent variable	Test	Mean	SD	Statistical *t*-test	*P*
Sleep quality	Pre-test	13	2.53	0.84	0.408
	Post test	12.78	2.29		
Subjective sleep quality	Pre-test	1.73	0.471	−2.53	0.021
	Post test	2	0.054		
Sleep latency	Pre-test	1.98	0.37	1.83	0.083
	Post test	2.84	0.737		
Total sleep time	Pre-test	1.63	0.768	1.55	0.137
	Post test	1.57	0.597		
Sleep adequacy	Pre-test	1.63	0.885	−0.438	0.667
	Post test	1.68	0.666		
Sleep disturbances	Pre-test	2	0.582	−2.05	0.055
	Post test	2.31	1.37		
Use of sleeping medications	Pre-test	1	1.37	1.45	0.163
	Post test	0.894	1.28		
Daytime dysfunction	Pre-test	1.73	0.653	0.809	0.429
	Post test	1.63	0.683		

has investigated primary insomnia in the elderly although in previous studies, behavior therapies (sleep restriction treatment, stimulus control, and relaxation) were applied for secondary insomnia resulting in a better sleep quality in women with grade I and II breast cancer. As mentioned in the present study, consumption of sleeping medications was not significantly changed by application of sleep restriction possibly due to the short time of follow up in the present study. A reduction in consumption of sleeping medications was seen after application of cognitive behavior therapies in former studies. Morin conducted a study on the elderly divided into three groups for 10 weeks: Those receiving mere cognitive behavior therapies (sleep restriction + stimulation control), those with mere gradual reduction of medication dosage, and those with cognitive behavior treatment accompanied with dosage reduction

and reported that high level of quitting sleeping medications was observed in all aforementioned groups ($P = 0.01$).

In the present study, post test of subjective sleep quality in the control group was significantly higher than pre-test (control group believed the sleep quality was worse in post test). Since there may be an association between intervention and control groups, the observed difference can be as a result of association between these groups.

Conclusion

All in all, application of cognitive behavior therapies including sleep restriction therapy which is a non-invasive treatment whose more stable effect on sleep quality has been observed in former studies seems helpful.

The results of the present study showed that sleep restriction therapy can significantly promote sleep quality in the elderly. Since low quality of sleep in the elderly is among their common problems, and the most ordinary therapeutic solution is taking sleeping medications, non-invasive interventions such as sleep restriction therapy and other cognitive behavior therapies, administrated by nurses, can make a positive background for promotion of the elderly quality of life and sleep, and their active attendance in the community. The present study has made a new domain of research in nursing services. Research restrictions included conducting the study in daytime canters which restricted the generalization of the results to nursing homes. Subjects' personal differences and mental and emotional conditions at the time of filling the questionnaires were out of researcher's control. It is recommended to conduct the present study in a longitude design together with sequential frequent measurements in hospitalization canters of the elderly. For future research it is suggested to include over 65-years-old people in investigations.

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