

CORRELATION PRENATAL DISTRESS QUESTIONNAIRES SCORE AND CORTISOL SERUM LEVELS FOR PREGNANT WOMEN

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Abstract

Objective: This study aims to compare prenatal distress questionnaire scores with cortisol levels in pregnant women.

Method: This type of research uses quantitative with analytical observational design. This research was conducted in 4 Puskesmas and 2 Regional Hospitals in Makassar City for the period of 2021 and 2022. The sampling technique used was purposive sampling, with the Spearman's Rho test.

Results: Based on the results of the Spearman's Rho test, there is a correlation between stress and cortisol levels with p value = $0.000 < 0.05$ and r value = 0.427 indicating that the two variables have a moderate correlation and have a positive relationship. This means that the higher the cortisol level, the higher the stress level in the mother.

Conclusion: Cortisol in the relationship between prenatal stress is proven by the mood of pregnant women with an increase in maternal glucocorticoids which is less clear so that cortisol levels also have an effect.

Keywords: Prenatal Distress Questionnaire Score, Cortisol Levels, Primigravida Pregnant Women

INTRODUCTION

Pregnancy, childbirth and motherhood are physiological things. Some of these events have different meanings for each woman and her family ^(1,2). For most women this is a positive and a pleasant transition phase to a new stage in their life cycle. But it can also have a negative impact so that pregnant women are very vulnerable to psychological pressure which includes anxiety, depression and stress ^(3,4).

During the pregnancy phase, several changes such as fetal organs and organ systems will be affected ^(5,6), so there is a lot of literature that justifies the relationship of maternal stress with delays in infant motor and cognitive development where it has been reported that maternal stress levels during mid-pregnancy will be significantly high. Significantly associated with lower scores of infant motor and mental development ^(7, 8).

Pregnant women who suffer from stress and anxiety during the third trimester of pregnancy will experience an increase in the release of stress hormones, causing disruption of blood flow in the uterus and resulting in weak uterine muscle contractions^(9, 10). Stress in pregnant women has often been associated with increased maternal endogenous cortisol levels^(11, 12). The hormone cortisol plays an important role in fetal development, during pregnancy the hormone cortisol increases two to four times. This increase has a positive effect, but if excess cortisol can result in impaired brain development as a result of neurotoxicity^(13, 14)

As many as 95% of health workers do not pay much attention to the psychological condition of pregnant women, but pay more attention to the physical conditions of mothers and babies in the womb⁽¹⁵⁾. Not infrequently pregnancy brings anxiety that will affect the physical and psychological well-being of the mother and fetus, for example pregnant women who experience stress before giving birth are at increased risk for premature birth, resulting in physical disability and a decline in potential intelligence and mental emotional aspects^(16, 17).

The prevalence of maternal prenatal depression has been observed to be slightly higher than 25% in low- and middle-income countries. While the importance of screening for obstetric risk factors and medical conditions is the norm in most fetal well-being it tends to be overlooked^(18, 19). Therefore, maternal psychological distress is a major public health problem and requires timely detection and intervention to prevent adverse pregnancy outcomes.

METHOD

This type of research uses quantitative with analytical observational design⁽²⁰⁾. This research was conducted in 4 Puskesmas and 2 Regional Hospitals of Makassar City for the period of 2021 and 2022. The sampling technique used purposive sampling with inclusion criteria, namely: pregnant women in the third trimester, Primigravida, and 28-32 weeks of gestation and pregnant women without abnormalities. and are willing to be respondents, so that the total sample size is 90 respondents. Analysis of the data collected in the study was processed analytically with the Spearman Rho test.

RESULTS

This research was conducted in the Makassar city area, where this data collection started from 2020 to 2021 with a total sample of 90 samples.

Table 1 shows the characteristics of the respondents based on the average age of the mother 22 years, and the husband's age 25 years, the majority of the length of marriage 12 months were 71 (78.9%), with an average income of 2.87, and the majority of mothers did not work (housewives) as many as 82 people (91.1%), the most recent education is high school as many as 50 people (55.6%). The majority of planned pregnancies were 63 people (70%), with the majority living with their families as many as 67 people (74.4%). The average upper arm circumference is 24.90, and the average weight gain is 14.07 with an average height of 152 and an average hemoglobin level of 10.83 gram% for pregnant women.

Table. 1 Distribution of Respondents Characteristics

Variable	n(%) / Mean±SD
Mother's Age	22.76±3.88
Husband's Age	25.98 ± 5.27
Length of Married (months)	
< 12	19 (21.1)
≥ 12	71 (78.9)
Income/months	2.87± 1.95
Mother's Job	
IRT	82 (91.1)
Work	8 (8.9)
Education	
SD	6 (6.7)
Junior High School	17 (18.9)
Senior High School	50 (55.6)
PT	17(18.9)
Pregnancy Status	
Planned	63 (70.0)
Unplanned	27 (30.0)
Residen Status	
With Family	67 (74.4)
Own	23 (25.6)
Lila (cm)	24.90±3.33
Weight gain (kg)	14.07±4.22
Height (cm)	1.52±4.62
Hb	10.83±0.74

Source: Primary Data, 2021

Table. 2 Correlation Analysis of Prenatal Distress Questionnaire scores with maternal serum cortisol level

Variable	Value	
	<i>P</i>	<i>r</i>
Stress with cortisol levels	0.000	0.427

Source: Primary Data, 2021

Spearman Rho test; p < 0.05

Based on the data in Table 2 shows that the results of the Spearman's Rho test, there is a correlation between stress and cortisol levels with a value of $p = 0.000 < 0.05$ and

a value of $r = 0.427$ indicating that the two variables have a moderate correlation and have a positive relationship. This means that the higher the cortisol level, the higher the stress level in the mother.

DISCUSSION

Maternal psychological stress during pregnancy affects the growth and subsequent development of the child^(21,22). When maternal anxiety and depression were measured through the Prenatal Distress Questionnaire (PDQ) instrument, the estimation of maternal endogenous cortisol levels could serve as a biomarker of psychological stress before delivery. Cortisol is a glucocorticoid hormone produced by the adrenal glands and increases when a person experiences stress^(23,24).

Respondents also experience cardiovascular symptoms, respiratory symptoms, and gastrointestinal symptoms as symptoms that indicate anxiety both at mild and moderate levels of anxiety so that it can cause stress. The hormone that regulates stress levels in a person's mind and body is called the hormone cortisol. When the body is in a state of danger or confusion, the hypothalamus will produce a number of hypothalamic regulating hormones which are sent to the pituitary gland below the hypothalamus⁽²⁵⁾.

Stress or anxiety in pregnant women can affect cortisol secretion. A dramatic increase in cortisol secretion, mediated by the central nervous system through increased activity of the corticotropin-releasing hormone (CRH)-adrenocorticotopic hormone (ACTH)-cortisol system, occurs in response to situations that cause stress or anxiety^(23,26). Corticotropin secretion is associated with anxiety, a dramatic increase in cortisol secretion, mediated by the central nervous system through increased activity of the corticotropin-releasing hormone (CRH)-Adrenocorticotopic hormone (ACTH)-cortisol system, occurs in response to situations that cause anxiety. The increase in plasma cortisol concentration is generally proportional to the intensity of stimulation: a greater increase in cortisol level indicates a response to severe anxiety events than to simple anxiety events^(27,28).

Hypothalamic hormones will regulate the secretion of hormones produced by the anterior lobe in the pituitary gland or pituitary gland, namely adrenocorticotopic hormone (ACTH). When the pituitary gland is stimulated, ACTH is secreted into the blood to be carried to other endocrine glands, including the adrenal cortex⁽³⁾. This gland is then stimulated to secrete specific hormones such as cortisol, which are carried by the blood to hormone receptors in or on target tissue cells. Then it enters the bloodstream, the heart beats faster, oxygen levels in the brain increase, and releases energy from body fat and glucose. Under conditions of excessive stress, the hormone cortisol will increase, and this will cause fatigue^(10,12).

CONCLUSION

The effect of stress on pregnant women affects mood which has implications for changes in the hypothalamic-pituitary-adrenal axis of the mother and fetus, so that cortisol in the relationship between prenatal stress is evidenced by the mood of pregnant women with an increase in maternal glucocorticoids which is less clear.

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REFERENCE:

1. Ahmed S, Fullerton J. Challenges of reducing maternal and neonatal mortality in Indonesia: Ways forward. *Int J Gynecol Obstet*. 2019;144:1–3.
2. Riu DS, Mappaware NA, Fujiyanto, Asmi MN, Tansil AR. Maternal hemoglobin concentration and birth weight: A report from mother and child tertiary hospital. *Enferm Clin [Internet]*. 2020;30:92–5. Available from: <https://doi.org/10.1016/j.enfcli.2019.07.042>
3. Braithwaite EC, Murphy SE, Ramchandani PG. Effects of prenatal depressive symptoms on maternal and infant cortisol reactivity. *Arch Womens Ment Health [Internet]*. 2016;19(4):581–90. Available from: <http://dx.doi.org/10.1007/s00737-016-0611-y>
4. Woolhouse H, Mercuri K, Judd F, Brown SJ. Antenatal mindfulness intervention to reduce depression, anxiety and stress: A pilot randomised controlled trial of the MindBabyBody program in an Australian tertiary maternity hospital. *BMC Pregnancy Childbirth*. 2014;14(1):1–16.
5. Goetz M, Schiele C, Müller M, Matthies LM, Deutsch TM, Spano C, et al. Effects of a brief electronic mindfulness-based intervention on relieving prenatal depression and anxiety in hospitalized high-risk pregnant women: Exploratory pilot study. *J Med Internet Res*. 2020;22(8).
6. Pan WL, Gau ML, Lee TY, Jou HJ, Liu CY, Wen TK. Mindfulness-based programme on the psychological health of pregnant women. *Women and Birth [Internet]*. 2019;32(1):e102–9. Available from: <https://doi.org/10.1016/j.wombi.2018.04.018>
7. Fan F, Zou Y, Zhang Y, Ma X, Zhang J, Liu C, et al. The relationship between maternal anxiety and cortisol during pregnancy and birth weight of chinese neonates. *BMC Pregnancy Childbirth*. 2018;18(1):1–6.
8. Prabhu S, George LS, Shyamala G, Jose TT, George A. The effect of a prenatal psychosocial education program on postnatal depression, stress, and parenting self-efficacy in women in South India - A study protocol for a randomised controlled trial. *Ment Heal Prev [Internet]*. 2020;20(October):200194. Available from: <https://doi.org/10.1016/j.mhp.2020.200194>
9. Nath A, Murthy GVS, Babu GR, Renzo GC. Effect of prenatal exposure to maternal cortisol and psychological distress on infant development in Bengaluru, southern India: A prospective cohort study. *BMC Psychiatry*. 2017;17(1):1–6.
10. Ladyman C, Signal TL, Sweeney B, Gander P, Paine SJ, Huthwaite M. A pilot longitudinal sleep education intervention from early pregnancy and its effect on optimizing sleep and minimizing depressive symptoms. *Sleep Heal*. 2020;6(6):778–86.
11. Esfandiari M, Faramarzi M, Nasiri-Amiri F, Parsian H, Chehrazi M, Pasha H, et al. Effect of supportive counseling on pregnancy-specific stress, general stress, and prenatal health behaviors: A multicenter randomized controlled trial. *Patient Educ Couns [Internet]*. 2020;103(11):2297–304. Available from: <https://doi.org/10.1016/j.pec.2020.04.024>
12. Hall H, Munk N, Carr B, Fogarty S, Cant R, Holton S, et al. Maternal mental health and partner-delivered massage: A pilot study. *Women and Birth [Internet]*. 2021;34(3):e237–47. Available from: <https://doi.org/10.1016/j.wombi.2020.05.003>
13. Sanfilippo KRM, McConnell B, Cornelius V, Darboe B, Huma HB, Gaye M, et al. Community psychosocial music intervention (CHIME) to reduce antenatal common mental disorder symptoms in The Gambia: a feasibility trial. *BMJ Open*. 2020;10(11):e040287.
14. Sbrilli MD, Duncan LG, Laurent HK. Effects of prenatal mindfulness-based childbirth education on child-bearers' trajectories of distress: a randomized control trial. *BMC Pregnancy Childbirth*. 2020;20(1):1–13.
15. Aarestrup AK, Skovgaard Væver M, Petersen J, Røhder K, Schiøtz M. An early intervention to

- promote maternal sensitivity in the perinatal period for women with psychosocial vulnerabilities: Study protocol of a randomized controlled trial. *BMC Psychol.* 2020;8(1):1–13.
16. Zwan JE Van Der, Huizink AC, Lehrer PM, Koot HM. The Effect of Heart Rate Variability Biofeedback Training on Mental Health of Pregnant and Non- Pregnant Women: A Randomized Controlled Trial.
 17. Clarke K, Azad K, Kuddus A, Shaha S, Nahar T, Aumon BH, et al. Impact of a Participatory Intervention with Women ' s Groups on Psychological Distress among Mothers in Rural Bangladesh : Secondary Analysis of a Cluster- Randomised Controlled Trial. 2014;9(10).
 18. Hulsbosch LP, Nyklíček I, Potharst ES, Meems M, Boekhorst MGBM, Pop VJM. Online mindfulness-based intervention for women with pregnancy distress: Design of a randomized controlled trial. *BMC Pregnancy Childbirth.* 2020;20(1):1–10.
 19. Agampodi T, Katumuluwa S, Pattiyakumbura T, Rankaduwa N, Dissanayaka T, Agampodi S, et al. Feasibility of incorporating mindfulness based mental health promotion to the pregnancy care program in Sri Lanka : a pilot study [version 2 ; peer review : 2 approved]. 2019;1–15.
 20. Sugiyono. *Metode Penelitian Kombinasi (Mix Methods)*. 2015.
 21. Sikander S, Lazarus A, Bangash O, Fuhr DC, Weobong B, Krishna RN, et al. The effectiveness and cost-effectiveness of the peer-delivered Thinking Healthy Programme for perinatal depression in Pakistan and India : the SHARE study protocol for randomised controlled trials. *Trials* [Internet]. 2015;1–14. Available from: <http://dx.doi.org/10.1186/s13063-015-1063-9>
 22. Fuhr DC, Weobong B, Lazarus A, Vanobberghen F, Weiss HA, Singla DR, et al. Delivering the Thinking Healthy Programme for perinatal depression through peers : an individually randomised controlled trial in India. *The Lancet Psychiatry* [Internet]. 2019;6(2):115–27. Available from: [http://dx.doi.org/10.1016/S2215-0366\(18\)30466-8](http://dx.doi.org/10.1016/S2215-0366(18)30466-8)
 23. Deligiannidis KM, Kroll-desrosiers AR, Svenson A, Jaitly N, Barton BA, Hall JE, et al. Cortisol Response to the Trier Social Stress Test in Pregnant Women at Risk for Postpartum Depression. *HHS.* 2017;19(5):789–97.
 24. Sut HK. Anxiety , depression , and related factors in pregnant women during the COVID - 19 pandemic in Turkey : A web - based cross - sectional study. 2020;(August).
 25. Lönnberg G, Jonas W, Unternaehrer E, Bränström R, Nissen E, Niemi M. Journal of Affective Disorders Effects of a mindfulness based childbirth and parenting program on pregnant women ' s perceived stress and risk of perinatal depression – Results from a randomized controlled trial. *J Affect Disord* [Internet]. 2020;262(March 2019):133–42. Available from: <https://doi.org/10.1016/j.jad.2019.10.048>
 26. Yuliana A, Murti B, Prasetya H. The Effect of Antenatal Class on Birth and Parenting Preparedness: A Path Analysis Evidence from Salatiga, Central Java. 2018;(36):223–223.
 27. Bischoff M, Howland V, Tomczyk S, Schmidt S, Zygmunt M, Heckmann M. Save the children by treating their mothers (PriVileG-M-study) - study protocol : a sequentially randomized controlled trial of individualized psychotherapy and telemedicine to reduce mental stress in pregnant women and young mothers and to improve Child ' s health. 2019;1–15.
 28. Koushede V, Brixval CS, Thygesen LC, Axelsen SF, Winkel P, Lindschou J, et al. Antenatal small-class education versus auditorium-based lectures to promote positive transitioning to parenthood - A randomised trial. *PLoS One.* 2017;12(5):1–18.