

Mangrove Leaf Extract Nanogel to Reduce Labor Pain

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Abstract. This study aims to optimize mangrove leaves formed in nanogel preparations with smaller particle sizes so that the content in the preparation can have an optimal effect as a pain reliever in maternity mothers. This study used a pre post test with control group design with a sample of 60 maternity mothers divided into intervention groups and control groups. Pain measuring instruments use numeric rating scale and cortisol examination taken from saliva. Ethical clearance is given by the ethics committee of health research, Faculty of Health Science, Universitas Muhammadiyah Magelang No: 025/KEPK-FIKES/II.3.AU/F/2020. Data analysis using t test independent. The results show that pain scale before intervention in intervention group and control group (7.90 ± 1.296 ; 7.70 ± 0.817). Pain scale after intervention group action and control group (6.20 ± 1.297 ; 8.67 ± 0.84). There was a difference in the pain scale between the two groups (1.70 ± 0.535 ; -0.9 ± 0.759 , $p: 0.000$). Cortisol before intervention in intervention group and control group (6.05 ; 2.97, $p: 0.352$). Cortisol after intervention in intervention group and control group (5.21; 2.16, $p: 0.267$). There was no difference in the cortisol between the two groups ($p: 0.906$). So that nanogel extracts mangrove leaves effectively reducing labor pain.

Keywords: Nanogel, *Acanthus ilicifolius*, Labor pain

1 Introduction

Labor pain is the main problem of maternity. Most women experience pain during childbirth with moderate to severe intensity. Some studies state that by using analog scale visual pain, assessment (score 0 to 10), the average intensity of pain during childbirth for primipara and multipara mothers at 8.31 ± 0.99 and 8.37 ± 1.16 [1]. Heni's research (2013) showed that by using the Numeric Rating Scale (NRS), against six participants, all participants experienced pain. Three participants experienced pain on a scale of ten, two participants experienced pain on a scale of nine and one participant experienced pain scale eight [2].

Labor pain must be addressed because it affects the functional mechanisms that cause physiological stress responses. Long labor pain causes hyperventilation thus lowering CO₂ levels and increasing blood pH. If the mother's CO₂ level is low, then the CO₂ level of the fetus is also low, causing a slow deceleration of the fetus' heart rate. Pain also causes unirradiated

uterine activity so that childbirth becomes longer which eventually threatens the life of both the mother and the fetus [3].

Various nursing measures have been taken to overcome pain during childbirth both pharmaceutical and non-pharmaceutical. Although many actions have been taken, the pain is still felt by the mother. Pharmacological action often causes adverse effects such as nausea, vomiting, restlessness, hypotension, impaired motor system, fever, urine retention, itching and so on. Patients prefer without the use of drugs because no harmful effects appear to the mother and fetus [4]. This research focuses on herbal remedies made in the form of nanogels as painkillers with mangrove raw materials. Nanoparticles have been shown to improve the bioavailability of drugs with low solubility in blood circulation [5]. The purpose of this research is to investigate the effectiveness of mangrove leaf extract nanogel to overcome labor pains.

2 Method

The design of this study was a quasi experiment with a pre post test with control group design with a sample of 60 maternity mothers divided into two groups of 30 people as an intervention group and 30 people as a control group. In the intervention group, maternity mothers measured the pain scale by a numeric rating scale and took saliva for examination of cortisol levels then smeared it with nanogel for 30 minutes. After that the maternity mother was measured again on the pain scale and took back her saliva. In the control group, the mother also measured the pain scale and took her saliva after 30 minutes measured the pain scale and took her saliva. Cortisol examination is done in Pramita Laboratory. Ethical clearance is given by the ethics committee of health research, Faculty of Health Sciences, Universitas Muhammadiyah Magelang No: 025/KEPK-FIKES/II.3.AU/F/2020. Data analysis using t test independent.

3 Results and Discussion

Data collection was conducted for two months at Muntilan Hospital, Magelang Regency. The data retrieval process started from the intervention group until it was fulfilled by 30 people and then continued by a control group of 30 people. The characteristics of respondents are contained in Table 1. The average age of 28 respondents means that respondents are in the normal age range or the group is not at risk for pregnancy between 20 to 35 years. Based on gravida status, most respondents are multipara. Most of the respondents were housewives. There were no differences in age, gravida status and employment between the two groups of respondents.

Table 1. Characteristics of respondents

№	VARIABLE	INTERVENTION GROUP (n=30)				CONTROL GROUP (n=30)				Q
		Mean	Sd	N	%	Mean	Sd	N	%	
1	Age	28.13	5.69			27.57	5.03			0.684
2	Gravida Status									0.163
	a. Primigravida			10	33,3			13	43,3	
	b. Multigravida			20	66,7			17	56,7	
3	Occupation	5,32	2,79			5,48	4,38			0.434
	a. No.			27	90			24	80	
	b. Yes			3	10			6	20	

Bivariate analysis is used to determine whether or not there is a difference in the scale of pain before and after the action between the two groups. Table 2 shows that prior to the action the maternity mother experienced pain in the category of severe pain and there was no difference in the pain scale between the two groups.

Table 2. Differences in pain scale before and after action in both groups with NRS

№	Variable	Intervention Group I'm not going to say that		Control Group (N=29)		Q
		pain scale	Sd	pain scale	Sd	
A	Pain before	7.90	1.296	7.77	0.817	0.635
B	Pain after	6.20	1.297	8.67	0.840	0.000
C	Difference between before and after	1.70	0.535	-0.90	0.759	0.000

However, after the action, in the intervention group the mother experienced pain on a moderate scale and in the control group the mother still experienced pain on a heavy scale. There was a significant difference in the pain scale between the two groups. It can be concluded that mangrove leaf extract nanogel effectively reduces the pain of maternity mothers.

Another parameter used by researchers to measure pain intensity is cortisol examination taken from saliva. Normal hormone cortisol saliva levels are 1.2 – 14.7 ng/dl. The results of cortisol levels are shown in Table 3.

Table 3. Differences in cortisol levels before and after action in both groups

No	Variable	Intervention Group I'm not going to say that		Control Group (N=29)		Q
		Median	Min-Max	Median	Min max	
A	Cortisol before	6.05	1.35-42.98	2.97	1.25-27.40	0.352*
B	Cortisol after	5.21	0.64-42.25	2.16	0.71-19.25	0.267*
C	Differences in cortisol before and after	0.40	-14.67-4.99	0.23	-11.16-16.42	0.906*

*Mann whitney u test

Table 3 shows that median cortisol levels for both groups before and after the action showed normal results but there were some respondents who had more than normal cortisol levels. This can happen because cortisol will increase significantly during stressful labor conditions [6]. This

study did not examine the state of stress in maternity mothers, which can affect cortisol levels. Interesting data showed a decrease in cortisol levels between before and after actions in both groups, although the decrease in the intervention group was more compared to the control group. There was no difference in cortisol levels between the intervention group and the control group at the time before and after the action.

Based on phytochemical tests conducted by heni et al [7] mangrove leaf extract (*acanthus ilicifolius*) contains flavonoids, alkaloids, tannins, saponins and steroids. The results of the study are in line with handayani research [8] which states that the content of mangrove leaves (*acanthus ilicifolius*) are flavonoids, alkaloids, saponins, phenols and steroids.

Alkaloids have biological activities such as antimalarial, antimicrobial, antihyperglycemic, anti-inflammatory and pharmacological effects. Saponins serve for the maintenance of permeability of anti-cholesterol cell membranes, stimulation of hormones luteinizing release, anticancer, anti-hyperglycemic and adjuvant effects for vaccines [9]. Alkaloid *acanthus ilicifolius* significantly inhibited inflammatory pain in mouse models of acetic acid induced [10]. Flavonoids are efficacious as analgesics whose mechanism of action inhibits the work of the enzyme cyclooxygenase. Inhibition of the enzyme cyclooxygenase will reduce the production of prostaglandins thereby reducing pain. Flavonoids also inhibit the degranulation of microphiles so that it inhibits the production of cytokines, free radicals, as well as enzymes that play a role in inflammation. In this test the increase in extract concentration was directly proportional to analgesic power. The greater the concentration of the extract, the greater the analgesic power obtained [11]. The content of chemical compounds in *acanthus ilicifolius* serves as neuralgia, analgesics, anti-inflammatory, antioxidant, anticancer, antileukemia, antimicrobial, antifungal, antiviral, and insecticide [12].

In the examination of cortisol levels, there was no difference in cortisol levels between the intervention group and the control group before and after the action of applying mangrove leaf extract nanogel (*acanthus ilicifolius*). The results of this study are different from some concepts that state that hormone cortisol will increase during stress and pain. The hormone cortisol is referred to as a stress hormone, since it will be produced more when the body is stressed, which can be affected by infectious conditions, injuries, sedentary activities, as well as physical and emotional stress. When you feel threatened, part of the brain will set off a body alarm. It will then trigger the adrenal glands that are above the kidneys secrete the hormone adrenaline, this is simultaneously with the hormone cortisol. The hormone adrenaline will increase heart rate, while the hormone cortisol known as stress hormone will increase sugar in the bloodstream, so the brain can work more effectively. Under normal conditions, the highest levels of the hormone cortisol reach a peak at 8 a.m. and will decrease further. The lowest level of the hormone cortisol is at bedtime [13]. Cortisol levels increase during pregnancy and continue to increase in line with the delivery process. These physiological changes are a necessity to maintain the well-being of the mother / fetus and encourage the development of normal childbirth [15].

However, the results of this study are in line with asadi et research. al (2015) which states there is no difference in cortisol hormone in the group of maternity mothers who performed acupuncture with maternity mothers who did not do acupuncture to overcome the pain of childbirth. In Asadi's research, the action of reducing pain with acupuncture while in this study with mangrove leaf extract nanogel. Acupuncture will increase endorphin secretion or comfort hormone, while mangrove leaf extract nanogel contains flavonoids that inhibit the production of prostaglandins so that the pain is reduced. After applying nanogel, serum cortisol levels decreased although not significantly. Cortisol levels are still within normal limits although some have increased. Pain, anxiety, and stress during childbirth can lead to increased release of catecholamines and cortisol into circulation. Elevated cortisol levels can cause decreased uterine

blood flow and inhibited uterine contractions [6]. If not resolved, it will cause old partus which is one of the causes of maternal and infant death in Indonesia.

In the control group that is not smeared with mangrove leaf extract nanogels also decreased slightly. This condition can occur because cortisol levels are affected by several things, including stress and sleep disorders. If the maternity mother does not experience stress, then cortisol levels will also not increase. In addition, cortisol levels will also rise when sleep quality is lacking [16]. While in this study also did not examine the sleep quality of respondents. So that maternity mothers if experiencing pain but can be controlled is not accompanied by anxiety and impaired sleep quality, then cortisol will decrease, this is the limitation of this study. Further research should identify problems with stress levels and quality of maternity mothers that can affect cortisol levels.

4 Conclusion

Mangrove leaf extract nanogel (*acanthus ilicifolius*) is proven to be effective in overcoming labor pains without causing side effects. Researchers hope that nanogels can be used in maternity services as an effort to improve service facilities to patients.

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