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Antihypertension Activity of *Cymbopogon nardus* (L.) Rendle as an Aromatherapy Candle Material at Community Health Center Kapuk II West Jakarta, Indonesia

A Yelfi,^{1,3}, T P Napitupulu², and D U Meliana³

¹Doctoral Programme of Pharmacy Faculty of Pancasila University, Jakarta, Indonesia

²Research Center for Biology, Indonesian Institute of Sciences – LIPI, Cibinong, West Java, Indonesia

³Pharmacy Faculty of 17 August 1945 Jakarta University, Jakarta, Indonesia

Email : yelfi.anwar@uta45jakarta.ac.id

Abstract. The utilization of natural materials is likely to increase nowadays, including for aromatherapy purposes. In this research, aromatherapy candle had been made from the volatile oil of *Cymbopogon nardus* (L.) Rendle (citronella grass). The aims of this research is to observe the influence of aromatherapy candle containing citronella grass oil toward the blood pressure of hypertension patients at Community Health Center Kapuk II Jakarta, Indonesia. This research used pre-experiment design with one group pretest-posttest design. The population was elderly who had high blood pressure. A sample of 43 peoples were obtained by simple random sampling technique. Data analysis was done by t-dependent test (paired t-Test) with significance value $\alpha = 0,05$. The result of paired t-Test from pretest and posttest of systole blood pressure was obtained with P value 0,000 and paired t-test from pretest and posttest of diastolic blood pressure was obtained with P value 0,012. It can be concluded that there was an influence of aromatherapy candles of *Cymbopogon nardus* (L.) Rendle toward lowering blood pressure in hypertension patient at Puskesmas Kapuk II Jakarta Indonesia.

1. Introduction

According to a research conducted by The Ministry of Health of Republic of Indonesia, there an increase of prevalency of hipertention in Indonesia, from 7.6 % in 2007 to 9.5% in 2013 [1]. This condition needs to be solved in order to achieve a better public health condition. In this situation, alternative therapy as complement strategy should be addressed to help the patients. Aromatherapy is one of the fastest growing branches of complementary and alternative medicine. A definition of aromatherapy is: ‘the therapeutic use of fragrances or at least of mere volatiles to cure or to mitigate or to prevent disease, infections, and indispositions only by means of inhalation [2]. The use of natural product at this time indeed tends to increase, among others ingredients for aromatherapy [3][4]. One of them is the citronella grass (*Cymbopogon nardus* (L.) Rendle) [5]. It is utilized as aromatherapy product because it contains essensial oil with refreshing and pleasant effect [6]. The use of wax among other hydrophobic base excipients on preparation of aromatherapy is common practice since it is



considerably more environmental friendly with less side of effects [7]. The aim of this research is to know the effectivity of aromatherapy candles using essential oils of *Cymbopogon nardus* (L.) Rendle in lowering blood pressure in hypertension patient.

2. Materials and Methods

The design in this research is pre experiment design using one group pretest-posttest design that was not used comparison group (control). The independent variables are the difference concentration of essential oils of *Cymbopogon nardus* (L.) Rendle and the wax in the formulation of aromatherapy candles that applied to hypertension patient's at Community Health Center Kapuk II. The dependent variable are physical quality of wax aromatherapy candle and blood pressure of hypertension patients at Community Health Center Kapuk II. Figure 1 shows the flow chart of the methods.

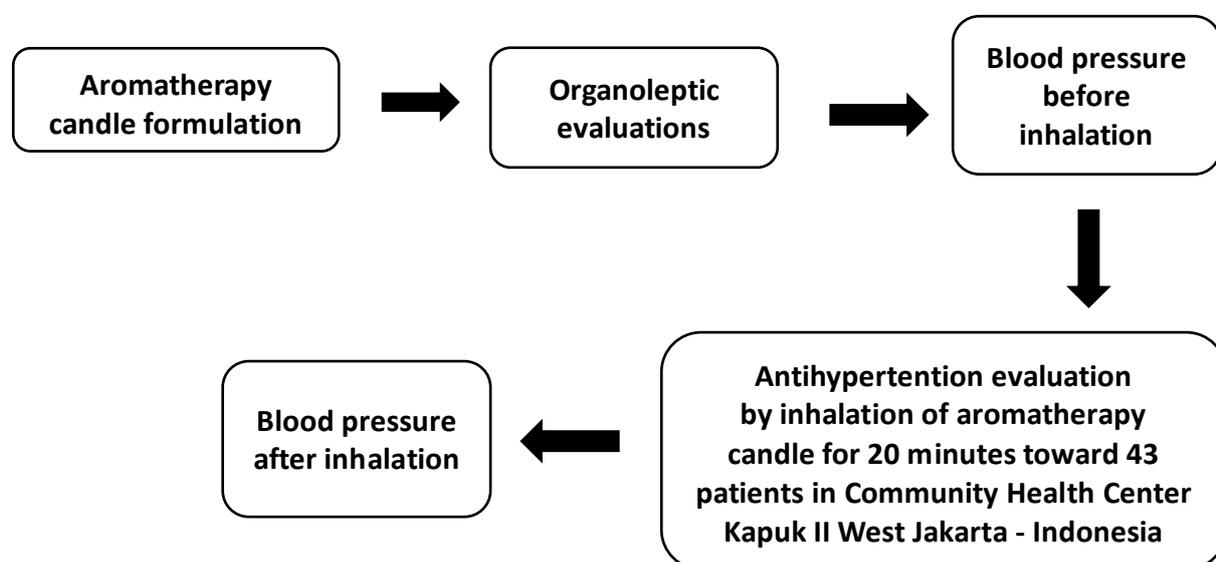


Figure 1. The flow chart of the methods

2.1. Place and period of research

The aromatherapy Candles were prepared in Basic Pharmaceutical Laboratory University of 17 August 1945 Jakarta. The data collection of hypertension patient was held at Community Health Center Kapuk II, Jakarta, Indonesia. The overall period of research was conducted on November 2017 until January 2018.

2.2. Examination of chemical and psychochemical properties of the essential oil.

The citronella grass oil was examined to reveal its chemical and psychochemical properties. The parameters included color, density, refractive index, solubility, and chemical composition of the oil.

2.3. Preparation of aromatherapy candles.

Three formulations of aromatherapy candles were prepared on basis of the difference of citronella grass oil concentration (Table 1). The candles were prepared with the following procedures. The basis of candles was divided into two kind of basis. Solid paraffin as the first basis material were melted over the water bath and stirred with the stirring rod until the solid paraffin becomes liquid. The second basis is white oil, that was placed on evaporating dish and heated over the water bath as well. The first and second basis were then mixed on a beaker glass over the water bath and stirred with the stirring

rod until the two bases were completely mixed. Immediately, the citronella grass oil was added to the basis. The whole mixture was put into prepared candle mold while a thread was kept to stay upright with the position in the middle of the mold container candle. The candles were stored until frozen.

Table 1. Design of Formulation of Aromatherapy Candle

	F 1 (%)	F2 (%)	F3 (%)	Used
Concentration of <i>Cymbopogon nardus</i> (L.) Rendle essential oil	12.5	25	37.5	Active ingredient
White Oil	7.5	7.5	7.5	Base
Solid Paraffin	Ad 100	Ad 100	Ad 100	Base

2.4. Organoleptic test.

The tests conducted to determine the physical properties of a material which includes odor, color, texture.

2.5. Blood Pressure Test

This test is conducted to determine the effects that occur in hypertensive patients after use aromatherapy candles if there is a decrease in blood pressure after use Aromatherapy candles by recording the initial blood pressure before using aroma candles therapy and blood pressure after the use of aromatherapy. The population was mostly elderly who had high blood pressure. A sample of 43 peoples were obtained by simple random sampling technique (Table 2). The research instrument used is an observation sheet which contains about observation of pretest blood pressure and posttest blood pressure after 20 minutes. Measuring instruments for blood pressure in hypertensive patients were mercury sphygmomanometer and stethoscope. The pretest blood pressure was carried out before giving aromatherapy candles by measuring systole and diastolic blood pressure. After that, the respondent was inhaled aromatherapy candles for 20 minutes, then the blood pressure was measured after inhalation to observe whether any changes occurred.

Table 2. Demography of Hypertention Patients at Community Health Center Kapuk II West Jakarta

	Characteristic	Frequency (%)
Age (years)	60 – 65	15 (34,9)
	45 – 50	11(22,4)
	40 – 45	9 (20,93)
	35 – 40	5 (11,62)
	30 – 35	3 (6,97)
Sex	Man	21 (48,84)
	Woman	22 (51,16)

2.6. Statistical analysis

Blood pressure measurement data before and after giving aroma therapy to hypertensive patients in the Community Health Center Kapuk II Jakarta obtained were processed in the form frequency distribution.

To analyze the effect of citronella grass oil aromatherapy on decreasing blood pressure in hypertensive patients at the Community Health Center Kapuk II Jakarta, after the data were collected, the next stage will be processed and analyzed by testing the "t-test" with the SPSS system, namely testing for

one group in pairs with the aim of comparing the values of variables before treatment and after treatment with the formula:

$$T = \frac{M. d}{\sqrt{\frac{\sum dx^2}{N(N-1)}}}$$

Where:

M. d: mean of difference pf pretest and posttest

$\sum dx^2$: number of squares of deviation

N: number of subjects

The expected hypothesis in the study is to accept the H1 hypothesis, namely there is a significant difference between the variables before treatment and after treatment. H1 hypothesis is accepted if t count is greater than t table with free degree (db = n-1) and alpha 5% (t count > t table) or more significant values small from alpha 5% (sig < alpha).

3. Results and Discussion

3.1. Chemical and psychochemical properties of the essential oil.

Table 3 shows the result of chemical and psychochemical properties of the essential oil of citronella grass. A large portion of geraniol is presence in the citronella grass oil. Among many significance substances, the chemical composition of citronella grass oil is marked by the presence of citronellal. Our result is similar with other report that stated the compositions of the essential oil are mainly consist of the monoterpene fractions such as geraniol and citronellal [8].

Table 3. Chemical and Psychochemical Properties of the Essential Oil of Citronella grass

Parameters	Results	Methods
Color	Pale yellow	Visual
Density (20 ⁰ C)	0.8829	Gravimetric
Refractive Index (20 ⁰ C)	1.4701	Refractometric
Solubilty in ethanol	1:1 (very soluble)	Volumetric
Total of geraniol (%)	82.36	Titrimetric
Citronellal (%)	17.55	Gas Chromatography

3.2. Organoleptic Test

According to organoleptic tests, the researchers chose Formula 3 because it had stronger odor than other formulation. The burning aromatherapy candle was smelled by responden so that the desired effect can be observed. The formulation of candles are indeed influence their organoleptic properties. As stated by [7], the best aromatherapy candle was determined based on its hardness, burning time, melting point, colour test, desirable range of detection time of the aroma, desirable range of therapeutic effect time detection. Same report showed that the best therapeutic effect of candle was obtained with composition of 90 stearic acid : 10 paraffin and the best essential oil in terms of familiarity and easy to detect was jasmine oil with the best concentration of the essential oil is 2 % in candle [7]

3.3. Blood Pressure Test

Table 4 shows the the blood pressure value before and after inhalation at community health center Kapuk II West Jakarta, Indonesia. Based on the blood pressure test, sig value = 0.000 <0,05 was obtained between the systole of blood pressures before and after inhalation. This means that the relationship (correlation) is very closel or very real with value of correlation is 0.833. The value of t arithmetic 19.899 > t table 6.324, so Ho rejected. The value of sig = 0.012, <0.05 was obtained between the diastole of blood pressures before and after inhalation This means that the relationship (correlation) is very closel or very real as well with value of correlation is 0.308. Value t arithmetic 20.374> t table 6.324, so Ho rejected : In conclusion, there is a change in blood pressure after application of aromatherapy candles. Previously, similar result was also reported [9]

Table 4. Blood Pressure Measurement Before and After Inhalation for 20 Minutes at Community Health Center Kapuk II West Jakarta – Indonesia

Blood Pressure Test	Mean (mmHg) (n = 43)	SIG.	Correlation	T-Value
Systole, Before Inhalation	156,74	0,000	0,83	19,90
Systole, After Inhalation	131,98			
Diastole, Before Inhalation	120,47	0,012	0,38	20,37
Diastole, After Inhalation	94,19			

An investigation of the mechanisms involved in hypotension responses,[10] performed an *in vitro* experiment using preparations of isolated rings of superior mesenteric artery of rats, and showed that citronellol was able to induce vasorelaxation. The vessel relaxation was due to inhibition of Ca²⁺ influx through the membrane and the release of Ca²⁺ from intracellular stores. From these results, we suspect that the hypotensive effect of aromatherapy candle containing citronella grass oil is probably because of a reduction of peripheral vascular resistance due to a direct effect on vascular smooth muscle [11]

4. Conclusion

Application of aromatherapy candle containing *Cymbopogon nardus* (L) Rendle essential oil decreased blood pressure of hypertension patients at Community Health Center Kapuk II both systolic and diastolic. Formulation of aromatherapy candle with higher the essential oil concentration (up to 37.5%) was chosen due to its superior organoleptic properties.

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