



Effectiveness of Lavender Oil Application on Pain during Arteriovenous Fistula Puncture

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Authors' contributions

This work was carried out in collaboration between both authors. Author PT designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author KBP managed the literature searches, collected the data and analyses of the study. Both authors read and approved the final manuscript.

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ABSTRACT

Introduction: Patient undergoing hemodialysis experience constant fear and anxiety due to the pain during puncture of arteriovenous fistula. Pain management is one of the main focuses of caring patients, therefore should aim for effective pain management using complementary and alternative treatment. Hence the present study was conducted with aim to determine the Effectiveness of Lavender oil Application on pain during arteriovenous fistula Puncture among patient undergoing Hemodialysis.

Materials and Methods: Post-test only design was carried out with 30 samples who met the inclusion criteria were randomly allocated into experimental group (n=15) and control group (n=15). Demographic variables were collected by using multiple choice questionnaires for both experimental and control group. Experimental group received the lavender oil application 5 minutes prior to puncture of arteriovenous fistula. Control group received the routine care of the hospital. The intensity of the pain was assessed during the puncture of arteriovenous fistula by using numerical pain rating scale. The data were tabulated and analyzed by descriptive and inferential statistics.

Results: The finding of the study reveals that 13 (86.7%) had moderate pain whereas in control group 14 (93.3%) severe pain during the puncture of dialysis needle and also found statistically significant difference between the experimental and control group at the level of $P < 0.05$.

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Conclusion: The study finding concludes that topical application of lavender oil is an effective technique to reduce pain during AV fistula puncture by insertion of dialysis needle in hemodialysis patients. Hence, lavender oil application could be a best suitable alternative complementary medicine for the pain of AVF puncture.

Keywords: Aromatherapy; arteriovenous fistula; hemodialysis; lavender oil; pain.

1. INTRODUCTION

Chronic kidney disease is an emerging non-communicable disease of public health importance [1]. End-stage renal disease (ESRD) is the last stage of chronic kidney disease when the glomerular filtration rate is less than 15 ml/minute and requires renal replacement therapy to survive. The estimated age-adjusted incidence rate of ESRD is 229 per million populations, whereas more than 100,000 new patients enter renal replacement programs annually in India [2]. Renal replacement therapies are hemodialysis, peritoneal dialysis and kidney transplantation from which hemodialysis is considered as the most widely used therapy. Hemodialysis is a therapy that filters waste, removes extra fluid and balances electrolytes. The arteriovenous fistula (AVF) is the preferred vascular access by joining an artery and vein for hemodialysis (HD) and is advocated in clinical practice guidelines [3–6] to reach the blood for hemodialysis. On average, a hemodialysis patient undergoes ten AVF punctures per month and continues to undergo the procedure throughout his life or until a successful renal transplant [7]. Repeated AVF punctures create considerable amounts of pain for the patient due to the diameter and length of the needles used [8]. Patient undergoing hemodialysis experience constant fear and anxiety due to the pain of the insertion of needles, which might lead to certain physiological and psychological complications for them in the long term. Needle phobia is significantly associated with a negative attitude toward self-care dialysis [9]. More than one-fifth of a HD population reported pain as a troublesome issue [10].

Pain management is one of the main focuses of nursing [11]. Pain reduction leads to the acceptance of the procedure thereby improves the quality of life [12] and also improve the level satisfaction with the health care personnel [13] therefore should aim for effective pain management. Complementary and alternative medicine is a growing industry in health care systems with an application that is constantly evolving [14]. The use of complementary

treatments and natural alternatives decreases complications and reduces the need for analgesics [15]. Recent researchers support non-pharmacological pain control measures such as distraction, cutaneous stimulation especially use of cold cutaneous and any aromatherapy can be effectively used to relieve pain. Lavender essential oil extracts from the plant *Lavandula angustifolia* and has its main compounds such as linalyl acetate and linalool that have topical analgesic properties. Researchers believe that the topical pain-reducing effect of lavender is associated with antimuscarinic activities or channel blocking (Ca^{2+} , Na^{+}) [16,17] as the block of sodium currents in the pain-transmitting nerve fibers blocks pain nerve messages [18]. It also stimulates the receptors in the olfactory bulb and transfer the message to limbic system and cause releasing endorphin, enkephalin, and serotonin, which results in the sense of relaxation, pain relieve and stress reduction [19]. The linalyl acetate and linalool content of lavender are absorbed through the skin 5 min after they are massaged can increase topical blood circulation, and its linalool content can decrease muscle tone and create sedative effects [20,21]. By considering the potential benefits the current study was conducted with the aim to test the hypothesis of significant difference in the level of pain between the patient patients receiving lavender oil application and those who do not.

2. MATERIALS AND METHODS

Post-test only research design was adopted to conduct the study with 30 samples in Dialysis Unit, Saveetha Medical College and Hospital after obtaining approval from the hospital authority. Samples who met the inclusion criteria allocated into experimental group (n=15) and control group (n=15) by simple random sampling technique. The inclusion criteria were Patients with End Stage Renal Disease and on hemodialysis for more than 3 months with age group between 25 to 65 years of both male and female, receiving hemodialysis 3 times per week or 2 times per week for 4 hours per treatment, using bicarbonate dialysate solution for

hemodialysis, willing to sign an informed consent and participate in the study and having no problems in arteriovenous fistula. Patients those who were critically ill, unconscious, allergic reaction to lavender oil and who were undergoing hemodialysis with other access were excluded from the study. The demographic questionnaire was completed at the beginning of the study in both experimental group and control group. Experimental group received lavender oil application on AV fistula site 5 minutes before the AV puncture. The arterial needle was inserted after the skin on the site of the needle insertion was disinfected with betadine solution. It was continued for three consecutive cycles of hemodialysis. Control group received the routine care of the hospital. The intensity of pain was assessed during the puncture of AV fistula in both the groups using Numerical pain rating scale. Confidentiality was maintained throughout the procedure. The data were tabulated and analyzed by descriptive and inferential statistics using SPSS statistical package. The data were expressed as Mean \pm SE and as frequency distribution. Unpaired 't' test was used for the comparison of means between experimental and

control group. A probability of 0.05 or less was taken as statistically significant.

3. RESULTS

Regarding demographic variables, The Table 1 shows that in the experimental group, most of them were in the age group of 30 – 60 years, 10 (66.7%) were male. 8(53.3%) had diagnosed as end stage renal disease for past 6 months to 1 year, majority of them coming for hemodialysis treatment thrice in a week and 9 (60%) were in the treatment of HD since 6 months to 1 year in both experimental and control group.

Table 2 depicts that in the experimental group, 2(13.3%) had mild pain, 13(86.7%) had moderate pain and none of them had mild as well severe pain. Whereas in the control group one (6.7%) had moderate pain, 14 (93.3%) had severe pain and none of them had no pain and mild pain.

Table 3 shows that the experimental group and control group post-test mean score of pain was 2.31 ± 1.14 and 4.34 ± 2.26 . Mean score of

Table 1. Frequency and Percentage distribution of demographical variables in both experimental and control group among patient undergoing hemodialysis

| S.No | Demographical Variables | Experimental Group | | Control Group | |
|------|--|--------------------|------------|---------------|------------|
| | | Frequency | Percentage | Frequency | Percentage |
| 1. | <u>Age</u> | | | | |
| | a) 30-40 years | 5 | 33.3 | 2 | 13.3 |
| | b) 41-50years | 3 | 20.7 | 7 | 46.6 |
| | c) 51-60years | 2 | 13.0 | 3 | 20.0 |
| | d) 60 above | 5 | 33.0 | 3 | 20.0 |
| 2. | <u>Sex</u> | | | | |
| | a) Male | 5 | 33.3 | 6 | 40.0 |
| | b) Female | 10 | 66.7 | 9 | 60.0 |
| 3. | <u>Duration of End Stage Renal Disease since Diagnosis</u> | | | | |
| | a) Less than one year | 8 | 53.3 | 10 | 66.7 |
| | b) 1 year – 3 years | 4 | 26.7 | 2 | 13.3 |
| | c) 3 years - 5 years | 2 | 13.3 | 3 | 20.0 |
| | d) More than 5 years | 1 | 6.7 | - | |
| 4. | <u>Hemodialysis Treatment Per Week</u> | | | | |
| | a) Twice in a week | 8 | 53.3 | 9 | 60.0 |
| | b) Thrice in a week | 7 | 46.7 | 6 | 40.0 |
| 5. | <u>Duration of Hemodialysis</u> | | | | |
| | a) 6 months – 1 Year | 9 | 60.0 | 10 | 66.7 |
| | b) 2 years – 3 years | 4 | 26.7 | 2 | 13.3 |
| | c) More than 3 years | 2 | 13.3 | 3 | 20.0 |

Table 2. Frequency and percentage distribution of post-test level of pain during AV fistula puncture in both experimental and control group among patients undergoing hemodialysis

| Post Test Level of Pain | Experimental Group | | Control Group | |
|-------------------------|--------------------|------------|---------------|------------|
| | Frequency | Percentage | Frequency | Percentage |
| No Pain | 0 | 0% | 0 | 0% |
| Mild Pain | 2 | 13.3% | 0 | 0% |
| Moderate Pain | 13 | 86.7% | 1 | 6.7% |
| Severe Pain | 0 | 0% | 14 | 93.3% |

Table 3. Comparison of post-test level of pain during AV fistula puncture between experimental and control group among patient undergoing hemodialysis

| Variable | Experimental Group | | Control Group | | Unpaired t test |
|-------------------------|--------------------|------|---------------|------|----------------------------------|
| | Mean | SD | Mean | SD | |
| Post-test level of Pain | 2.3 | 1.14 | 4.34 | 2.26 | t= 7.32 df=28 P=3.29 S* |

S* - Significant, df - degrees of freedom

Table 4. Association between post-test level of pain during AV fistula puncture with selected demographic variables in experimental group among patient undergoing hemodialysis

| Demographic Variable | Post-test Level of Pain | | | | | | Chi-Square |
|----------------------|-------------------------|-------|---------------|-------|-------------|------|-----------------------|
| | Mild Pain | | Moderate Pain | | Severe Pain | | |
| | No | % | No | % | No | % | |
| <u>Sex</u> | | | | | | | X ² =9.36, |
| a) Male | 4 | 26.6% | 3 | 20.0% | 1 | 6.6% | d.f=3, P<0.05 |
| b) Female | 3 | 20.0% | 4 | 26.6% | - | - | (S) |

S - Significant, df - degrees of freedom

post-test level of pain between the experimental and control group was compared by unpaired 't' test and value of pain t=7.32 was found to be statistically significant at p<0.05 level which clearly shows that there was significant difference in the level of pain during the puncture of AV fistula between the hemodialysis patients in experimental and control group.

The chi-square test reveals that there is a significant (p<0.05) association between the post-test level of pain with the demographic variables of sex in the experimental group among hemodialysis patients.

4. DISCUSSION

Pain is an unpleasant emotional experience during insertion of dialysis needle during hemodialysis. Pain management is a prime task for managing the clients on hemodialysis. Hence the present study intensively analyzed the effects of lavender oil application on pain during puncture of AV fistula among hemodialysis patients. In systematic review and meta-analysis

by Shaheen E. Lakhan et al. [22] reported that there is a significant positive effect of aromatherapy compared to placebo or treatments as usual controls in reducing pain and also indicated that indicate that aromatherapy can successfully treat pain when combined with conventional treatments.

The present study finding observed that 13 (86.7%) had moderate pain whereas in control group 14(93.3%) severe pain during the puncture of dialysis needle and also found statistically significant difference between the experimental and control group which clearly infers that infers that intervention was found to be effective in reducing the level of pain. This findings was supported by the previous study by Similarly Ali Asghar Ghodsa et al. [23] found that the topical application of 100% lavender essential oil is effective in reducing the intensity of pain during the insertion of dialysis needle in hemodialysis patients. In another study by Masoumeh Bagheri-Nesami et al. [24] concluded that lavender aromatherapy may be an effective technique to reduce pain following needle insertion into a

fistula in hemodialysis patients. Similarly Aliasgharpour et al. [25] reported in quasi experimental study with 40 samples that inhalation of lavender aromatherapy is effective to decrease pain of AVF puncture in patients on hemodialysis and also concluded that lavender aromatherapy could be a suitable alternative complementary medicine for the pain of AVF puncture. Kim S et al. [26] conducted a study to investigate whether lavender oil aromatherapy can reduce the bispectral index (BIS) values and stress and decrease the pain of needle insertion in 30 volunteers and observed that lavender oil is significantly reduced the pain intensity of needle insertion. Some studies have reported that aromatherapy using lavender oil either by inhalation or topical application is effective in reducing chronic back pain [27], neck pain [28], knee pain [29], episiotomy pain [30], menstrual pain [31], pain related to labor and childbirth [32], post-Cesarean section pain [33], and even cancer pain [34]. Hence, the current study accepted the hypothesis based on the findings and with other supportive study findings. However, the current study limits in observing the parameters which impacts on pain such pulse rate, heart rate, blood pressure and other psychological factors like anxiety and depression because lavender oil has a beneficial effect on those parameters. Hence future study may be suggested with large number of samples and observing vital parameters including psychological aspects among patients undergoing hemodialysis.

5. CONCLUSION

The study finding concludes that topical application of lavender oil is an effective technique to reduce pain during AV fistula puncture by insertion of dialysis needle in hemodialysis patients. Hence, lavender oil application could be a best suitable alternative complementary medicine for the pain of AVF puncture. Therefore, should include aromatherapy concepts and techniques in the continued education of health care personnel working in the dialysis unit and aim at establishing standards of aromatherapy care.

CONSENT

All participants were received the verbal explanation of the nature and aim of the study and written informed consent was obtained from each participant

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected from hospital authority and preserved by the author(s).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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