

Study of the Relationship Between Sleep Quality and Prevalence of Delirium in Patients Undergoing Cardiac Surgery

¹Mohammad Ali Cheraghi, ²Mahsa Hazaryan,
³Fatemeh Bahramnezhad, ²Farshid Mirzaei pour and ⁴Hamid Haghani

¹Department of Critical Care Nursing, School of Nursing and Midwifery,
Tehran University of Medical Sciences, Tehran, Iran

²School of Nursing and Midwifery, Tehran University of Medical Sciences, Tehran, Iran

³PhD candidate in Nursing, School of Nursing and Midwifery,
Tehran University of Medical Sciences, Tehran, Iran

⁴Department of Biostatistics, School of Health, Iran University of Medical Sciences, Tehran, Iran

Abstract: low sleep quality and delirium in hospitalized patients is common and occurs at the same time but their relationship is unclear. The aim of this study is "to determine the relationship between sleep and the prevalence of delirium in patients undergoing cardiac surgery". This analytical-descriptive study was conducted on patients undergoing cardiac surgery in educational hospital affiliated to Medical Sciences University of Tehran in 2014. 44 patients were studied by available method. The incidence of delirium in patients was assessed twice daily on the second to fifth day after surgery through the CAM-ICU scale (Confusion Assessment Method -ICU). Also sleep of patients on the second day after surgery was assessed using Pittsburgh Sleep Quality scale. Data were analyzed using statistical tests of Chi-square, Mann-Whitney and Fisher's exact test under SPSS software. *Results:* There is a significant relationship between demographic characteristics and the prevalence of delirium. (52.5%) of patients had good sleep quality. The results of Fisher's exact test showed there was a significant difference between the sleep disorder and the prevalence of delirium ($P=0.007$). *Conclusion* Due to the significant relationship between sleep quality and prevalence of delirium, the need to use a program of prevention from sleep deprivation in the clinical nursing instructions in hospitals is essential particularly critical and surgery wards.

Key words: Delirium • Sleep and cardiac surgery

INTRODUCTION

Depression, anxiety, delirium and cognitive disorders are the common problems in cardiovascular patients [1]. In the meantime, delirium is one of the effects of hospitalization in intensive care unit (ICU) which occurs due to cognitive dysfunction in the brain. The syndrome is specified with acute change in cognition, alertness and impairment change and fluctuate [2] and its prevalence is reported between 10.5% and 50.6% [3]. In Iran, the rate of prevalence of delirium in hospitalized patients is expressed between 25%-23% in open heart surgery [5, 6].

In addition to the high prevalence of delirium in patients who have undergone open heart surgery,

something that makes important addressing to this issue is significant and risky effects such as increase of sensitivity to drugs, hospital acquired infections, falls [7, 8], increase the need to nursing care [9], reduce the level of individual performance [10], increase the likelihood of occurrence extubation, sleep deprivation and remove any peripheral access routes such as intravenous and catheter in the patients [7, 11].

Patients undergoing coronary artery bypass surgery are at risk for sleep deprivation after surgery [3]. Sleep is an essential biological function to the individual's physiological feeling of comfort and relaxation [12] and with the role of restoration and protection has a significant share in the reconstruction of physical and

excitement-emotional strength of individual [13]. Despite the low sleep quality involved more hospitalized adult patients in the hospital, but unfortunately isn't investigated by most health professionals desirably and appropriately [12]. Excessive use of tranquilizers or mechanical ventilation that the consequences of prolong of this disorder include decrease the performance of immune system, disorder in respiratory function and cognitive status of individual, which can be very risky [14]. The results of some studies suggest that a low sleep quality can independently cause delirium after coronary artery bypass surgery and patients who have poor quality sleep are at higher risk of delirium than those who have other risk factors [3].

In the meantime, the nurses due to prolonged contact with patients and provide specialized services to them can have a major role in prevention, early detection and treatment of patients with delirium [15, 16] and in fact, the purpose is to remove or reduce predisposing factors of delirium [17]. Given the purpose and high importance of delirium after cardiac surgery and serious effects of delirium, as well as because of the relationship between sleep deprivation and delirium are not fully understood, more research is needed to explain this relationship, which in this study has been performed by determining the relationship between sleep and the prevalence of delirium in patients undergoing cardiac surgery.

MATERIALS AND METHODS

This research was conducted as descriptive-analytical on hospitalized patients undergoing heart surgery in wards of ICU open heart surgery and heart surgery of an educational hospital affiliated to Medical Sciences University of Tehran from the beginning of October until the end of November 2014.

Sampling method was available. Sample size according to the results of previous study and using formula ($P=0.225$, $P2=0.35$, $P1=0.1$) was estimated 44 patients, that two of the patients due to the therapy programs and two others were excluded due to lack of consent from the study, finally study was conducted with 40 patients.

Inclusion Criteria Included: lack of addiction to alcohol or drugs, carry out open heart surgery selectively, lack of using psychotropic drugs, lack of known psychiatric disorders such as psychosis and depression and aged over 18 years. Exclusion criteria also included: the need for emergency open heart surgery or the need for reoperation.

In this study, in addition to the questionnaire of investigating individual properties, two scales of delirium in the ICU (CAM-ICU = Confusion Method Assessment-ICU) and Pittsburgh sleep quality were used. Individual characteristics questionnaire included questions about age, gender, marital status and education.

The scale of delirium measurement (CAM-ICU) is a world famous scale to measure the prevalence of delirium and is used for patients in critical wards. First by Ely and his colleagues in 2001 was accepted with high validity and reliability [18]. The questionnaire consists of 4 main items: 1) acute change in mental status, 2) lack of attention 3) thought disorder 4) changes in awareness and consciousness. The tool of delirium is positive when criterion 1 is with criterion 2 and one of the criteria 3 or 4. This tool has responses of yes and no and filling it needs two minutes and can be completed by a doctor or nurse. In order to validate the questionnaire, content validity was used and its reliability was also investigated by equivalent method [19].

Pittsburgh Sleep Quality Scale is a self-report questionnaire. The questionnaire is standard and has 18 questions. They are classified in 7 components: 1) quality of sleep subjectively 2) delay in falling asleep 3) duration of sleep 4) sleep efficiency and effectiveness of patient 5) Sleep disorders 6) use of hypnotics 7) inadequate performance during the day. Each question is rated between 0 and 3 and point of each component is maximum 3. The total mean of scores of the seven components form the total score of tool ranging from 0 to 21. The more obtained score the lower sleep quality. Score greater than 5 indicates poor sleep quality. Validity PSQI 0.80 and its reliability were evaluated with test-retest that is reported 0.93 to 0.98 [20].

Ethical considerations include permission to conduct research from the Medical Sciences University of Tehran and University ethics committees, outlines the objectives and nature of educating them and achieve informed consent, freely participation in study and the freedom to withdraw from there search and give them confidence in the confidentiality of personal information. For the study conduction, informed consent of the patient and in some cases their companions were taken. On the first day of hospitalization in heart surgery sector, research objectives for qualified patients and in some cases for their companions were described and after obtaining informed consent, individual characteristics were completed and collected. In the second to fifth day after the surgery of patients in terms of prevalence of delirium using the delirium measurement scale CAM-ICU twice a day (morning 9-12 and evening 17-20) totally 8 times, in terms

of prevalence of delirium (answer of questionnaires was as yes and no and one time positive result indicates the delirium) were analyzed by first author, sleep quality is also on the second day after surgery was assessed using the Pittsburgh Sleep Quality scale.

Data using the Chi-square tests, Fisher exact test and Mann-Whitney test was analyzed under 16 SPSS software.

RESULTS

The research results showed that the mean of age of the patients was 59.19 with standard deviation 10.6. Information related to demographic characteristics is shown in Table 1. Based on this table, the prevalence level of delirium in more than 70 years (P=0.002) and in males (P=0.018) was significantly higher. 72.5 of patients were undergoing surgery CABG. Table 2 shows that the majority of patients (52.5%) had a good sleep quality.

Table 3 shows that there was a significant difference between sleep disorder and prevalence of delirium in patients (P=0.007). In 95.2% of subjects that had a good sleep quality, delirium was not observed.

DISCUSSION

The results of this study showed there is a significant relationship between sleep disorder and the prevalence of delirium that few studies have investigated this issue and have also confirmed these findings. For example, in the study of Trompeo and colleagues in 2011 that have investigated sleep disorders in patients in the surgical ICU, delirium and daily injections of lorazepam are factors that independently can increase the risk of "decline the stage of REM" in ICU patients [21]. The cause of this similarity could be due to investigate surgical ICU patient and the use of CAM-ICU. In line with these results, Rompaey and colleagues in 2012 stated that the use of earplugs at night in hospitalized adult patients in ICU causes to improve the quality of sleep and subsequently reduce the prevalence level of delirium in them [22] and also Nazeri Astane and his colleagues in their study stated improve of sleep by non-drug interventions such as massage, hot drink before bedtime and reduce the noise and light adjustment in patients after heart surgery cause to reduce the rate of delirium that these findings indicate that there is a significant relationship between sleep

Table 1: compare the frequency distribution demographic characteristics of patients undergoing open heart surgery with delirium

Variable	N(%)	delirium		P
		yes N(%)	no N(%)	
Age	<50	10(25)	1(10)	0.002*
	50-59	10(25)	0	
	60-69	11(5/27)	2(2/18)	
	70<	9(5/22)	6(7/66)	
sex	male	24(60)	8(7/7)	0.18/0**
	woman	16(40)	2(2/22)	
Marital Status	Married	37(5/92)	7(8/77)	121/0**
	Single	0(0/0)	0	
	Divorced	3(5/7)	2(2/22)	
Education	Illiterate	18(45)	5(6/55)	848/0**
	Less than High school	16(40)	4(4/44)	
	diploma	4(10)	0	
	higher education	2(5)	0	

**Fisher's Exact Test

*Mann-Whitney test

Table 2: Absolute and relative frequency of sleep quality

Quality of sleep	N(%)
Desired	21(52/5)
Inappropriate	19(47/5)
Mean ± SD	8/22±5/21
Total	40(100)

Table 3: The relationship between quality of sleep and the incidence of delirium in patients undergoing cardiac surgery

Quality of sleep N(%)	Incidence of delirium	
	Desired	Inappropriate
Yes	1(4/8)	8(42/1)
No	20(95/2)	11(57/9)
Total	21(100)	19(100)
Result test	Fisher's Exact Test, P: 0.007	

disorders and the prevalence level of delirium [6]. The cause of similarity of this study could be due to the same study population. In line with these results Stuck (2011) in their study said that there is a clear relationship between sleep disorders and prevalence of delirium in ICU patients [23]. Its cause can be the investigation of patients undergoing cardiac surgery. In a study by Slatore and colleagues in 2012 that was conducted with the aim of describing sleep quality and investigating the relationship between sleep quality with delirium in patients, it was found that 44% of patients had low sleep quality and low sleep quality was associated with increase of risk of delirium, in this context, Slatore and colleagues in 2012 examined the relationship between sleep quality and prevalence of delirium among institutionalized veterans and concluded that the low quality of sleep and its disorders can lead to delirium in these patients [24], the questionnaire for this study as our research was the measurement tool of CAM and Pittsburgh sleep and also the results of this study was consistent with our findings. Kamdarand colleagues (2013) stated in their study that measures of sleep quality improvement resulting in decrease of prevalence of delirium [25]. The cause of this similarity can be the investigation of patients by CAM-ICU twice a day.

However, the result of Zolfaghari *et al.*, in 2012 and with the aim of investigating efficacy of multifactorial intervention on prevention of delirium and length of patients hospitalization of open heart surgery isn't in line with the results of this study and reported studies, Results of this study showed there isn't observed a significant correlation between the prevalence of delirium and sleep disorders, the cause of this inconsistent is this that Zolfaghari and colleagues have investigated the sleep disorder on admission and as self-report, but in this study, sleep quality assessment tool of Pittsburgh and along with the self-report was used to evaluate sleep disorders. Meanwhile, the authors make the probability that this difference in results is due to low of studied units, low duration of hospitalization and use of hypnotic drugs in the studied units in the study of Zolfaghari and colleagues [19].

The limitations of this study include small sample size, use of sleep medications by patients.

CONCLUSION

According to the results of this study, there is a relationship between low sleep quality and prevalence of delirium. Due to this significant relationship, the use of a

sleep deprivation program for the prevention is essential in clinical instructions of nursing in hospitals particularly ICU and surgery wards. Strategies are recommended to improve sleep of patients, including changing the environment, reducing noise and light, using of earplugs and use of light alarms instead of sound alarms. The obtained results in this study can be used in order to change the environment, create a calm environment, personnel training and patient use of simple and cheap methods like earplugs.

ACKNOWLEDGMENT

The present study MS thesis and research projects with the number 25510 was approved by Tehran University of Medical Sciences, Tehran, Iran. The authors are grateful to the vice-president of research of nursing and midwifery Faculty of Tehran University of medical sciences and the patients in the study.

REFERENCES

1. Foruzandeh, N., M. Delaram, M. Foruzandeh and S. Darakhshandeh, 2013. Study of mental health status of cardiovascular diseases patients and determination of some effective factors on it in the patients hospitalized in CCU and cardiology wards of Hajar Hospital, Shahrekord. *Journal of Clinical Nursing and Midwifery*, 2(2): 18-25. [Persian].
2. Martinez, F., C. Tobar and N. Hill, 2014. Preventing delirium: should non-pharmacological, multicomponent interventions be used? A systematic review and meta-analysis of the literature. *Age and ageing*: afu 173.
3. Zhang, W.Y., W.L. Wu, J.J. Gu, Y. Sun, X.F. Ye and W.J. Qiu, *et al.*, 2015. Risk factors for postoperative delirium in patients after coronary artery bypass grafting: A prospective cohort study. *Journal of critical care*, 30(3): 606-12.
4. Boorsma, M., K.J. Joling, D.H. Frijters, M.E. Ribbe, G. Nijpels and H.P. Hout, 2012. The prevalence, incidence and risk factors for delirium in Dutch nursing homes and residential care homes. *International journal of geriatric psychiatry*, 27(7): 709-15.
5. Rad, M., N. Mohammadi, M. Seedoshohadee and H. aghani, 2014. Relationship of blood transfusion and CPB with delirium. *Journal of Sabzevar University of Medical Sciences*, 20(5): 801-7. [Persian].

6. Astaneh, A.N., S. khajehmougahi, S. Pakseresht and A. Ramezani, 2007. The multicomponent intervention to prevent postoperative delirium after open-heart surgery. *Journal of Medicine*, 6(2): 141-9.[Persian].
7. Korfiotis, D., A. Arvaniti and I. Pneumatikos, 2013. Epidemiology, diagnosis and management of delirium in the intensive care unit: a narrative review of the literature.
8. Zhang, H., Y. Lu, M. Liu, Z. Zou, L. Wang, F.Y. Xu and X.Y. Shi, 2013. Strategies for prevention of postoperative delirium: a systematic review and meta-analysis of randomized trials. *Crit Care.*, 17(2): R47.
9. Balas, M.C., C.S. Deutschman, E.M. Sullivan-Marx, N.E. Strumpf, R.P. Alston and T.S. Richmond, 2007. Delirium in older patients in surgical intensive care units. *Journal of Nursing Scholarship*, 39(2): 147-54.
10. Marcantonio, E.R., J.M. Flacker, R.J. Wright and N.M. Resnick, 2001. Reducing delirium after hip fracture: a randomized trial. *Journal of the American Geriatrics Society*, 49(5): 516-22.
11. Cunningham, A.J., 2011. A Systematic Review of the Effectiveness of Interventions to Prevent Delirium in Perioperative Patients: York University.
12. Mistraletti, G., E. Carloni, M. Cigada, E. Zambrelli, M. Taverna, G. Sabbatici, M. Ombrello, G. Elia, A.L.L. Destrebecq and G. Iapichino, 2008. Sleep and delirium in the intensive care unit. *Minerva anesthesiologica*, 74(6): 329-34.
13. Shafiee, Z., S. Babaee, A. Nazari and V. Atashi, 2013. The effect of massage therapy on sleep quality of patients after coronary artery bypass graft operation. *Cardiovascular Nursing Journal*, 2(2): 22-9.[Persian].
14. Watson, P.L., P. Ceriana and F. Fanfulla, 2012. Delirium: Is sleep important? *Best Practice and Research Clinical Anaesthesiology*, 26(3): 355-66.
15. Preto, M., R. Spirig, K. Milisen, S. DeGeest, P. Regazzoni and W. Hasemann, 2009. Effects of an interdisciplinary nurse-led Delirium Prevention and Management Program (DPMP) on nursing workload: a pilot study. *International journal of nursing studies*, 46(6): 804-12.
16. Milisen, K., J. Lemiengre, T. Braes and M.D. Foreman, 2005. Multicomponent intervention strategies for managing delirium in hospitalized older people: systematic review. *Journal of advanced nursing*, 52(1): 79-90.
17. Sendelbach, S. and P. Guthrie, 2009. Evidence-based practice guideline. Acute confusion/delirium. University of Iowa Gerontological Nursing Interventions Research Center, Research Translation and Dissemination Core.
18. Ely, E.W., R. Margolin, J. Francis, L. May, B. Truman, R. Dittus, T. Speroff, S. Gautam, G.R. Bernard and S.K. Inouye, 2001. Evaluation of delirium in critically ill patients: validation of the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU). *Critical care medicine*, 29(7): 1370-9.
19. Zolfaghari, M., M. Arbabi, S. Pedram razi, K. Bayat and A. Bavi, 2012. Effect of a multifactorial intervention on prevention of delirium during hospitalization and open heart surgery. *HAYAT.*, 18(1): 67-78. [Persian].
20. Baraz, S., A. Mohammadi and B. Boroumand, 2006. The relationship between quality of sleep, quality of life and some blood parameters in patients treated with Hemodialysis *Journal of Medical Sciences Shahrekord University*, 9(4): 68-74. [Persian].
21. Trompeo, A., Y. Vidi, M. Locane, A. Braghiroli, L. Mascia, K. Bosma and V.M. Ranieri, 2011. Sleep disturbances in the critically ill patients: role of delirium and sedative agents. *Minerva anesthesiologica*, 77(6): 604.
22. Van Rompaey, B., M.M. Elseviers, W. Van Drom, V. Fromont and P.G. Jorens, 2012. The effect of earplugs during the night on the onset of delirium and sleep perception: a randomized controlled trial in intensive care patients. *Critical care*, 16(3): R73.
23. Stuck, A., M.J. Clark and C.D. Connelly, 2011. Preventing Intensive Care Unit Delirium: A Patient-Centered Approach to Reducing Sleep Disruption. *Dimensions of critical care nursing*, 30(6): 315-20.
24. Slatore, C.G., E.R. Goy, D.J. O'Hearn, E.A. Boudreau, J.P. O'Malley, D. Peters and L. Ganzini, 2012. Sleep quality and its association with delirium among veterans enrolled in hospice. *The American Journal of Geriatric Psychiatry*, 20(4): 317-26.
25. Kamdar, B.B., L.M. King, N.A. Collop, S. Sakamuri, E. Colantuoni, K.J. Neufeld, O.J. Bienvenu, A.M. Rowden, P. Touradji, R.G. Brower and D.M. Needham, 2013. The effect of a quality improvement intervention on perceived sleep quality and cognition in a medical ICU. *Critical care medicine*, 41(3): 800.