

The Influence of Labor Environment Settings on Labor Progression

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Abstract

The environment in labor can have a great effect on the fears and anxieties experienced by the mother. Anxiety can inhibit cervical dilatation, so that the perception of pain increases. Cortisol is secreted in response to tension and anxiety, it affects the progress of cervical dilatation. The increasing concentration of cortisol during pregnancy and continue to rise until labor. Anxiety is usually associated with increased pain during labor and modification of labor pain can be done through psychological and physiological mechanisms. One way to modify psychological labor pain is by setting the delivery environment. The purpose of this study was to analyze the effect of the setting of the labor environment on the progress of labor.

The results showed the average delivery progress (cm/hour) in the treatment group 1.38 (0.43) and the control group 1.23 (0.52), obtained $p = 0.058$, this indicates there was no difference in labor progress in both study groups. Based on the statistical test results of the effect of the setting of the delivery environment on the progress of labor, the p value = 0.015 shows that there is an influence of the delivery environment setting on the progress of labor and the RR value of 3.67 (IK = 1.14-11.84), which means that the mother gives birth in a Independent Midwifery Practice (IMP) who did not manage the delivery environment had a risk of having a cervical opening < 1 cm/hour by 3.67 times compared to mothers giving birth at the IMP who did the setting of the delivery environment.

The conclusion of this research is that there is a positive influence of the delivery environment to the progress of labor.

Keywords: Labor progress, labor environment, childbirt, cortisol, cervical dilatation.

Introduction

Childbirth is an amazing event that can be experienced and remembered in every woman's life. Birth will change a woman's life and the care given has the potential to affect both physically and emotionally in the short and long term. The goal of caring for women during childbirth is to create positive experiences for a woman and her family while maintaining physical and psychological health (Susilowati E. 2014, Irvani M, Zarean E, Bahrami M. 2015).^{1,2}

The environment in labor room can have a great effect on the fears and anxieties experienced by the

mother (Munro J, Jokinen M. 2012).³ Anxiety is usually associated with pain that increases during labor and can be in either modify labor pain through psychological and mechanisms of physiological.(Lowe NK 2002)⁴ One way to modify labor pain psychologically is by regulating the labor environment.

Fear and pain cause stress which results in adrenaline expenditure. This results in vasoconstriction and reduced vascularization to the uterus, resulting in a decrease in uterine contractions which will cause prolonged labor. This is less beneficial for the mother and fetus in the mother's uterus (Reck C, Zimmer K, Dubber S, Zipser

B, Schlehe B, Gawlik S. 2013)⁵ Stress during labor can also reduce the amplitude and frequency of uterine contractions and thus, labor will last long and allow for *caesarean section* (SC).(Namazi M, Akbari SAA, Mojab F, Talebi A, Majd HA, Jannesari S. 2014).⁶

It also can increase adrenaline so that blood vessel constriction occurs so that oxygen supply to the fetus decreases. Decreased blood flow also causes weakening of uterine contractions and results in prolonged labor.⁵ hormones, such as catecholamines, cortisol, epinephrine and beta-endorphins, which are secreted in response to tension and anxiety, are involved in the progression of cervical dilatation. It is affecting the muscles of the uterus and reduce the strength of the contract of the of the uterus and efficiency in the delivery so eventually will prolonged labor, increasing pain and trigger anxiety. (Masoudi Z, Akbarzadeh M, Vaziri F, Zare N, Ramzi M. 2014).⁷

Method

Population and Sample: Subjects in this study were all women in the Independent Midwifery Practice (IMP) who met the inclusion criteria, were not included in the exclusion criteria and were willing to participate in the study by signing the informed consent sheet after explanation.

Inclusion and Exclusion Criteria: The inclusion criteria in this study were primigravida, latent parturient phase with gestational age 37-40 weeks, normal pelvic size, estimated fetal weight of 2500-4000 grams, single fetus, head presentation, desired and or planned pregnancy, mother accompanied during pregnancy, mother who has an anxiety score ≤ 59 . Exclusion criteria were premature rupture of membranes, blind and deaf, mothers who had attended pregnancy exercises and yoga.

Research Design: This study is a quasi-experimental study with a non equivalent control group design. The research subjects were divided into two groups namely the treatment group and the control group. In the treatment group of the Midwifery Practice (IMP), maternity interventions were given in the form of labor environment settings which included lighting arrangements, wall color arrangement, arrangement of medical equipment, use of natural scenery, use of music, furniture arrangement, temperature regulation and using plants to neutralize fishy odors the labor environment, while the control group using environmentally deliveries

already exist.

This research was carried out simultaneously with members of the research team in developing the delivery environment. Data collection was performed in the treatment group and the control group. The treatment group was given an intervention in the form of childbirth at the Independent Midwifery Practice (IMP) that had done the delivery environment. The maternity control group at IMP is in accordance with the existing delivery environment.

Measurement Result

The main outcome to be measured in this study is the difference in labor progress (cervical opening) in the intervention and control groups. Other results that will be measured in this study are anxiety scores, pain scores and cortisol levels, gestational age and birth weight.

Research Flow: In the Independent Midwifery Practice (IMP) which is made as an intervention group, the delivery environment will be arranged in accordance with the draft delivery arrangements that have been made and the Independent Midwifery Practice (IMP) which is used as a control group using the existing delivery environment. This study requires examination of cortisol levels in maternal, so the researcher collaborates with the Laboratory of the Faculty of Medicine Unpad to examine cortisol levels. Examination of cortisol levels is done once, namely in the latent phase, blood samples are taken for examination of cortisol levels carried out by midwives. Then to obtain the inclusion criteria anxiety score ≤ 59 performed an anxiety score assessment by other researchers. Furthermore, the measurement of labor progress (cervical dilatation) starts from the opening of 3 cm to the opening of 10 cm, is checked every 4 hours and the average opening (cm/hour) is assessed.

Research Instrument: The instruments used in this study were partographs and observation sheets to assess the progress of labor.

Location and time of research: This research was conducted at the Independent Midwifery Practice (BPM) of West Bandung Regency and Cimahi in July-September 2016.

Ethical Aspect: The ethical aspects considered include (Wirakusumah FF, Satari MH. 2011)⁸

1. The principle of respecting human dignity and respect (*Respect for person*)

In this principle, research subjects are given information about the research to be carried out including: procedures, benefits, volunteerism, confidentiality of data, inconvenience and compensation as well as officers who can be contacted if there is anything that needs to be discussed in connection with research. The research subject is free to determine its participation in following the course of the study, it must be stated in writing by signing the consent form (*informed consent*) as respondents.

2. The principle of benefits and no harm (*Beneficence*)

The advantage of this research that can be felt directly by respondents is obtaining the comfort of

giving birth in a room that has been arranged so that labor is expected to run smoothly.

3. The principle of *justice*

Researchers always be honest, careful, professional, humane. Researchers also always pay attention to the factors of accuracy, equality, accuracy, intimacy, psychological and religious feelings of respondents.

Results

In the study of the effect of the setting of the delivery environment on the progress of labor the characteristics of the subjects can be seen in the following table:

Table 1 Characteristics of research subjects

Characteristics	Group		Value of p
	Treatment	Control	
	(n = 30)	(n = 30)	
Mother's age (years)			0.812 *
Average	22.90	22.70	
Median	23.00	22.50	
Range	17-29	17-32	
Gestational age (weeks)			0.317 **
Average	38.33	38.03	
Median	38	38	
Range	37-40	37-40	
Birth weight (gram)			0.215 **
Average	2,925	3,040	
Median	3,000	3,000	
Range	2,500-3,400	2,500-3,500	

Note: * T test is not paired, ** Mann-Whitney Test

Based on table 1 it can be seen that the statistical test results obtained on maternal age characteristics p value = 0.812, gestational age values p = 0.317 and birth weight (BW) obtained p value = 0.215 it indicates that there is no significant difference between the characteristics mothers in the treatment group and in the control group,

so that both of these research groups were considered homogeneous.

Differences in cortisol levels ($\mu\text{g}/\text{dl}$) and pain in the two study groups can be seen in the table below:

Table 2 Differences in Cortisol and Pain Levels in the Treatment and Control Groups

Cortisol (µg/dl)	Group		Value of p
	Treatment	Control	
	n = 30	n = 30	
Cortisol			0.988 *
Average	371,201	429,125	
Median	361,211	334,185	
Range	140,000-579,856	160,050-895,831	
Pain			0.109 *
Average	4.97	5.67	
Median	5	6	
Range	3-7	2-10	

Explanation: * Mann-Whitney

From table 2 it can be seen that the statistical test results obtained cortisol values (µg/dl) $p = 0.988$ and pain values obtained $p = 0.109$ it shows that there is no significant difference between the treatment group and

the control group, so both of these research groups are considered homogeneous.

To analyze the comparison of the progress of labor in the treatment group and the control group can be seen in the following table:

Table 3 Comparison of Progress in Labor in the Treatment and Control Groups

Variable	Group		Value of p
	Treatment	Control	
	(n = 30)	(n = 30)	
Labor Progress (cm/hour)			0.058 *
Average	1.38	1.23	
Median	1,2	1.08	
Range	0.8-2, 3	0.5-2.3	

Note: * Mann-Whitney test (one- sided test)

From table 3 it can be seen that the results of statistical tests for the progress of labor (cm/hour) in the treatment group and the control group obtained $p = 0.058$, so this shows that there was no difference in labor progress in the two study groups.

To analyze the effect of the setting of the delivery environment on the progress of labor the following calculation results are obtained:

Table 4 The influenced of Labor Environment Settings on the Progress of Labor

Group	Cervical Opening				RR (95% IK)	Value of p
	< 1 cm/hour		≥ 1 cm/hour			
	n = 30	%	n = 30	%		
Control	11	36.7	19	63.3	3.67(1.14-11.84)	0.015 *
Treatment	3	10	27	90		

Note: *Test two proportions (one party)

From table 4.4 the statistical test results show that in the control group subjects who had cervical opening < 1 cm/hour were 11 (36.7%) and in the treatment group were 3 (10%), whereas in the control group subjects who had cervical opening ≥ 1 cm/hour was 19 (63.3%) and in the treatment group was 27 (90%). The difference in the proportion of labor progress in the two groups was found to be $p = 0.015$, so this shows that there is an influence of the delivery environment on the progress of labor. Furthermore, by calculating the relative risk of the relationship between treatment with the progress of labor obtained $RR = 3.67$ ($IK = 1.14-11.84$), meaning that mothers who give birth at Independent Midwifery Practice (IMP) who do not do labor settings have a risk to have cervical opening < 1 cm/hour 3.67 times compared to mothers who gave birth at Independent Midwifery Practice (IMP) who carried out the delivery environment.

Discussion

The environment in the process of childbirth can have a great effect on the fears and anxieties experienced by the mother, such as an unfamiliar environment, then the existence of medical interventions and the existence of negative thoughts such as childbirth which is always followed by pain and then the mother is afraid of the condition of the baby being born. Anxiety is usually associated with pain that increases during labor and childbirth pain can be modified through psychological and physiological mechanisms. (Lowe NK.2002).⁴

The environment is the biggest factor influencing the healing process in medical facilities that is equal to 40%. The physical environment affects 94% of the ease or difficulty of giving birth.^{9,10} A physical environment has an influence on human thoughts, feelings and behavior. As a built environment, space is a stimulus (stimulation from outside) that is able to be responded by the human sensory system (vision, hearing, taste, smell

and touch), which psychologically has the potential to form perceptions that indirectly affect emotional and human behavior. (Sari SM. 20030)¹¹

Pain during labor can be caused by uterine contractions and cervical opening (stretching down the uterus). According to control theory, there is a relationship between pain and psychological problems such as anxiety.¹² The environment in labor can have a great effect on the fears and anxieties experienced by the mother. (Munro J, Jokinen M. 2012)³

Simultaneously, the hypothalamus-pituitary-adrenal (HPA) axis and the *sympathetic nervous system* (SNS) organize various circumstances psychological (eg: emotional processing) and physiological (eg: hormonal endocrine activation and cardiovascular) process to ensure that the maintenance of homeostasis of the organism that is being challenged to stress. (Thoma MV, Marca RL, Brönnimann R, Finkel L, Ehlert U, Nater UM. 2013)¹³ At the same time, the perception of the injury will enable (HPA) axis, where corticotropin releasing hormone (CRH) produced in the hypothalamus into the bloodstream, causing the release of adrenocorticotrophic hormone (ACTH) and other substances. ACTH then activates the adrenal cortex to release cortisol.(Melzack R. 1999)¹⁴ During labor an increase in CRH levels stimulates an increase in myometrial prostaglandin receptors, prostaglandin release, oxytocin, fetal cortisol and beta-endorphins. (Dixon L, Skinner J, Foureur M. 2013)¹⁵

The speed of the opening of the cervix itself is influenced by various factors, namely the strength and weakness of uterine contractions will affect the process of cervical opening. To be able to perform contractions oxytocin hormone secretion is needed. Oxytocin is a hormone produced in the hypothalamus and is transported through the axoplasmic flow to the posterior pituitary which, if given the right stimulation,

will be released into the blood. This hormone is named oxytocin based on its physiological effects, namely the acceleration of labor by stimulating contraction of the uterine smooth muscle (Lestari I, Abadi A, Purnomo W. 2012)⁹

A major proposition from the gate control theory is that to reduce pain affects the center of the brain that serves attention, cognition and emotion which activates nerve impulses to close the “gate” located in the dorsal horn of the spinal column. A second proposition from gate control theory is that pain is a sensory interaction, motivation and a component of middle control.¹⁷ The presence of pain interferes with the brain’s homeostatic regulatory system, resulting in stress and requires a complex program to restore homeostasis. (Newburn M, Singh D 2003)¹⁰

The pain causes stress which results in adrenaline expenditure. This results in vasoconstriction and reduced vascularisation to the uterus, resulting in a decrease in uterine contractions which will cause prolonged labor.⁵ Oxytocin also reduces stress by way of centralized activate the parasympathetic nervous system, which gives the effect of calm and healing; and by reducing activity in the sympathetic nervous system which reduces fear, stress and stress hormones and increases socialization. (Buckley SJ. 2015)¹⁸

Increased anxiety and pain increase catecholamine release and alpha receptor stimulation by the sympathetic nervous system, which in turn causes vasoconstriction, increased muscle tension and decreased uterine blood flow, increased blood pressure, loss of uterine contractions, slowed labor progress and increased metabolism and oxygen consumption to mother.^{4, 19} Stress during labor can also reduce the amplitude and frequency of uterine contractions and thus, labor will last for a long time and allow for *caesarean section* (SC). (Namazi M, Akbari SAA, Mojab F, Talebi A, Majd HA, Jannesari S. 2014)⁶

Lighting can be used creatively and seriously to create a birth space that is calming and relaxing.¹ At the beginning of labor, catecholamines (stress hormones) have the potential to stop labor. When a woman feels very afraid of pain, is in the hospital, labor can fail to progress. (Lothian JA. 2004)²⁰ Darkness stimulates the body to produce melatonin, which then increases oxytocin production. Found a link between lighting arrangements with oxytocin production. The presence of

oxytocin affects the production of endorphins. (Gedey S. 2014)²¹ Expending endorphins can make mothers feel relaxed.

A causal relationship between an increase in nocturnal endogenous melatonin and a decrease in core temperature. On the other hand, melatonin secretion is usually suppressed by bright light and thus, endogenous melatonin levels are almost zero during the day. (Kondo N, Taylor NA, Shibasaki M, Aoki K, Muhamed AMC. 2009)²²

Color can affect the human soul strongly or can affect human emotions. Color can also affect one’s mood. (Darmaprawira S. 2002).²³ The use of color in the delivery room must be considered because it can stimulate the neocortex to release endorphins. Bright colors must be avoided because it can stimulate the neocortex. (Stenglin M, Foureur MJ. 2013)²⁴ The neocortex provokes the release of adrenaline and inhibits the physiology of birth. (Jenkinson B, Josey N, Kruske S. 2014)²⁵ Penyimpanan equipment deliveries in wardrobes can create peace for the mother and reducing the clinical atmosphere.²⁵ Labor equipment should be stored and kept away from the view of maternity so that the mother does not experience anxiety. (NTC Policy Briefing 2011)²⁶ The use of natural elements can also help reduce stress and pain felt during labor, for example by exposure to natural scenes.²⁷

In addition to lighting arrangements, the color/use of wall paint, the arrangement of medical equipment and the use of natural elements, it is also important to note the importance of the arrangement of furniture. Furniture influences the atmosphere of the delivery room. Minimalist furniture and arrangement is very important to note, given the importance of sufficient space for mobility in the delivery room. (Jenkinson B, Josey N, Kruske S.)²⁵ The existence of restrictions on mobility contributes to increased stress and tension. (Manizheh P, Leila P. 2009)²⁸

The use of music in the labor room can also help mothers to deal with pain that is good to increase stimulation and pain threshold. (Gedey S. 2014)²¹ Music provides a pleasant sensory stimulus, causing endorphin release. In addition, music therapy is also a cognitive process that can stimulate the control system through the production mechanism of endorphins, so that with the stimulation of the descending control, the “gate” area will close the transmission of pain to the brain.

Music therapy has vibration and harmony that can be used according to the listener so it will feel comfortable. In addition, because the vibrations of music produce vibrations or the delivery of air to the ear, the vestibular organ (balance tool) also gets the impact of music so that it relaxes. (Malehere NS. 2013, Dwirahayu Y. 2014)^{29, 30}

Adding new odors in the labor environment to change odorous substances into substances that are less stimulating. (Suma'mur. 1996)³¹ Like adding plants in the labor environment that can neutralize fishy odors in the labor environment.

Improve the physical environment, increase women's expectations and confidence. Women believe that the birth environment can affect the ease or difficulty of labor and the facilities provided can affect opportunities for normal birth or risks that require emergency surgery. (Newburn M, Singh D. 2003).¹⁰

Conclusion

The conclusion of this research is that there is a positive influence of the delivery environment to the progress of labor.

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