Research Article

Quality of Sleep and Quality of Life of South Indian Patients on Maintenance Hemodialysis A Study on the Impact of Sleep Education

Vanitha Rani N*

Department of Health Sciences, Sri Ramachandra University, Chennai, India

Corresponding author:
Vanitha Rani N, Department of Health Sciences, Sri Ramachandra University, Chennai, India, E-mail: reachvanitha99@gmail.com

Received: 22-Mar-2020, Manuscript No. AMHSR-20-8478; **Editor assigned:** 26-Mar-2020, Pre QC No. AMHSR-20-8478 (PQ); **Reviewed:** 10-April-2020, QC No. AMHSR-20-8478; **Revised:** 09-Nov-2022, QI No: 8478; Manuscript No: AMHSR-20-8478 (R); **Published:** 07-Dec-2022, DOI: 10.54608.annalsmedical.2022.70

Abstract

Background: The study assessed the Quality of Sleep (QoS) and associated health-related Quality of Life (QoL) of patients on hemodialysis and the impact of sleep education on the same.

Materials and Methods: 84 patients undergoing maintenance hemodialysis were assessed for their QoS and QoL using Pittsburgh sleep quality index and QoL SF-36 questionnaire respectively, at the baseline. The patients were given four educational sessions consecutively every 15 days focusing on sleep hygiene and were reassessed for their QoS and QoL at final follow-up after two months using the same tools. The differences in mean PSQI and QoL scores and the effect of education on quality of sleep from baseline to the follow up were assessed using paired T-test. A probability value of <0.05 was considered significant.

Results: The global PSQI was high at baseline which significantly decreased on intervention with sleep education, and the difference from baseline to the final follow-up was statistically significant (P<0.001). There was a significant increase in the mean scores of QoL components and the overall quality of life (P<0.001) from baseline to the final follow-up. A negative correlation was observed between global PSQI score and the overall QoL score of the study population both at baseline and at follow-up indicating a poor QoL with a poor sleep quality.

Conclusion: The quality of sleep was found to be poor in patients on maintenance hemodialysis which improved significantly by continuous education and training on sleep hygiene that in turn had a positive impact on their quality of life.

Keywords: Hemodialysis; Quality of sleep; Quality of life; Sleep education

Introduction

Chronic Kidney Disease (CKD) is a chronic, progressive condition leading to a gradual and irreversible loss of renal function eventually resulting in End-Stage Renal Disease (ESRD), which requires Renal Replacement Therapy (RRT). CKD has multiple etiologies and all individuals with the evidence of persisting kidney damage, that lasts for at least 3 months are defined as having CKD [1,2]. CKD is one of the major health problems worldwide and the prevalence of CKD is on the rise every year with a significant 10% of the population being affected by chronic kidney disease worldwide. In India it is estimated that the prevalence of CKD varies from 0.16%-0.78% and an alarming no of about 8 million people are suffering from CKD [3].

End Stage Renal Disease (ESRD) is a condition that leads to potentially fatal retention of non-volatile, metabolic waste products, salt, and water due to a significant loss in the number of functional nephrons [4]. The development of renal failure is progressive and the end-stage is reached when the Glomerular Filtration Rate (GFR) approaches 15 ml/min. However, metabolic effects are impaired even before the end-stage failure, and patients become anorexic, there is a loss of body mass; retention of salt, water, and phosphate; impairment in the production of renal hormones (renin, calcipotriol, erythropoietin) and reduction in the production of endogenous vasodilator compounds such as nitric oxide and kinins. Treatment for ESRD involves Renal Replacement Therapy (RRT), restoration of the hormones that are not produced and provision of a good quality of life as possible for each patient [5,6]. Two principal modalities of renal replacement therapy are clinically available, namely dialysis and kidney transplantation. However, the treatment options are life-long, complex, and costly [7,8].

Sleep disorders are highly prevalent in hemodialysis patients leading to physical, behavioral and psychological problems, thereby significantly affecting their Quality of Life (QoL). HRQoL (Health-Related Quality Of Life) is a unique dimension of chronic disease care that allows patient perceptions to be captured via a valid, reliable tool that facilitates tracking and interpreting the result. Dialysis is both life-saving and life-altering. It changes patients' patterns of eating, sleeping, medication use, and ability to perform daily tasks at home, in the community, or the workplace. Among people on dialysis, HRQoL scores are predictors of critical outcomes and morbidity and mortality. A decrease in QoL is reflected as a change in the functional status of the patients physically so that the rate of daily activity and their ability to do daily activities are highly reduced.

How to Cite this Article: Quality of Sleep and Quality of Life of South Indian Patients on Maintenance Hemodialysis A Study on the Impact of Sleep Education. Ann Med Health Sci Res. 2022;12: 1578-1583.

pharmacological methods to improve sleep quality is important [9].

Apart from these, various studies have shown that sleep deprivation which is highly prevalent in chronic hemodialysis patients, is likely to influence their physical function, emotional well-being and overall quality of life. Sleep disorders and sleeplessness in a patient undergoing maintenance hemodialysis is due to illness, treatment, and medicines. Sleep disorders in these patients manifest as insomnia, excessive day time sleepiness, restless leg syndrome, narcolepsy, obstructive sleep apnoea, behavioral disorders [10]. Sleep hygiene is a behavioral practice developed based on our understanding of sleep physiology and pharmacology, to promote good sleep. Several studies have demonstrated that sleep hygiene education can significantly promote the onset of sleep and reduce wakefulness normal population. An increase in the number of hemodialysis patients and the reports from the multidisciplinary health care team that works with them commonly hearing patients complain about sleep disorders testifies the rise of these problems, but studies and research in this field are insufficient. Therefore, studies focusing on awareness of sleep quality and QoL of these patients are the need of the hour for making clinical decisions and promoting the QoL of patients on maintenance hemodialysis [11,12]. Hence a study was conducted to assess the impact of continuous sleep education on the quality of sleep and associated health-related quality of life of patients on maintenance hemodialysis.

Materials and Methods

A prospective interventional study was conducted in the hemodialysis unit of a tertiary care teaching hospital, Tamil Nadu, India. Patients of either above 18 years of age, diagnosed with ESRD and undergoing twice/thrice weekly maintenance hemodialysis for 6 months and above were included in the study. Patients with clinically proven psychological or psychiatric conditions were excluded. Based on the literature the sample size was determined by using Open Epi software 2.1.3 version with a power of 80% and a confidence interval level of 95%. Data on patient demographics past medical history, past medication history, personal history, dialysis characteristics inclusive of dialysis dose (Kt/V), duration of dialysis, weight loss during dialysis, biochemical values inclusive of haemoglobin and serum calcium were collected by direct interview of the patient and from the patients' case records. Patients' quality of sleep and quality of life were assessed at the baseline using the Pittsburgh sleep quality index [13]. Health related quality of life 36-item Short Form (SF-36) questionnaire respectively [14]. The study-specific interventions in the form of Sleep education comprising of sleep hygiene practices as stated by the National Sleep Foundation were provided every fifteen days for two months continuously in the form of verbal counseling [15]. The patients were assessed for their quality of sleep and quality of life using the same questionnaires after the fourth intervention on the 60th day (at the end of two months).

Quality of sleep was measured using the Pittsburgh Sleep Quality Index (PSQI). This PSQI contains 19 self-rated questions yielding seven components: Subjective sleep quality sleeps latency, sleep duration, sleep efficiency, sleep dysfunction. Each component is scored from 0 to 3, yielding a global PSQI score between 0 and 21, with higher scores indicating lower quality of sleep. The PSQI is useful in identifying good and poor sleepers. A global PSQI score >5 indicates that a person is a 'poor sleeper' having severe difficulties in at least two areas or moderate difficulties in more than three areas.

HRQoL was measured with the medical outcomes study 36-item Short-Form (SF-36). This instrument has been used extensively in populations of patients with renal disease. The SF-36 is a 36-item self-administered questionnaire that yields score for eight domains of HRQoL (physical functioning, role limitations physical, bodily pain, general health perceptions, vitality, social functioning, role limitations emotional and mental health) as well as two summary scores, a Mental Component Summary score (MCS) and a Physical Component Summary Score (PCSS). Each of the eight domains is scored out of 100, with higher scores indicating better functioning. The MCS and PCS scores are standardized to the mean of 50, with scores above and below 50 indicating above and below average functioning, respectively [16].

The collected data were analyzed with SPSS statistics software 23.0 Version. Categorical variables were expressed as descriptive statistics (frequency analysis, percentage analysis) and continuous variables as mean and Standard Deviation (SD). The significant differences in the mean PSQI scores and the mean SF-36 component from baseline to the follow-up were assessed using paired sample T-test. The difference in the mean scores of QoS and QoL based on the age of the study population was assessed using one way ANOVA [17]. The association between duration of dialysis, dialysis adequacy (Kt/V), serum haemoglobin and calcium levels and the mean QoL and QoS scores were assessed using Pearson's correlation. Similarly, the effect of sleep education over quality of sleep and its summated effect on the quality of life were also assessed by Pearson's correlation using differences in the mean value from baseline to followup. A probability value of $P<0.05$ was considered as significant level [18].

Results

The study was conducted in 84 patients who were on maintenance hemodialysis, of which 26 (31%) were females and 58 (69%) were males. Among the study population, 34 (39%) patients were found to have diabetes, 18 (21%) were found to have hypertension and 32 (39%) patients had both diabetes and hypertension. The patients were found to be in the age range of 17 years to 77 years with a mean age of 50.76 years ± 12.68 years. There were 19 (22%) patients in the age range of ≤ 40 years, 46 (54%) patients in the age range of 41 years-60 years and 19 (22%) were above the age range of >60 years. The dialysis characteristics of the patients were a mean Kt/V of 1.26 ± 0.23, mean dialysis duration of 3.62 years ± 0.8 years and mean weight loss during dialysis was 2.32 kgs ± 0.52 kgs. The mean serum hemoglobin levels were 11.24 g/dL ± 2.01 g/dL and mean serum calcium was 7.92 mg/dL ± 2.01 mg/dL.

Depicts the mean scores of the components of PSQI among the study population at baseline and at the time of final follow-up after the fourth educational intervention at the end of two months [19]. There was highly significant decrease in the mean scores of subjective sleep quality (2.11 ± 0.65 *vs* 1.12 ± 0.36; P<0.001), sleep latency (2.51 ± 0.57 *vs* 1.56 ± 0.49; P<0.001); sleep duration (2.31 ± 0.69 *vs* 1.42 ± 0.58; P<0.001); habitual sleep efficiency (2.63 ± 0.69 *vs* 1.55 ± 0.54; P<0.001); sleep disturbances (2.17 ± 0.59 *vs* 1.31 ± 0 .46; P<0.001); daytime dysfunction (2.06 ± 0.79 *vs* 1.29 ± 0.52; P<0.001) and global PSQI score (13.79 ± 2.67 *vs* 8.24 ±1.59; P<0.001) from baseline versus the final follow-up. There was no significant change in the mean score of the component use of sleep medication from baseline to the fourth-week intervention (0.06 ± 0.32 *vs* 0.00 ± 0.30; P=0.102) (Table 1).

Table 1: PSQI scores at baseline and at follow-up.

PSQI Components	Mean ± SD		Significance P
	Baseline	Final follow-up	
Subjective sleep quality	2.11 ± 0.65	1.12 ± 0.36	0.001
Sleep latency	2.51 ± 0.57	1.56 ± 0.49	0.001
Sleep duration	2.31 ± 0.69	1.42 ± 0.58	0.001
Habitual sleep efficiency	2.63 ± 0.69	1.55 ± 0.54	0.002
Sleep disturbances	2.17 ± 0.59	1.31± 0 .46	0.002
Daytime dysfunction	2.06 ± 0.79	1.29 ± 0.52	0.001
Global PSQI score	13.79 ± 2.67	8.24 ±1.59	0.001

Depicts the mean scores of the eight components of medical outcomes study health-related quality of life among the study population at baseline and at the time of final follow-up after the intervention at the end of two months [20]. There was highly significant improvement in the mean scores of physical functioning (42.62 ± 17.67 *vs* 47.68 ± 16.76; P<0.001), role physical (31.61 ± 17.41 *vs* 43.33 ± 17.22; P<0.001); role emotional (32.12 ± 22.83 *vs* 69.06 ± 21.21; P<0.001); energy/fatigue (43.50 ± 7.2 *vs* 58.39 ± 10.39; P=0.002); emotional wellbeing (44.37 ± 5.75 *vs* 56.29 ± 11.38; P=0.002); social functioning (43.43 ± 14.72 *vs* 61.99 ± 15.97; P<0.001); pain (45.71 ± 13.49 *vs* 58.29 ± 11.64; P<0.001); general health (29.10 ± 11.29 *vs* 44.29 ± 8.54; P<0.001) from baseline to the follow-up. The mean score of Physical Component Summary (PCS) was found to be 37.19 ± 10.48 at the baseline which significantly increased to 48.39 ± 8.13 on follow-up (P<0.001); the mean score of Mental Component Summary (MCS) was 39.85 ± 3.84 at the baseline which increased significantly to 61.43 ± 8.4 in the follow-up (P<0.001). The mean score of overall quality of life was 29.10 ± 11.29 at baseline which significantly increased to 44.29 ± 8.54 in the final follow-up (P<0.001) (Table 2).

Table 2: Mean HRQoL scores at baseline and at follow-up.

QoL Components	Mean ± SD		Significance P
	Baseline	Final follow-up	
Physical functioning	42.62 ± 17.67	47.68 ±16.76	0.001
Role physical	31.61 ± 17.41	43.33 ± 17.22	0.001
Role emotional	32.12 ± 22.83	69.06 ± 21.21	0.001
Energy/fatigue	43.50 ± 7.2	58.39 ± 10.39	0.002
Emotional wellbeing	44.37 ± 5.75	56.29 ± 11.38	0.002
Social functioning	43.43 ± 14.72	61.99 ± 15.97	0.00
Pain	45.71 ± 13.49	58.29 ± 11.64	0.001
General health	29.10 ± 11.29	44.29 ± 8.54	0.001
PCS	37.19 ± 10.48	48.39 ± 8.13	0.001
MCS	39.85 ± 3.84	61.43 ± 8.4	0.001
Overall QoL	29.10 ± 11.29	44.29 ± 8.54	0.001

There was no statistically significant difference in the global PSQI score and the mean score of QoL components of the study population with respect to their age at the baseline and in the final follow-up (P>0.05). Explains the relationship between the duration of dialysis, QoS and QoL at baseline and follow-up. There was a positive correlation between global PSQI score and duration of dialysis at baseline and at follow-up indicating that longer the duration of dialysis poorer was the quality of sleep. However it was not statistically significant (r=0.97; P=0.37 *vs* r=0.05; P=0.64). There was a negative correlation between the scores of QoL components and duration of dialysis both at baseline and follow-up implicating that longer the duration of dialysis poorer was the QoL but it was not statistically significant (P>0.05) (Table 3).

Table 3: Correlation between the duration of dialysis, QoS and QoL.

QoS and QoL components	Duration of dialysis (at baseline)		Duration of dialysis (at follow-up)	
	R	P	R	P
Global PSQI	0.97	0.37	0.05	0.64
Physical functioning	-0.2	0.85	-0.01	0.88
Role of functioning/ physical	-0.06	0.56	-0.11	0.29
Role of functioning/ emotional	-0.09	0.39	-0.06	0.58
Energy/ fatigue	-0.06	0.56	-0.01	0.96

Emotional well being	-0.01	0.99	-0.15	0.16
Social functioning	-0.01	0.99	-0.05	0.63
Pain	-0.14	0.19	-0.06	0.57
General health	-0.05	0.62	-0.02	0.79
Overall QoL	-0.073	0.49	-0.03	0.76

Explains the correlation between age, serum hemoglobin and calcium, Kt/v and the QoL and QoS components in the study population at baseline *vs* follow-up. There was a positive correlation between age and the global PSQI score (r=0.03 *vs* r=0.04) indicating that greater the age, poorer was the sleep, and a negative correlation between serum hemoglobin and global PSQI score (r=-0.01 *vs* r=0.13), serum calcium and global PSQI score (r=-0.03 *vs* r=-0.05) inferring that the patients with a higher serum hemoglobin and calcium levels had a better sleep pattern, a negative correlation between Kt/v and global PSQI score (r=0.03 *vs* r=0.06) indicating that lower the dialysis adequacy poorer was the sleep. There was a negative correlation between age and PCS (r=-0.01 *vs* r=-0.04), MCS (r=-0.87 *vs* r=-0.18) and overall QoL (r=-0.05 *vs* r=-0.19) indicating that younger the age better was the QoL. There was a positive correlation between serum Hb and PCS (r=0.23 *vs* r=0.17), MCS (r=0.18 *vs* r=0.17) and overall QoL (r=0.19 *vs* r=0.14; serum calcium and PCS (r=0.34 *vs* r=0.24), MCS (r=0.47 *vs* r=0.36) and overall QoL (r=0.08 *vs* r=0.12); Kt/V and PCS (r=0. 11 *vs* r=0.18), MCS (r=0.10 *vs* r=0.04) and overall QoL (r=0.21 *vs* r=0.20) indicating that higher the serum haemoglobin, calcium levels and dialysis adequacy better was the QoL. Though age, dialysis adequacy and low serum haemoglobin and calcium levels did have correlation with sleep and QoL scores, none of these observations were statistically significant (P>0.05) (Table 4).

Table 4: Age, haemoglobin, calcium, Kt/v *vs* QoL and QoS.

QoL and QoS Components	Age (years)		Serum hemoglobin (g/dL)		Serum calcium (mg/dL)		Kt/V	
	R	P	R	P	R	P	R	P
Global PSQI baseline	0.03	0.78	-0.01	0.87	-0.03	0.57	-0.03	0.71
Global PSQI follow-up	0.04	0.68	-0.13	0.21	-0.05	0.62	-0.06	0.59
PCS baseline	-0.01	0.97	0.23	0.06	0.34	0.52	0.11	0.28
PCS follow-up	-0.04	0.7	0.17	0.12	0.24	0.57	0.18	0.09
MCS baseline	-0.87	0.43	0.18	0.09	0. 47	0.65	0.1	0.35
MCS follow-up	-0.18	0.08	0.17	0.11	0. 36	0.56	0.04	0.72
Overall QoL baseline	-0.05	0.61	0.19	0.08	0.08	0.87	0.21	0.07
Overall QoL follow-up	-0.05	0.63	0.14	0.18	0.12	0.68	0.2	0.06

Correlation between global PSQI scores, the PCS, MCS and overall QoL of the study population at baseline and at follow up is explained in Table 5. There was a negative correlation between global PSQI score and the PCS (r=-0.08 *vs* r=-0.06), MCS (r=-0.17 *vs* r=-0.13) and overall QoL (r=-0.11 *vs* r=-0.3) of the study population both at baseline and at follow-up stating that greater the sleep score poorer was the QoL, but the relationship was not statistically significant (P>0.05) (Table 5).

Table 5: Global PSQI *vs* QoL at baseline.

QoL components	Global PSQI			
	Baseline		At follow-up	
	R	P	R	P
PCS	-0.08	0.46	-0.06	0.56
MCS	-0.17	0.1	-0.13	0.21
Overall QoL	-0.11	0.3	-0.3	0.73

Discussion

End-stage renal disease together with the requirements of applying an effective treatment in the form of hemodialysis, reduces the patient's quality of life, especially in the area of physical activity. Also, sleep complaints are common in HD patients and include delayed sleep onset, frequent awakening, restlessness and daytime sleepiness. Sleep is a basic physical need. Although sleep functions are not clearly understood it is excepted that sleep is necessary for maintaining health and state of illness. Sleep quality is measured by whether an individual feels energetic, active and ready to start a new day. Complaints about sleep are very common and the quality of sleep is an important indicator of many illnesses. Many factors in hemodialysis patients such as blood urea level, creatinine level, parathyroid hormone level, systolic and diastolic blood pressure and bone pain increase the prevalence of sleep problems. It has been reported 50%-80% of dialysis patients experience sleep problem which significantly decrease an individual quality of life. The quality of sleep of hemodialysis patients who have a high rate of relapse with sleep problems because they have a combination of poor physical health and emotional problems such as anxiety and depression needs to be evaluated and improved.

The present study was conducted in 84 patients undergoing maintenance hemodialysis for 6 months and above. The QoS and QoL were assessed at the baseline following which the patients were given four sleep education sessions every fortnight (15 min/patient/session) consecutively for two months. The study population constituted 69% of males and 31% of females with the mean age of 50.76 years. In the present study, the prevalence of poor sleep quality was 83.33% which is concordance in a study done by the percentage of poor quality of sleep was 88% in MHD patients and 78% in PD patients. Similar reports in the present study, the quality of sleep was assessed using the PSQI questionnaire. There was a highly significant decrease in the mean scores of the components of PSQI and the global PSQI scores from baseline to the fourth intervention (P<0.01). Sleep medication (Zolpidem) was used by one patient at the baseline which was discontinued after four consecutive sleep educational interventions. This indicates that continuous sleep

education on sleep hygiene had a significant impact on the sleep patterns of the study population. The findings of the present study are concordance which identified that sleep training created a significant improvement in all components of sleep quality, which helped greatly in the reduction of day time fatigue and sleepiness. Similarly, the health-related quality of life was assessed using HRQoL SF-36 questionnaire. The mean scores of the eight components of QoL, the PCS, MCS, and the overall QoL were undesirable at the baseline indicating poor quality of life. However, following the continuous sleep education interventions, there was a highly significant improvement in the mean scores of all the components of Qol, the PCS, MCS, and the overall QoL from baseline to the fourth-week intervention ($P<0.01$).

In the present study, there was no significant relationship between age, dialysis dose (Kt/V), duration of dialysis, serum hemoglobin and calcium levels and the components of both QoL and QoS. Also, there were no statistically significant differences were observed in patients' quality of sleep and quality of life scores based on their age ($P>0.05$). This could be attributed to smaller study population. These findings are similar to those stated in their study, which was conducted in the Iranian population using the PSQI and medical outcomes study SF-36 scores.

In the present study, there was a negative correlation between quality of life components and quality of sleep scores. However, the correlation was not statistically significant. A study conducted by Edalat also found no significant correlation between the quality of sleep and physical component summary of QoL and a negative correlation between QoS and mental component in their study, reported a significant negative correlation between the quality of sleep scores and the scores of quality of life components. Few studies have also reported a significant relationship between patients' quality of sleep and their mental and physical health and patients with poor sleep quality had poorer physical and mental health and many problems in doing daily activities.

The above findings depict that sleep quality is an effective factor influencing the mental and physical health dimensions of QoL, hence evaluating the patients undergoing maintenance hemodialysis for sleep disorders and the risk factors should be done periodically. It is well understood that studying sleep quality and management of sleep disorders may pose a significant positive impact on the quality of life of long term hemodialysis patients, improve their clinical outcomes and may considerably reduce their cost of treatment.

To our knowledge, this is one of the very few studies to assess the quality of sleep and associate it with the quality of life of maintenance hemodialysis patients. The results of the present study extend the result of previous investigations by demonstrating that QoS is independently associated with a significant decrease in overall quality of life for patients undergoing maintenance hemodialysis. Therefore, similar to the aforementioned studies, the present study had also justified the positive impact of continuous sleep hygiene training on patients' quality of sleep and sleep latency. The findings of the present study reiterate the need for the provision of continuing education training and necessary therapeutic interventions to improve patients' sleep quality to a normal level.

Conclusion

The results of the present study identified a poor quality of sleep in patients on maintenance hemodialysis, which significantly improved on continuous sleep education and training on sleep hygiene. This in turn had a positive impact on their quality of life. The study suggests that sleep hygiene can be taught regularly in hemodialysis wards to improve the patient's sleep, their physical and mental health, which in turn can have a positive impact on the clinical outcomes and their quality of life.

Limitations of the Study

Small sample size, a study design non-inclusive of a control group for comparison and shorter duration were the major limitations of the study. Since the sleep assessment was subjective, there is a probability that the patients did not reveal their real feelings in answering the questions. Also, there was an inability to ascertain the cause of sleep disturbances in patients due to a lack of polysomnographic data.

References

1. John R, Webb M, Young A, Stevens PE. Unreferred chronic kidney disease: A longitudinal study. Amer J Kid Dis 2004; 43:825-35.
2. Coresh J, Astor BC, Greene T, Eknoyan G, Levey AS. Prevalence of chronic kidney disease and decreased kidney function in the adult US population: Third National Health and Nutrition Examination Survey. Amer J Kid Dis 2003;41:1-12.
3. Tel H, Esmek M. Quality of sleep in hemodialysis patients. Dialy Transplant 2007;36:479-84.
4. Chandna SM, Schulz J, Lawrence C, Greenwood RN, Farrington K. Factors affecting survival and morbidity on chronic dialysis. Is there a rationale for rationing. Brit Med J 1999;318: 217-23.
5. Heidenheim AP, Lindsay RM. Patient quality of life quotidian hemodialysis. Amer J Kid Dis 2003:42:36-41.
6. Beddhu S, Baird BC, Zitterkoph J, Neilson J, Greene T. Physical activity and mortality in chronic kidney disease (NHANES III). Clin J Amer Soci Nephrol 2009; 4:1901- 06.
7. Ting GO, Kjellstrand C, Freitas T, Carrie BJ. Long term study of high–comorbidity ESRD patients convereted from conventional to short daily hemodialysis. Amer J Kid Dis 2003; 42:1020-35.
8. Augner C. Associations of subjective sleep quality with depression score, anxiety, physical symptoms and sleep onset latency in students. Cent Europ J Pub Heal 2011;19:115-17.
9. Lemma S, Gelaye B, Berhane Y, Worku A, Williams MA. Sleep quality and its psychological correlates among university students in Ethiopia: A cross-sectional study. BMC Psychiat 2012;12: 237.
10. Saeedi M. Sleep hygiene training program for patients on hemodialysis. Iran J Kid Dis 2014; 8:65-9.

11. Eduard A Iliescu, Helen Coo, Margo H McMurray, Carol L Meers, Margo M. Quinn. Quality of sleep and health-related quality of life in haemodialysis patients. Nephro Dialy Transplant 2003;18:126–32.
12. Fukuhara S, Lopes AA, Bragg Gresham JL, Kurokawa K, Mapes DL. Health related quality of life among dialysis patients on three continents: The dialysis outcomes and practice patterns study. Kid Intern. 2003;64:1903-10.
13. Mapes D, Lopes A, Satayathum S. Health related quality of life as a predictor of mortality and hospitalization: The dialysis outcomes and practice patterns study. Kid Intern 2003:64:339-49.
14. Tang SC, Lai KN. Sleep disturbances and sleep apnea in patients on chronic peritoneal dialysis. J Nephrol 2009;22:318-25.
15. Kobra Parvan, Sima Lakdizaji, Fariborz Roshangar, Mahtab Mostofi. Quality of sleep and its relationship to quality of life in hemodialysis patients. J Car Sci. 2013;2:295-304.
16. Eryavuz N, Yuksel S, Acarturk G, Uslan I, Demir S. Comparison of sleep quality between hemodialysis and peritoneal dialysis patients. Intern Urol Nephrol. 2008; 40:785-791.
17. Sabbatini M, Minale B, Crispo A, Pisani A, Ragosta A. Insomnia in maintenance haemodialysis patients. Nephrol Dialy Transplant 2002; 17:852–856.
18. Sadeghi H, Azizzadeh FM, Haghdoost AA, Mohammad AS. Effect of implementing continuous care model on sleep quality of hemodialysis patients. Iran J Critic Care Nurs 2010;3:12–18.
19. Edalat Nejad M, Qlich Khani M. Quality of life and sleep in hemodialysis patients. Saudi J Kid Dis Transplant 2013; 24:514.
20. Shafipour V, Jafari H, Shafipour L, Nasiri E. Assessment of the relationship between quality of life and stress in the hemodialysis patients in 2008. Pakist J Biol Sci. 2010;13:375-79.