THE ASSOSIATION CORTISOL LEVELS OF MATERNAL BETWEEN PRETERM AND ATERM LABOR

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ABSTRACT

Preterm labor is a problem that needs great attention because of its impact on perinatal morbidity and mortality. Every year, 15 million babies are born prematurely. The World Health Organization (WHO) estimated in 2003 a 10.5% BBLR incidence, an IUGR of 19.8%, and a preterm labor of 18.5%. Preterm labor still being problem of health that needs great attention because its impact on perinatal morbidity and mortality. Chronic stress during pregnancy will lead to an increase and release of hormones that play a role in childbirth, including CRH, ACTH, cortisol, prostaglandin, and other hormones that play a role to initiate the onset of labor. This may lead to an increased risk of preterm birth. The aim of the research is to find out the association between cortisol levels of mother with preterm and aterm labor. This study is an observational research with cross-sectional design. The study was conducted at Regional public hospital Dr. Rasididin Padang, Regional public hospital Prof. Dr. MA Hanifiah SM Batusangkar, Central public hospital M. Djamil Padang. The number of samples 50 respondents selected by consecutive sampling is divided into 2 groups, 25 respondents with aterm labor and 25 preterm respondents. Examination of cortisol levels was performed at the Biomedical Laboratory of Andalas University of Padang by using ELISA method. Normality test with Shapiro-wilk and analysis applied using chi-square test. The mean level of cortisol in preterm is higher than aterm. There is a association between cortisol levels with preterm dan aterm labor (p = 0,02; p < 0,05). The results found that there was a relationship between between cortisol levels with preterm dan aterm labor in Padang City. High levels of cortisol lead to an increased risk of preterm labor.

Keyword : Stress maternal, Cortisol, preterm labor

INTRODUCTION

Preterm labor occurs because of several interrelated disorders or because of something that cannot be explained. On the other hand, knowledge about the pathophysiology of preterm delivery is still limited. The growth and development of the fetus in the womb, really depends on the health condition of the mother. Disrupted maternal health will impact for babies with low birth weight. Every year, 15 million babies are born prematurely. The World Health Organization (WHO) estimated that in 2003 the incidence of LBW was 10.5%, IUGR 19.8%, and preterm delivery was 18.5%.Globally, infant mortality rates have decreased from the estimated rate of 63 deaths per 1,000 live births in 1990 to 32 per 1,000 live births in 2015.[14] Infant mortality has decreased from 8.9 million in 1990 to 4.5 million in 2015.

Approximately 30% of preterm deliveries have unknown cause. While the remaining 70%, is contributed by several factors such as multiple pregnancies (30% of cases), genital infections, premature rupture of membranes, antepartum hemorrhage, cervical incompetence, and congenital uterine abnormalities (20-25% of cases).[1] Despite advances in diagnosis, the incidence of preterm birth is higher than before, around 12.5%. About half of preterm births occur as a result of preterm delivery.

IMR in West Sumatra Province, compared to other provinces in Indonesia, has shown a significant decrease, even though the provincial target is only 66%. IMR in West Sumatra in 2007 decreased by 47/1000 KH to 27/1000 KH in 2012 with a target of 18/1000 KH. The number of infant deaths in West Sumatra is as many as 681 people spread across 19 districts / cities with the highest contributor to death from the city of Padang, which is 108 babies.

Based on Register of Obstetrics Room Regional public hospital Prof. Dr. M.A Hanafiah SM Batusangkar found 60 cases (9.6%) in 2016. From the data from the Register of Obstetrics Room, Dr. M. Djamil Padang found 55 cases of preterm delivery out of 590 deliveries (9.3%) in the same year, while in Regional public hospital Dr. Rasidin Padang in 2015 as many as 19 cases.

Preterm labor is preceded by a variety of mechanisms. There are four pathological processes that occur in preterm labor, namely: systemic infection or inflammation in the decidua-chorion-amnionitic, maternal stress that activates the HPA axis which releases cortisol and stimulation of prostaglandins, decidual bleeding, and excessive stretching of the uterus due to polyhydramnios or multiple pregnancy. causing increased levels of prostaglandins and collagenase. [1,4,6]

Specifically, the changes in the levels of CRH and cortisol production in mid-to-late pregnancy in response to stress have an effect on a decrease in the hormone progesterone which functions to maintain pregnancy, then with an imbalance in the ratio of estrogen and progesterone, the result is a decrease in the hormone progesterone due to cortisol which stimulates the emergence prostaglandin hormone which triggers contraction and increases contraction intensity. This cause lead to an increased risk of preterm birth. [1,3]

One study reported that there were differences in the neuroendocrine regulation of cortisol between the preterm and term labor groups (p <0.01).[7] There is a link between cortisol and the risk of preterm labor and there is still a lack of research on cortisol in preterm delivery, so this study will examine biomolecularly, especially the relationship of cortisol levels with preterm labor and delivery at term.

MATERIAL AND METHODS

This study is an observational research with cross-sectional design. The study was conducted at Regional public hospital Dr. Rasididin Padang, Regional public hospital Prof. Dr. MA Hanifiah SM Batusangkar, Central public hospital M. Djamil Padang. The data collection of this research was carried out from January to June 2020 in 3 Hospital in west sumatera among others, Regional public hospital Dr. Rasididin Padang, Regional public hospital Prof. Dr. MA Hanifiah SM Batusangkar.

The population in this research is all preterm labor and aterm labor. The population will be grouped into two groups, namely all patients with preterm and term labor. The research sample consisted of 25 respondents who gave preterm labor and 25 respondents who delivered at term using consecutive sampling.

The inclusion criteria in this study were mothers with gestational age ≤ 34 weeks, mothers with gestation 37 - 42 weeks, single

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pregnancies, foetus is live known based on ultrasound results in medical records, not experiencing intrauterine bleeding and the patient want to be a respondent.

The exclusion criteria in this study were maternal with a history of preterm labor, incomplete medical record, active smokers and alcohol consumption.

Preterm and term mothers who were diagnosed by a doctor / resident who met the inclusion and exclusion criteria at the study site were used as research samples, then before the mother or family signed the informed consent, an explanation was given about this study. Identity and clinical examination results were recorded on the data collection form. Then, ± 3 ml of venous blood was taken by the laboratory officer who was on duty at that time, after that put it into a centrifuge tube (vacuum tube) without EDTA. Put the blood in the vacuum tube on the tube rack, then let stand for 1-2 hours at room temperature until the blood clots. Then blood sample was centrifuge at a speed of 3000 rotations per minute (rpm) for 15 minutes, then take the serum from the centrifuge using a micropipete, put it in a microtube that has been coded according to the identity of the research subject. Then the serum sample was sent to the Biomedical Laboratory of FK-UNAND using a cooler bag to be stored in a refrigerator (temperature -20^{0}C). Serum measurements are made after the total number of samples is met. Then the cortisol were examined using the ELISA method.

The data normality test was carried out using the Shapiro-Wilk test. To see the relationship between variables, a chi-square test was used and the fisher test was an alternative. All data is processed using a computer program.

RESULT

The characteristics of respondents in this study are shown in Table 1. The mean cortisol levels in the preterm were higher than aterm labor (Table 2). Based on the statistical test, it was found that there was a relationship between maternal cortisol levels with preterm and term labor, with $p = 0.020$ (p> 0.05) OR 4.667. (Table 3).

Table 1.
The characteristics of respondents

Variable	Group of labor		Total
	Preterm	**Aterm**	n (%)
Age (year)			
< 20	4	1	5 (10)
20-35	19	20	39 (78)
> 35	2	4	6 (12)
Paritas			
Primipara	16	10	26 (52)
Multipara	9	15	24 (48)

Table 2.
Mean cortisol levels in preterm dan aterm labor

Variable	Group of Labor	
	Aterm Mean ± SD	Preterm Mean ± SD
Kortisol (µg/dl)	36,16 ± 14,04	50,47 ± 18,68

Table 3.
Assosiation cortisol levels of maternal between preterm and aterm labor

Cortisol	Group of labor		Total n (%)	p value	OR
	Aterm n (%)	Preterm n (%)			
Normal	10 (40)	2 (8)	12 (24)	0,02	4,667
High	15 (60)	23 (92)	38 (76)		
Total	25 (100)	25 (100)	50 (100)		

Exp : Uji *Chi-Square*

DISCUSSION

In response to stress, the hypothalamus directly activates the sympathetic nervous system. Release CRH to stimulate the secretion of ACTH and cortisol, and trigger the release of vasoprespine which aims to suppress stress. However, the increasing amount of CRH and cortisol in stress can result in preterm labor if the depressive state continues to chronic stress. [7,12] Assessed CRH levels during pregnancy and found that women who delivered preterm had significantly elevated CRH levels.[3]

The HPA axis mechanism is characterized by stress and anxiety that usually occurs in young primiparous who have a genetic predisposition. The physical and psychological stress of young primi mothers causes premature activation of the mother's Hypothalamus-Pituitary-Adrenal axis and causes uteroplacental insufficiency and results in stressful conditions in the fetus, leading to preterm labor. [4,8]

Based on the results of the study, prostaglandin levels were higher in the term labor group than preterm labor. This is in accordance with the theory of childbirth where the change in the placenta becomes old with increasing gestational age will make the corial villi experience changes, so that estrogen and progesterone levels decrease which causes spasm of the blood vessels. The decrease in the hormone progesterone leads to the production of the hormone prostaglandin.

Basically, the mechanism that occurs in term and preterm labor is the same, which distinguishes only the time of activation of the labor phase. The increase in prostaglandins at term labor is more physiological in labor, but if it occurs prematurely or preterm, the increase in prostaglandins is classified as a pathological condition of labor.

Maternal stress causes elevated levels of cortisol, which can activate placental CRH gene expression. Placental CRH in turn can stimulate the secretion of fetal cortisol and DHEA-S (by activating the fetal HPA axis) and result in an increase in prostaglandins.[1,6] High cortisol levels in preterm mothers can lead to higher prostaglandins, where excess prostaglandin production in preterm pregnancy will result. spur the work of the uterine muscles to contract and will lead to preterm labor.

CONCLUSION

The mean cortisol levels in the preterm group were higher than at term delivery. There is a relationship between maternal cortisol levels with preterm labor and delivery at term. Given the limitations of this study, it is advisable for further researchers to carry out experimental research to determine the relationship of other factors that trigger preterm labor, and to consider some of the weaknesses in this study so as to obtain maximum results.

REFERENCES

Behrman, RE. 2007. Preterm Birth : Cause, Consequences, and Prevention. Washington, D.C: The National Academies. pp. 176-180.

Benson, RC. and Pernoll, ML. 2009. Handbook of Obstetric and Gynecology 9th Edition. Philadelphia : Mc. Graw-Hill Companies. pp. 343-348.

Chen, Y. Holzman, C. Chung, H. Senagore, P. Talge, NM. Siler-Khord, T. 2010. Level of Maternal Serum Corticotropin Releasing Hormon (CRH) at Mid Pregnancy in Relation to Maternal Characteristics. USA : National Institutes of Health Public Access. pp. 820-832.

Cunningham, FG. Leveno, KJ. Bloom, SL. Hauth, JC. Rouse, DJ. Spong, CY. et al. (2014). William Obstetrics 24th edition. Jakarta : EGC.

Dinas Kesehatan Kota Padang. 2014. Profil Kesehatan Provinsi Sumatra Barat Tahun 2014. Padang: Dinas Kesehatan Provinsi. Hal. 12-15.

Funai, EF. Evans, MI. Lockwood, CJ. 2008. High Risk Obstetrics : The Requisites in Obstetrics and Gynecology. Piladelphia: Mosby Elsevier. pp. 171-180.

Habersaat, S. Borghini, A. Faure, N. Nessi, J. Guex, MF. Pierrehumbert, B. et al. 2013. Emotional and neuroendocrine regulation in very preterm and full-term infants. Switzerland : European Journal of Developmental Psychology. pp. 691–706.

Hacker, NF. 2010. Hacker and Moore's Essentials of Obstetrics and Gynecology. Philadelphia: Saunders Elsevier. pp. 146-157

Ivanicevic, M. Djelmis, J. and Bukovic, D. 2001. Review on Prostaglandin and Oxytocin Activity in Preterm Labor. Croatia : Coll Antropol. pp 687-694.

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TECHNOLOGY, PUBLIC HEALTH, AND HEALTH INFORMATION MANAGEMENT (SeSICNiMPH)

Klimaviciute, A. Calciolari, J. Bertucci, E. Abelin-Tornblom, S.Stjemholm-Vladic, Y. Bystrom,B. Petraglia, F. et al. 2006. Corticotropin-Releasing Hormone, It's Binding Protein and Receptors in Human Cervical Tissue at Preterm and Term Labor in Comparison to Non-Pregnant State. Biomed Central. pp. 4-29

Latendresse, G. dan Ruiz, RJ. (2011). Maternal CRH and The Use of Selective Serotinin Reuptake Inhibitors Independently Predict The Occurrence of Preterm Birth. USA : National Institutes of Health Public Access. pp. 118-126.

Newnham, JP. Dickinson, JE. Hart, RJ. Pennel, CE. Arrese, CA. Keelan, JA. (2014). Strategies to Prevent Preterm Birth. Australia : Frontiers in Immunology. pp.

Tse, AC. Janet, WR-E. Koenan, K. Wright, R. J. (2012). Cumulative Stress and Maternal Prenatal Corticotropin-Releasing Hormon in an Urban U.S Cohort. Brookline : National Institutes of Health Public Access. pp. 970-979.

WHO. (2017). Global Health Observatory (GHO) data : Infant Mortality. Diakses februari 28, 2017, from http://www.who.int/. available in http://www.who.int/gho/child_health/mortality/neonatal_infant_text/en/ .

University of Oxford. 2008. The International Fetal and Newborn Growth Standards for the 21st Century (INTERGROWTH-21st) Study Protocol. The International Fetal and Newborn Growth Consortium. pp.1-5.