The effect of acupuncture treatment for insomnia in chronic hemodialysis patients

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Abstract. Insomnia is a problem often experienced by patients on chronic dialysis which reduces their quality of life. Current management of insomnia with this specific group of patients has yet to produce optimum results. In this study, we explored the role of acupuncture as a treatment for symptoms of insomnia in patients on chronic dialysis. Twenty-eight hemodialysis patients suffering from insomnia were divided randomly into two groups, an acupuncture group (n = 15) who received acupuncture treatment at the points HT7 Shenmen, PC6 Neiguan, GV20 Baihui, and EX-HN1 Sishenchong, and a control group (n = 13) who underwent a sham procedure in which a needle was inserted into an elastic bandage at the same points. The acupuncture treatment was done during hemodialysis twice a week for five weeks. PSQI scores and the WHOQOL-BREF were assessed before treatment, after the fifth treatment, and at the end of the treatment. Significant differences were found in the PSQI score (4.20±2.27 vs. 11.23±3.37; p = 0.000) and in the WHOQOL-BREF (94.53±10.08 vs. 82.69±11.90; p = 0.008) between the acupuncture group and the control group by the end of the period of treatment. Acupuncture treatment effectively improved the quality of sleep and the quality of life for these chronic hemodialysis patients.

1. Introduction
Insomnia can be interpreted as a subjective complaint involving sleep interference, including the duration or quality of sleep. Insomnia is a problem that occurs frequently in chronic hemodialysis patients who are being treated for kidney disease; insomnia occurs twice as often in this group as it does in a healthy population. Reports of sleep interference by chronic hemodialysis patients varies widely, with different studies reporting rates varying from 45–90% [1,2]. Insomnia affects the patients physically and psychologically, and increases the patients’ mortality rate [1-4]. Studies conducted by the Indonesian Renal Registry in 2014 show that in Indonesia, alone, there were 703139 patients on routine hemodialysis treatment, who ranged from 15–64 years in age [5]. This suggests that insomnia is a potentially significant yet generally under-recognized problem. Pharmacological intervention for insomnia in hemodialysis patients is limited by its side effects and by the potential for drug dependence, especially after long term use [1,2]. Medications taken for insomnia are associated with side effects such as headache, cognitive dysfunction, motoric incoordination, orthostatic hypotension, diarrhea, and daytime sedation [6]. When patients have kidney disease, careful attention must be paid
to medication usage because of their dysfunctional kidney metabolism. In addition, these patients may be taking other drugs, therefore increasing the risk of drug interactions [7].

Several studies [1,2,8,9] have shown that body or ear acupressure effectively improves sleep quality in chronic hemodialysis patients in several domains, including overall quality of sleep, sleep duration, sleep latency reduction, sleep disturbance reduction, and daily dysfunction. Research done by Wu et al. showed that acupressure significantly reduced estazolam usage in patients, from 6.98±4.44 pills to 4.23±2.66 pills [2]. Studies using polysomnography have also demonstrated that acupressure improves quality of sleep [10]. In this study, we explore the effect of acupressure therapy in the management of insomnia in chronic hemodialysis patients.

2. Materials and Methods
This double-blind, randomized controlled clinical trial was done at the hemodialysis unit in the General Hospital Cipto Mangunkusumo, Jakarta. The study participants were hemodialysis patients who had been diagnosed with insomnia according to the criteria of the Indonesian Manual for the Management of Psychiatric Disorders, 3rd revision (PPDGJ III). They all had a Pittsburgh Sleep Quality Index (PSQI) score ≥7, were between 15 and 64 years of age, were hemodynamically stable, had no infection, wound, or tumor, were willing to comply with the study follow up, and were prepared to sign an informed consent form. Exclusion criteria were having a hemoglobin level of less than 8 g/dL and the presence of grade III pruritus with a constant itch that disturbed sleep and daily activities. Analysis was done according to the protocol, and patients who did not finish the research procedure or who missed the acupuncture on two consecutive occasions were excluded from the analysis.

Using computer-based random allocation, subjects were randomly allocated to one of the two groups, an acupuncture group or a sham acupuncture group. The study intervention was done twice a week for a total of 10 sessions. Acupuncture was given following the application of strips of adhesive bandages to the HT7 Shenmen, PC6 Neiguan bilateral, GV20 Baihui and EX-HN1 Sishenchong points until the depth at which needle sensations were felt. The needles were left in place for 30 minutes, after which they were taken out. In the sham acupuncture group, the needles were pricked into the adhesive bandages applied to the same points as in the acupuncture group, but without contacting the skin. The needles were left in place for 30 minutes, after which they were taken out. The endpoints in this study were the quality of sleep scored using the PSQI questionnaire and the quality of life scored using the WHOQOL-BREF questionnaire. Assessments were done before treatment, after the fifth treatment and at the end of the treatment period by an independent evaluator team. Data analyses were conducted using the IBM SPSS version 20. Paired t-tests were used for intragroup analysis, and independent sample t-tests were used for intergroup analysis. In the event of non-normally distributed data, Wilcoxon and Mann-Whitney tests were used as alternatives.

3. Results and Discussion
3.1 Results
The intervention and control groups were comparable in baseline characteristics, as shown in tables 1 and 2. The main study endpoint, the PSQI score (Table 3), was similar between the two groups at baseline but started to diverge after the fifth treatment, and this difference was maintained until the end of treatment at five weeks (PSQI score 6.4 vs. 11.46 at fifth treatment and 4.20 vs. 11.23 at tenth treatment for acupuncture and sham groups respectively, p < 0.05). A similar trend was also observed in the WHOQOL-BREF score (Table 4) which demonstrated a smaller but statistically significant improvement after the tenth treatment (94.53 vs. 82.69, p < 0.05).
### Table 1. Characteristic based on gender, education, and job analyzed with fisher exact test

| Characteristic  | Acupuncture | Sham Acupuncture | p-value |
|----------------|-------------|------------------|---------|
|                | n   | %   | n   | %   |         |
| Gender         |     |     |     |     |         |
| Male           | 8   | 53.3 | 7   | 53.8 | 1.000   |
| Female         | 7   | 46.7 | 6   | 46.2 |         |
| Education      |     |     |     |     |         |
| Low-Mid        | 7   | 46.7 | 9   | 69.2 | 0.276   |
| High           | 8   | 53.3 | 4   | 30.8 |         |
| Marital status |     |     |     |     |         |
| Not married    | 5   | 33.3 | 2   | 15.4 | 0.396   |
| Married        | 10  | 66.7 | 11  | 84.6 |         |
| Job            |     |     |     |     |         |
| Employed       | 5   | 33.3 | 3   | 23.1 | 0.686   |
| Unemployed     | 10  | 66.7 | 10  | 76.9 |         |

### Table 2. Characteristics Based on Age, Hemodialysis Period, and Hemoglobin

| Characteristic                  | Acupuncture | Sham acupuncture | p-value |
|--------------------------------|-------------|------------------|---------|
|                                | Mean (SD)   | Mean (SD)        |         |
| Age (years old)                | 43.87 (10.98)| 49.54 (9.21)     | 0.154   |
| Hemodialysis period (years)    | 4.75 (3.40) | 5.23 (4.16)      | 0.741   |
| Hemoglobin (g/dl)              | 9.81 (1.59) | 9.87 (1.08)      | 0.913   |

SD=standard deviation; independent sample T-test

### Table 3. Comparison of PSQI score

| PSQI Score                      | Acupuncture | Sham acupuncture | p-value |
|---------------------------------|-------------|------------------|---------|
|                                | Mean (SD)   | Median (min-max) |         |
|                                |             |             |         |
| Before intervention             | 13.87 (2.33)| 14 (10-17)   |         |
| After 5th treatment             | 6.40 (2.41) | 7 (2-12)     | 0.000*  |
| After 10th treatment (end of therapy) | 4.20 (2.27) | 4 (1-8)    | 0.000*  |

**Independent sample t-test; * Mann Whitney test

### Table 4. Independent sample t-test results comparing the WHOQOL-BREF Score

| WHOQOL-BREF Score                  | Acupuncture | Sham Acupuncture | p-value |
|------------------------------------|-------------|------------------|---------|
|                                    | Mean (SD)   | Mean (SD)        |         |
| Before intervention                | 81.20 (10.07)| 82.31 (11.06)   | 0.784   |
| After 5th treatment                | 86.4 (10.47)| 81.77 (11.22)   | 0.269   |
| After 10th treatment (end of therapy) | 94.53 (10.08)| 82.69 (11.90) | 0.008   |
3.2 Discussion
To the best of our knowledge, this is the first study in Indonesia to explore the use of acupuncture for insomnia in patients with chronic hemodialysis. A limited number of studies have explored the use of acupuncture for insomnia, and even fewer studies have explored its use in patients on chronic hemodialysis. Patients with hemoglobin of less than 8, or with severe anemia were excluded from this research because of the high morbidity rate. Available studies show controversy over the role of hemoglobin in quality of sleep, but a study by Holley et al. with 694 patients shows no relationship between hemoglobin level and patients’ quality of life [11].

Acupuncture points chosen for this research were those used in other published studies and included the GV20 Baihui, EX-HN1 Sishenchong, HT7 Shenmen, and PC6 Neiguan. Based on evidence, as reviewed by Cheuk et al., these are among those most commonly used in treating insomnia, in addition to other points such as GV24 Shenting, SP6 Sanyinjiao, and ear Shenmen [12]. The physiological changes related to these acupuncture points have been well documented, and include the normalization of nocturnal melatonin secretion (HT7 Shenmen point), increased GABA (HT7 Shenmen and GV20 Baihui points), the stabilization of sympathetic activity (HT7 Shenmen, PC6 Neiguan, EX-HN1 Sishenchong points), the reduction of alpha activity in the anterior insular cortex and anterior cingulate (HT7 Shenmen), the reduction of corticosterone and the ACTH level (HT7 Shenmen and GV20 Baihui) [12–16]. In addition, acupuncture also works through the opioidergic system by increasing the levels of met-enkephalin, beta-endorphine and dynorphin [17].

In a comparison of the PSQI scores of the treated group and the control group, the PSQI mean score varied from 13.87 (2.33) to 4.20 (2.27) in the treated group and from 12.31 (3.07) to 11.23 (3.37) in the control group. After conducting the statistical test, the p score obtained was p=0.000 (p<0.05). This showed a significant difference in the PSQI score of the treatment group compared with the control group, reflecting an improvement in their quality of life. This is in line with previous studies that show the efficacy of acupuncture and acupressure in alleviating insomnia. Studies by Nasiri et al., Shariati et al., Zou et al., Wu et al., Shiow et al., and Arab et al. show that the triggering of acupuncture points, whether by body acupuncture or by ear acupuncture using the acupressure technique, both had positive effects on improved quality of sleep in patients on chronic hemodialysis who experience insomnia [1,2,8,9,18,19]. Meta-analyses done by Cao et al. and Cheuk et al. also showed that acupuncture significantly improves quality of sleep, both in the general population and in specific medical conditions such as stroke, renal disease, perimenopause, pregnancy, and psychiatric disorders. Acupuncture and acupressure significantly improve sleep quality compared to an untreated control, to medical treatment only, or to sham acupuncture/acupressure [12,20].

In the WHOQOL-BREF comparison of the scores of the treated group and the control group, the WHOQOL-BREF score for the treated group changed from 81.20 (10.07) to 94.53 (10.08), and in the control group from 82.31 (11.06) to 82.69 (11.90). These results showed a statistically significant difference between the WHOQOL-BREF score of the treated group and that of the control group. The WHOQOL-BREF scores compared the quality of life of the treated patients with that of the control group, and showed a significantly better quality of life for the treated group. This research showed that there was strong correlation between quality of life and quality of sleep. Research done by Shiow et al. also showed that after acupressure for insomnia, patients on chronic hemodialysis experienced better quality of life, as seen by increases in their SF36 scores [9]. Research by Hachul et al. showed that acupuncture had a positive effect on menopausal women who were experiencing insomnia. They experienced improvement both in their quality of life and quality of sleep, as shown by decreases in their PSQI scores and increases in their WHOQOL-BREF scores [21]. A review by Cheuk et al. in Cochrane also showed that acupuncture significantly increases patients’ quality of life relative to sham acupuncture, with or without other treatments [12]. PSQI scores were significantly decreased, indicating significant effects on quality of life, physical health, mental health, and renal disease load [4].

During this research, the only side effects were mild bleeding, which stopped after pressure was applied using alcohol on cotton-wool (5.9%), and hematoma (0.2%), which was self-resolving in 7–10
days. In this study, no severe, life threatening side effects were found. All patients in this research were on heparin treatment as an anticoagulant. Research done by Phan et al., and a meta-analysis conducted by McCulloch et al. showed similar results. In the study by Phan et al., a mild bleeding side effect was found in 6.02% and hematoma in 2.1%. The prevalence of hematoma in this research was lower than in previous studies. The meta-analysis by McCulloch showed medium bleeding in only one case out of 3974 acupuncture treatments (0.003%), while bleeding that was resolved by applying pressure to cotton wool happened in 51 cases (14.6%) out of 360 acupuncture treatments. This shows that acupuncture is safe for patients on anticoagulants, assuming the correct puncture locations and depth are observed [22,23]. Some patients in this study experienced pain when pricked, and this occurred in about 68 cases (6.5%). Pain was mild and lasted just for a moment. The pain resolved by itself and did not disturb the patients. A systematic review by Ernst et al. showed that pain was the mostly commonly experienced side effect of acupuncture (1–45%) [24]. There was no syncope, no infection at the pricking points, or any other side effect. A limitation of our current study was that no biomarker examinations were conducted to support the working mechanism and pathophysiology of acupuncture because of budget limitations. Another limitation was the lack of follow up to observe whether the effects of acupuncture persisted after the treatment protocol was completed.

4. Conclusion
Acupuncture therapy is superior to sham acupuncture therapy in treating insomnia in patients on chronic hemodialysis and represents a safe and effective modality for improving sleep quality and overall quality of life in the management of these patients.

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