# Effect of Hybrid Aromatherapy on Sleep Quality of Patients with Acute Coronary Syndrome Admitted to Cardiac Care Unit

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## Abstract

**Background and objective:** Sleep disorder and reduced rest during admission to hospital is a stimulating factor of heart attacks in coronary artery disease patients. There are different ways to improve sleep quality.

**Method:** Aromatherapy is one of the methods used to improve sleep quality. This study determines the effects of hybrid aromatherapy on sleep quality of patients with ACS admitted to CCU. This clinical trial was conducted in 2016 on 60 patients diagnosed with ACS and admitted to CCU of the 22 Bahman Hospital, Gonabad. The patients were recruited by using convenient sampling and assigned randomly to control and experiment groups.

**Results:** The experimental group received aromatherapy with a combination of essential oils of lavender, Matricaria recutita and neroli (6:2:0.5) for three consecutive nights; the control group received no intervention. At the beginning and the end of the study, visual VSH scale was filled out to assess sleep quality. The collected data was analyzed by using SPSS20, independent t-tests, Chi-square test and exact Fisher test (p<0.05). Each group contained 30 samples who were not significantly different in terms of underlying characteristics (p>0.05).

**Conclusion:** There was a significant difference in mean score of post-interventional and pre-interventional sleep quality, effectiveness and sleep supplementation (p<0.001). The mean score of sleep quality and sleep supplementation increased in the control group and decreased in the experiment group, while the mean score of sleep effectiveness decreased in the control group and increased in the experiment group. The results showed that hybrid aromatherapy as a cost effective and uncomplicated method can improve sleep quality of patients with ACS admitted to CCU.

**Key words:** aromatherapy, sleep quality, acute coronary syndrome

## Introduction

More than any other diseases, ischemic heart diseases cause mortality and disability in developed countries and impose economic costs. Ischemic heart diseases are the most common, the most serious, the most chronic and the most dangerous diseases in the United States where 13 million people suffer from these diseases. More than 6 million people suffer from angina pectoris and more than 7 million people have had a myocardial infarction. High fat and energy diet, smoking and sedentary lifestyle are associated with prevalence of cardiovascular diseases. [1] In Iran, incidence of cardiovascular diseases is high, accounting for 90 thousand deaths annually. According to available statistics, 46% of mortalities are caused by cardiovascular diseases. According to the Ministry of Health and Medical Education, about 39% of all patients referred to healthcare centers suffer from cardiovascular diseases. [2] Acute coronary syndrome (ACS) is a manifestation of coronary artery disease which includes a wide range of diseases including unstable angina pectoris, non St-segment elevation MI and St-segment elevation MI. [3] Patients who are restricted to a particular treatment environment due to a therapeutic problem are both exposed to sensory overload and sensory deprivation. An important category of these patients includes those who are admitted to intensive care units and are prone to both problems, namely, sensory deprivation and sensory overload due to exposure to a high-noise environment and constraint of movement caused by being attached to different devices; this can in some cases lead to psychosis in the intensive care unit. [4] The occurrence of acute diseases, regardless of their origin, makes the patient susceptible to psychological and physiological complications. When providing care to critically ill patients, the focus is on prevention of complications related to the disease, including mental health problems such as hallucinations, depression, anxiety and sleep pattern disturbances. [5] One of the important components of the human lifestyle is sleep and rest. Sleep is one of the most important circadian cycles [6], and is the basis of physiological processes. [7] Illness and hospitalization are closely related to sleep disorders; a majority of patients complain of sleep deprivation and sleep disorders in the first three nights of admission and a majority of patients consider several causes for sleep deprivation, although severity of effect of these factors is different. [8] Generally, diseases can have negative effects on sleep or, conversely, low sleep quality can lead to symptoms in the individual. [9] Hospitalization specifically causes disturbances in sleep patterns and insomnia. [10] These disturbances may be caused by various external factors such as environmental noise, light, frequent interventions of personnel, and inappropriate bed conditions or internal factors such as pain, delusions, depression, and stress. [11] Sleep medications are the first line of treatment for insomnia which can potentially cause severe side effects. [12] Although these medications may induce or prolong the sleep process, sleep quality may still remain low. Additionally, the use of these medications can lead to complications such as resistance to effect of the drug, as well as symptoms of discontinuation during the sudden withdrawal of the drug, and sometimes exacerbated sleep disorders. [13] Alternative therapies such as acupressure, acupuncture, aromatherapy, therapeutic touch and music therapy are effective therapies on sleep disorders. [12] One of these treatments is aromatherapy. One of aromatherapy techniques is the inhalation of essential oil by applying essential oils on the clothes or pillows of patients. [13] Aromatherapy refers to the use of volatile oils or aromas extracted from aromatic plants for therapeutic purposes. This treatment is the second complementary medicine among nurses and it is widely used in clinical practice. [9] Application of complementary therapies such as aromatherapy is part of the nursing professional goals. Unlike clinical therapies, complementary therapies, in spite of being economical, lack any serious complications and drug interactions in most cases and they are simple and well-accepted by the patient. [15] Aromatherapy is used to relieve pain, anxiety, depression, insomnia, fatigue, asthma, and even provide self-confidence, success, and creativity. [16] Matricaria Chamomilla is a plant used in traditional medicine to help sleep and relax. Traditionally, Matricaria Chamomilla has been used in different parts of Iran due to its fever-lowering effects, effects on nervous and immune systems, sleep, sedation and analgesia. [17] One of fragrances highly used as a sedative is Lavandula angustifolia from the family Labiatae; its effective ingredients include linalool and linalyl acetate. Linalool acts as a sedative by influencing gamma-Aminobutyric acid receptors in the central nervous system [18], while linalyl acetate has a narcotic function. [19] Another fragrance is neroli; in traditional medicine of Iran, neroli is known as a sedative and sleep booster. A study on the effect of aromatherapy with neroli essential oil on sleep quality of patients hospitalized in the cardiology ward showed that although this treatment could improve all aspects of hospital sleep, this type of aromatherapy can be considered as a new treatment for patients with sleep disorders due to its effect on quality and depth of sleep. [13] These studies show that lavender, chamomile and neroli are effective in improving sleep quality. Due to the emphasis on aromatherapy, however, it is more beneficial to use a combination of herbal essential oils rather than to use them separately. [32, 33] It seems that the combination of these three essential oils is more effective in improving sleep quality. Therefore, this study tends to examine the effect of inhaled aromatherapy using a combination of essential oils of lavender, chamomile and neroli (6:2:0.5) on sleep quality of patients with acute coronary syndrome admitted to CCU for three days. If the result is positive, it can be used as a simple, inexpensive, available, effective and acceptable treatment for patients. It is worth noting that complementary therapies also lead to independence of the patient and can be used by the patients themselves with simple tools.

## Literature review

Through a pre-test and post-test quasi-experimental study with a control group, Atashi et al. (2015) examined the effect of aromatherapy with rose-red essential oil on sleep quality of athletes before competition. The statistical population included futsal players of the Islamic Azad University, Tehran Branch. Twenty players were selected by convenient sampling and divided into control and test groups. The instruments included demographic information questionnaire and Pittsburgh Sleep Quality Index. The test group received aromatherapy by red rose essence for 4 nights. Each night, three drops of red rose essence were instilled on their pillow and they inhaled the essential oil for 8 hours. The control group did not receive aromatherapy. People filled the Pittsburgh Sleep Quality Index on the morning of the fifth day (on the morning of the competition). This study showed that 4 nights of aromatherapy intervention had no significant effect on sleep quality of athletes before the competition. [23]

Moghadam et al. (2016) conducted a randomized clinical trial to study the effect of aromatherapy by lavender essential oil on sleep quality of ICU nurses. This study was conducted on 70 nurses working in ICUs in control and test groups. This study showed that inhalation of lavender essential oil had a beneficial effect on sleep quality of ICU nurses and could be used as a useful technique to improve sleep quality of these nurses. [24]

Najafi et al. (2014) conducted a clinical trial to examine the effect of aromatherapy with lavender on sleep quality of 60 hemodialysis patients referred to dialysis centers of Akhavan Kashan and Shohadaye Langjan Hospitals of Zarinshahr Hospitals. The patients were selected by continuous sampling. By using block randomization, the patients were divided into test (30) and control (30) groups. This study showed that aromatherapy with lavender essential oil had a positive effect on sleep quality of hemodialysis patients and could be used as a non-invasive, easy and inexpensive method for treatment of sleep disorders in these patients. [25]

Zeighami et al. (2014) conducted a study to examine the effect of neroli essence on sleep quality of 60 cardiac patients admitted to CCU. This study was a clinical trial with control group, pre-test and post-test. Two CCUs were divided into control and intervention groups based on random assignment. Patients admitted to these wards were enrolled according to inclusion criteria. The results showed that aromatherapy with neroli essential oil had a significant effect on hospital sleeping quality of two groups (p<0.05). Findings of this study showed that aromatherapy with neroli essential oil can be used as an auxiliary treatment for sleep disorders in cardiac patients. [20]

**Hypotheses:**
Aromatherapy is effective in reducing sleep disorder of ACS patients admitted to CCUs.

Aromatherapy is effective on sleep effectiveness of ACS patients admitted to CCUs.

Aromatherapy is effective in reducing sleep supplementation of ACS patients admitted to CCUs.

## Materials and methods

This study was a controlled clinical trial using random, parallel and single-blind methodology. Using convenient sampling, patients were recruited by considering and controlling variables and the intended parameters; then, the patients were randomly assigned to experiment and control groups. The experiment group was examined to determine the effect of hybrid aromatherapy on ACS patients admitted to CCUs. The studied population included patients diagnosed with ACS and admitted to CCU of the 22 Bahman Hospital, Gonabad. The sample included 60 patients diagnosed with ACS who were referred to the hospital for treatment and were willing to participate in the study. Considering data obtained from a similar study [24], sample size was estimated at 28 for each group using mean comparison formula at 95% confidence interval and 90% testability. By considering 10% likelihood of sample loss, 30 samples were selected for each group; totally, 60 samples were recruited for the study. Instruments and materials used for data collection included:

**1)** information form including demographic and underlying data such as age, gender, occupation, marital status, education, family size, frequency of hospitalization, known underlying diseases, administration of sedative drugs, level of daily activities, and drinks which are effective on sleep including tea or coffee and smoking; and physiological indices form before and after each course of aromatherapy:

**2) Verran and Snyder-Halpern Sleep Scale (VSH Sleep Scale):** this scale was developed by Snyder-Halpern and Veran in 1987 to measure individual mental responses to sleep in adult patients admitted to the hospital. This scale measures one's perception of last night. This scale was the best choice, since it is easy to respond to and requires minimal time and the least cost compared to other equipment and techniques. [26] This instrument is a 15-item visual scale which is filled out by paper and pencil and used to assess sleep of hospitalized patients. This scale measures one's perception of last night. VSH scale is a valid, valuable scale which includes various sleep parameters, such as sleep disturbances, wake-ups, difficulty in sleeping and sleep duration. The score of each item is from zero to 100 mm (it is graded every 5 mm) and participants mark their understanding of sleep at this distance. This scale measures sleep disturbance (sleep latency, interrupted sleep), effectiveness (how sleep is effective in creating happiness) and sleep supplementation (nap, day dreaming). Scores of these subscales are 0-700, 0-500 and 0-400. *Disturbance* measures interrupted sleep and sleep latency. *Effectiveness* measures sleep quality (relaxation and sleep depth) and sleep duration (sleeping hours in bed). *Supplementation* measures naps and sleep after waking up in the morning. For disturbance

and supplementation, higher scores indicate higher sleep disorder. For effectiveness, higher scores indicate better sleep. Arab et al (2013) used this questionnaire and confirmed its reliability by considering its Cronbach's alpha estimated at 0.78. [27]

Once the project was approved by the Regional Ethics Committee, Gonabad University of Medical Science (IR. GMU.REC.1394.61) and registered in the Iran Clinical Trial Center (IRCT2015122922682N4), the qualified samples were recruited. Written informed consent was obtained from the subjects. Samples were randomly assigned to experiment and control groups using permutation blocks (15 blocks of four) and random numbers table. Six possible scenarios (AABB, ABAB, BBAA, BABA, ABBA, BAAB) were listed. The number of blocks required was determined randomly, based on which subjects were assigned to experiment group (B) and control group (A). The author introduced himself and explained the objectives to patients. Written informed consent was obtained from the patients. The patients were asked to fill out a demographic data questionnaire. Records of the patients were completed; initial assessment was done. Sleep score of people was determined and recorded. Subjects were randomly assigned to experiment and control groups. Intervention (aromatherapy) was done for the experiment group. The control group received no intervention and only received routine care. The experiment group received usual drugs by nurses; then, they were exposed to a combination of lavender, Matricaria recutitaand neroli essential oils (6:2:0.5) for three consecutive nights at 21:00. The patients or their relatives were asked to instil two drops of combined essential oils (Gorgan Giah-Essence Agro-industry and Pharmaceutical Company) contained in a dropper on a cotton ball. The cotton ball was then held under the nose of the patients. The patients closed their eyes and took 10 deep breaths. Then, the cotton was pinned to the collar of the subjects. The patients unpinned the cotton once they woke up and threw it away. The author practically illustrated to patients how and where they should pin the cotton. The control group did not receive any intervention during the study. Note that the research assistant, who studied and filled the hospital sleep questionnaire for the patient, had no other role in this study and was blind to the hypothesis and unaware whether the patient was in the control or experiment group.

Data was analyzed by SPSS20 (p<0.05). Kolmogrov-Smirnov test was used to determine normality of quantitative variables. Independent t-test was used to compare mean of normally-distributed quantitative variables including age, weight, height, number of children, sleep disturbances, sleep effectiveness and sleep supplementation in two groups. Chi-square test was used to compare qualitative variables including gender, income, education, occupation, residence, hospitalization history, underlying disease, history of sedative drugs and drug abuse. Where Chi-square test could not be used, Fischer's exact test was used to compare qualitative variables including marital status and pre-sleep drinking in the two groups.

## Results

### General Characteristics:
As shown in Table 1 (next page), independent t-test showed no significant difference in mean age of subjects in the two groups and these groups were homogenous (P=0.1). There was no significant difference in mean weight of the subjects in the two groups (P=0.080). There was no significant difference in mean height of the subjects in the two groups (P=0.16).

As shown in Table 2, there was no significant difference in gender between the two groups (P=0.14) and the two groups were homogenous. As shown in the table, there was no significant difference in income between the two groups (P=0.26). According to Chi-square test, there was no significant difference in the occupation of subjects in the two groups (P=0.40) and the two groups were homogenous. There was no significant difference in residence of subjects in the two groups (P=0.59) and the two groups were homogenous. Moreover, there was no significant difference in hospitalization history between the two groups (P=0.20) and the two groups were homogenous. There was no significant difference in underlying diseases between the two groups (P=0.79). There was no significant difference in sedative drug use between the two groups (P=0.43). There was no significant difference in drug abuse between the two groups (P=1) and the two groups were homogenous. Moreover, Fisher's exact test showed no significant difference in marital status of subjects in the two groups (P=1) and the two groups were homogenous. Hypothesis Testing:

As shown in Table 3, there was a significant difference in mean score of pre-interventional (P=0.005) ad post-interventional (P<0.001) sleep disturbance between the two groups; however, there was a significant difference in difference of pre-interventional and post-interventional score in the two groups (P<0.001). Mean of sleep disturbance increased in the control group and decreased in the experiment group. According to Table 3, there was a significant difference in the mean score of pre-interventional (P=0.01) ad post-interventional (P<0.001) sleep effectiveness between the two groups; however, there was a significant difference in mean difference of pre-interventional and post-interventional score in the two groups (P<0.001). Mean of sleep effectiveness decreased in the control group and increased in the experiment group. According to Table 3, there was a significant difference in mean score of pre-interventional (P=0.02) ad post-interventional (P<0.001) sleep supplementation between the two groups; however, there was a significant difference in difference of pre-interventional and post-interventional score in the two groups (P<0.001). Mean of sleep supplementation increased in the control group and decreased in the experiment group.

**Table 1: comparison of age, weight and height of subjects in both groups**

| Age | N | Mean ± SD | Independent t-test |
|---|---|---|---|
| Control | 30 | 58.90 ± 10.73 | t=1.65 df=58 P=0.1 |
| Experiment | 30 | 54.33 ± 10.72 | |
| Weight (kg) | N | | |
| Control | 30 | 69.30 ± 13.44 | t=0.25 df=58 P=0.80 |
| Experiment | 30 | 68.53 ± 10.07 | |
| Height | N | | |
| Control | 30 | 172.07 ± 7.50 | t=1.41 df=58 P=0.16 |
| Experiment | 30 | 169.57 ± 6.17 | |

**Table 2: Comparison of gender, income, occupation, residence, hospitalization, drug use, underlying disease in the subjects of both groups**

| Gender | Control N (%) | Experiment N (%) | Result |
|---|---|---|---|
| Male | 25 (83.3) | 20 (66.7) | χ2=2.22 Df=1 P=0.14 |
| Female | 5 (16.7) | 10 (33.3) | |
| Total | 30 (100) | 30 (100) | |
| Income | | | |
| <1 million | 23 (76.7) | 19 (63.3) | χ2=1.27 Df=1 P=0.26 |
| 1-2 million | 7 (23.3) | 11 (36.7) | |
| Total | 30 (100) | 30 (100) | |
| Occupation | | | |
| Employee | 9 (30.0) | 11 (36.7) | χ2=1.82 Df=2 P=0.40 |
| Self-employed | 16 (53.3) | 11 (36.7) | |
| Unemployed | 5 (16.7) | 8 (26.7) | |
| Total | 30 (100) | 30 (100) | |
| Residence | | | |
| Urban | 18 (60.0) | 20 (66.7) | χ2=0.29 Df=1 P=0.59 |
| Rural | 12 (40.0) | 10 (33.3) | |
| Total | 30 (100) | 30 (100) | |
| Hospitalization history | | | |
| No | 13 (43.3) | 18 (60.0) | χ2=1.67 Df=1 P=0.20 |
| Yes | 17 (56.7) | 12 (40.0) | |
| Total | 30 (100) | 30 (100) | |
| Underlying disease | | | |
| No | 13 (43.3) | 14 (46.7) | χ2=0.07 Df=1 P=0.79 |
| Yes | 17 (56.7) | 16 (53.3) | |
| Total | 30 (100) | 30 (100) | |
| Sedative drug use | | | |
| No | 10 (33.3) | 13 (43.3) | χ2=0.63 Df=1 P=0.43 |
| Yes | 20 (66.7) | 17 (56.7) | |
| Total | 30 (100) | 30 (100) | |
| Drug abuse | | | |
| Yes | 5 (16.7) | 4 (13.3) | Fisher's Exact Test: P=1 |
| No | 25 (83.3) | 26 (86.7) | |
| Total | 30 (100) | 30 (100) | |
| Marital status | | | |
| Single | 1 (3.3) | 1 (3.3) | Fisher's Exact Test: P=1 |
| Married | 29 (96.7) | 29 (96.7) | |
| Total | 30 (100) | 30 (100) | |

**Table 3: Comparison of mean of sleep disturbance, effectiveness and supplementation before and after intervention in two groups**

| Phase | Sleep | Control Mean ± SD | Experiment Mean ± SD | Independent t-test |
|---|---|---|---|---|
| Before | Disturbance | 278.90 ± 113.09 | 369.83 ± 103.59 | t=2.92; df=58; p=0.005 |
| | Effectiveness | 315.37 ± 68.05 | 266.10 ± 77.37 | t=2.62; df=58; p=0.01 |
| | Supplementation | 171.27 ± 70.57 | 208.47 ± 50.66 | t=-2.34; df=53; p=0.02 |
| After | Disturbance | 317.40 ± 82.17 | 131.47 ± 42.66 | t=11.00; df=44; p<0.001 |
| | Effectiveness | 300.93 ± 53.87 | 408.93 ± 30.04 | t=-9.59; df=58; p=0.001 |
| | Supplementation | 200.27 ± 58.35 | 76.20 ± 44.98 | t=9.22; df=55; p<0.001 |
| Difference before and after | Disturbance | 29.50 ± 97.20 | -238.37 ± 122.82 | t=-9.37; df=58; p<0.001 |
| | Effectiveness | -14.43 ± 66.64 | 142.83 ± 75.55 | t=-8.55; df=55; p<0.001 |
| | Supplementation | 29.00 ± 71.55 | -132.27 ± 66.69 | t=9.22; df=58; p<0.001 |

## Discussion and Conclusion

This study examined the effect of hybrid aromatherapy on sleep quality of patients with acute coronary syndrome admitted to CCU. The results clearly show the beneficial effect of hybrid aromatherapy on sleep quality of patients with acute coronary syndrome admitted to CCU. Concerning the comparison of sleep disturbance, effectiveness and supplementation in the experiment and control groups, the results showed that hybrid aromatherapy decreases sleep disturbance by reducing mid-sleep awakenings, reducing movement during sleep, increasing sleep depth, reducing the time for getting ready for sleep and reducing sleep latency. Moreover, hybrid aromatherapy increases sleep effectiveness by increasing rest upon awakening, improving subjective quality of sleep, increasing sleep adequacy, and increasing total sleep period at night. Additionally, hybrid aromatherapy reduces sleep supplementation by reducing morning and afternoon sleep, and generally daytime sleep and full wake up after arousal. Different studies have proved the positive effects of aromatherapy in improving sleep quality of cardiac patients admitted to CCU. Hajibagheri et al showed that Rosa damascene aromatherapy can significantly improve sleep quality of heart patients admitted to CCU. According to this study, Rosa damascene aromatherapy reduces sleep latency and sleep disturbance and improves sleep effectiveness and quality and sleep duration. Moreover, it is effective in reducing daytime sleep disorder. [28] Moeini et al. found that lavender essence aromatherapy reduces sleep disturbance and thus increases sleep quality of patients with ischemic heart diseases admitted to ICU. [29] Although the above studies have examined the effect of different aromas on sleep quality of cardiac patients admitted to CCU, the main nature of all these studies has been aromatherapy in hospitalized patients. Therefore, the results and mechanisms noted in all of the above studies support current findings and show the positive effect of aromatherapy on sleep quality of patients admitted to CCU. Moreover, many studies have been done on effect of aromatherapy on sleep quality of other clinical and non-clinical conditions such as hemodialysis, postmenopausal women, students and nurses, all of which show a significant role of aromatherapy in improving sleep quality. Najafi et al. showed that lavender aromatherapy has a positive effect in improving sleep quality of hemodialysis patients.

[25] In this regard, Dabirian et al showed that inhalation of lavender essential oil has a beneficial effect on sleep quality of patients undergoing hemodialysis. Lavender essential oil inhalation improves sleep quality, including subjective sleep quality, sleep latency, sleep adequacy, sleep duration, sleep disturbance and daily dysfunction in hemodialysis patients. [30] Although condition of patients and people is different in these studies, all of these are consistent with results of the present study. In explaining improvement of sleep quality, according to the studies conducted, linalool present in lavender inhibits the release of acetylcholine and changes the function of ion canal in the neuromuscular junction site. In addition, linalil acetate has a narcotic function and linalool acts as a sedative. [31] Moreover, smell stimulant receptors in the nose convert the odour into nerve impulses and sends them to the limbic system. Based on literature, aromatherapy stimulates feelings such as pleasure, anger and anxiety and influences heart rate, blood pressure, respiration, activity of brain waves and release of hormones which regulate the amount of insulin, body temperature, stress, metabolism and hunger. Since the limbic system also influences the nervous system, smells can stimulate and release neurotransmitters and endorphins in the brain, which makes people feel good. [20] Finally, sleep is one of the most important elements in human life which is associated with rebuilding of physical and emotional powers. It is essential to maintain regular sleep courses to gain fitness and health. According to findings, aromatherapy improves sleep quality of patients with acute coronary syndrome admitted to CCU. These findings are clinically important in nursing care, since improving these indicators without medication is an important health care goal and can reduce the complications associated with drug interventions. Moreover, it is very important to improve sleep quality and other symptoms in these patients because of the reduced cardiac function, and to reduce and prevent progression of myocardial ischemia. Based on results of this study and the important role of aromatherapy in improving sleep quality of these patients and due to the high prevalence of this disease in all societies, since the aromatherapy is a cheap and simple nursing intervention, training and application of this treatment by healthcare providers, particularly nurses, can be an effective step to improve sleep quality of these patients and an opportunity for the health team, particularly nurses, to provide better care for these patients.

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