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RESEARCH ARTICLE

The Effect of Prenatal Yoga and Quran Recitations on Cortisol Hormone Levels and Labor Readiness

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ABSTRACT

Pregnancy is a time that requires adaptation in the face of a new role as a mother, which brings a variety of physical and psychological changes. Among the mental problems reported during pregnancy, pregnancy stress was 92.8%. The American College of Obstetricians and Gynecologists recommends prenatal yoga as one of the physical activities to improve the health of pregnant women. The alpha waves produced by the Quran recitation are a signal that a person is in a relaxed state. The auditory nerve will send neurotransmitters to the limbic cortex. Such stimulation can increase hypothalamic activity, which in turn will suppress the release of corticotrophin-releasing factor. Audio distraction by listening to Surah Ar Rahman from the Holy Quran can help reduce anxiety and the hormone cortisol during pregnancy. To analyze the effect of prenatal yoga and Quran recitations of Surah Ar Rahman on cortisol hormone levels and labor readiness. This study used a quasi-experimental design with a non-equivalent control group design approach. A total of 86 pregnant women with gestational age >28 weeks who met the inclusion criteria using the purposive sampling technique were divided into two groups: the intervention group (n = 43) and the control group (n = 43). The intervention group was treated with prenatal yoga and Quran recitation, while the control group was only treated with prenatal yoga. Both groups were given treatment for 2 weeks with 4 times meetings, and then saliva samples were collected. Data were collected through a questionnaire measuring labor readiness levels. Data were analyzed using Mann-Whitney and Chi-square tests ($p < 0.05$). The statistical test results show that in the variable cortisol hormone levels, the p-value = 0.000 ($p < 0.05$) means that there is a significant difference in cortisol hormone levels between the two groups. In the labor readiness variable, the p-value = 0.366 ($p < 0.05$) does not show a significant effect between the two groups. There is an effect of prenatal yoga and Quran recitation on cortisol hormone levels. There is no effect of prenatal yoga and Quran recitation on labor readiness.

INTRODUCTION

Pregnancy is a time that requires adaptation in the face of a new role as a mother, which brings a wide range of physical and psychological changes (1) (2). Anxiety can cause physical and mental tension, which makes muscles and joints stiff. As a result, uterine contractions become inadequate, which can hinder the labor process (3). The hypothalamus-pituitary-adrenal (HPA) system can be activated by stress and anxiety. The hypothalamus releases corticotropic-releasing hormone (CRH), which prompts the pituitary gland to release adrenocorticotropic hormone (ACTH). Subsequently, ACTH prompts the adrenal glands to produce and release cortisol into the blood. Increased placental cortisol levels are one of the signals of emotional stress. During the second trimester of pregnancy and before labor, cortisol levels will increase but will decrease after labor (4,5).

About 30% of mothers experience anxiety each trimester, and 6.9 percent of mothers experience it during pregnancy (6,7). To make pregnant women more prepared for labor, physical activity during pregnancy can help reduce anxiety and cortisol hormone levels (8,9). Research proves that prenatal yoga can affect the anxiety levels of pregnant women (10,11) (12). Further research proves that prenatal yoga before labor significantly reduces anxiety and improves sleep quality in the intervention group (13,14). In addition, pregnant, maternity, and postpartum women can also do non-pharmacological therapies, such as acupressure, acupuncture, warm or cold compresses, hydrotherapy, hypnotherapy, endorphin massage, relaxation, and distraction techniques, when experiencing stress and anxiety (15). Visual distraction and auditory distraction are two types of distraction that can be used to reduce physical pain, stress, and anxiety. Audio distraction is one of the effective distraction techniques (16). Research shows that audio distraction by listening to Surah Ar Rahman can help reduce anxiety and cortisol hormones during pregnancy (17). Clinical trials were conducted on mice that experienced stress by giving Quran Recitation of Surah Ar Rahman therapy, with the findings that there was a significant difference in cortisol levels in mice that were given treatment. This means that Quran recitation therapy can reduce cortisol levels in mice exposed to noise stress (18).

Further research proved that recitation and listening to the Qur'an can be used as a useful non-pharmacological treatment to reduce anxiety, stress, and depression (19–25). Another study showed that, compared to relaxation music, listening to Surah Ar Rahman was statistically more effective in reducing cortisol levels and stress scale scores (26–27).

Literature studies conducted found that research on the effectiveness of prenatal yoga and Quran recitations in reducing anxiety levels and cortisol hormone levels has been widely done, but there has been no research that combines the effect of prenatal yoga, Quran recitation, and prenatal yoga on cortisol hormone levels and labor readiness.

Based on the background description above, it attracts the attention of researchers to conduct research entitled "The Effect of Prenatal Yoga and Quran Recitations Surah Ar-Rahman on Cortisol Hormone Levels and Labor Readiness".

METHODS

Subject

This study obtained a sample of 86 respondents with gestational age ≥28 weeks as a sample. The inclusion criteria in this study are as follows:

1. Pregnant women are willing to be respondents and sign informed consent
2. In the intervention group, pregnant women are Muslim.
3. Single pregnancy
4. Pregnant women participated in prenatal yoga twice a week (for 2 weeks) for the control group and for the intervention group, they were willing to participate in prenatal yoga twice a week (for 2 weeks) and listen to the recitation of the Al-Quran Surah Ar-Rahman.
5. Fetal growth and development according to gestational age
6. Pregnant women do not have hearing impairment

The exclusion criteria in this study are as follows:

1. Pregnant women who have contraindications (such as preeclampsia, eclampsia and placenta previa)
2. Pregnant women who are doing exercise/other physical activities during pregnancy
3. Pregnant women who have a history of mental disorders

MATERIALS

Precision pipettes for dispensing 50, 100, 150 and 300 μL, disposable pipette tips, distilled or deionized water, plate shaker, benchtop centrifuge, microplate reader with dilter set at 450 nm and upper od limit of 3.0 or greater, broken well microplate coated with anti-cortisol antibody, cortisol

horseradish peroxidase (HRP) conjugate concentration, saliva cortisol calibrator, control, wash buffer concentrate, assay buffer, TMB substrate.

Experimental design

This study is a type of quasi-experiment research with a nonequivalent control group design approach that aims to determine the effect of prenatal yoga and recitations of the Quran Surah Ar-Rahman on cortisol hormone levels and labor readiness. This research was conducted at Barayya Primary Clinic of Hasanuddin University and several Midwife Independent Practices in Makassar City and Hasanuddin University Medical Research Center (HUM-RC) in September-October 2024. This study obtained a sample of 86 respondents with gestational age >28 weeks as a sample, 43 people as a control group, and 43 people as an intervention group. Sampling in the research subject group was carried out on research subjects who had met the inclusion criteria with the purposive sampling technique. Research sampling was carried out on pregnant women who routinely did prenatal yoga 4 times for 2 weeks, and the intervention group was given additional treatment, namely listening to the Quran Recitation Surah Ar Rahman during the relaxation phase (savasana) for 15 minutes. The recitations were played from the Ammar TV YouTube channel by a reciter named Salim Bahanan (20). He is a Quran hafidz who has memorized 30 Juz with melodious and beautiful chants. This study has received ethical approval recommendations from the Health Research Ethics Commission (KEPK), Faculty of Public Health, Hasanuddin University with no. 2172/un4.14.1/tp.01.02/2024.

Definition of variable

Prenatal yoga is a physical movement combined with breathing techniques carried out by pregnant women in the third trimester with a gestational age of 28-40 weeks, with a frequency of 2 times a week, exercise duration ± 60 minutes / meeting, with 4 meetings in accordance with the core movements of prenatal yoga.

Quran recitations of Surah Ar-Rahman is the recitation of the Holy Quran Surah Ar-Rahman with the aim of seeing the cortisol levels and the readiness of pregnant women to face childbirth.

Measurement of cortisol hormone levels based on nominal figures obtained from the results of examining saliva samples in the morning after waking up.

The readiness of pregnant women to face childbirth, both from a physical and psychological aspect.

Statistical Analysis

Data analysis was conducted using the SPSS version 29.0 program with the Mann-Whitney Test and the Chi-Square Test with a confidence interval of 95%. The statistical method used was calculating descriptive statistics (mean range, median, mean, standard deviation, and data distribution) and the Kolmogorov-Smirnov normality test. Statistical tests were carried out based on data distribution analysis to assess the normality of the research data. Analysis of cortisol hormone levels using the enzyme-linked immunosorbent assay (ELISA KIT) method with an average range <100 ng/mL according to the examination protocol.

RESULTS

Table 1. Frequency Distribution of Respondents' Characteristics Based on Age, Gestational Age, Education, Parity, and Occupation

Variables	Characteristics Respondents						P-Value*
	Control Group (PY)		Intervention Group (PY+QR)		Total		
	n	%	n	%	n	%	
Age							
20 – 25 Years	16	37.2	17	39.5	33	38.4	0.899
26 – 30 Years	15	34.9	13	30.2	28	32.6	
31 – 35 Years	12	27.9	13	30.2	25	29.1	
Age Pregnancy							
28 – 31 Weeks	7	16.3	16	37.2	23	26.7	**0.023**

32 – 35 Weeks	15	34.9	17	39.5	32	37.2	
36 – 40 Weeks	21	48.8	10	23.3	31	36.0	
Education							
Elementary school	3	7.0	2	4.7	5	5.8	
Junior High School	6	14.0	7	16.3	13	15.1	0.489
High School / Vocational School College	16	37.2	22	51.2	38	44.2	
	18	41.9	12	27.9	30	34.9	
Parity							
1	15	34.9	18	41.9	33	38.4	
2	17	39.5	11	25.6	28	32.6	
3	9	20.9	10	23.3	19	22.1	0.375
4	2	4.7	3	7	5	5.8	
5	0	0	1	2.3	1	1.2	
Work							
Work	8	18.6	7	16.3	15	17.4	0.776
No Working (Housewife)	35	81.4	36	83.7	71	82.6	

Note: Chi-Square Test, Abbreviations : PY = Prenatal Yoga, QR = Quran Recitation

Based on Table 1, the age characteristics of respondents are dominantly in the age range of 20–25 years in the control group, 16 (37.2%), and 17 (39.5%) in the intervention group. The p value obtained of 0.899 indicates that the difference in the age distribution of respondents between the control group and the intervention group is not statistically significant.

In the table of respondent characteristics based on gestational age, 36–40 weeks dominated in the control group, namely 21 (48.8%), and 32–35 weeks of gestation in the intervention group, as many as 17 (39.5%). The p-value obtained of 0.023 indicates that the difference in the distribution of respondents' gestational age between the control and intervention groups is statistically significant.

In the table, the characteristics of respondents based on education at the college level are more dominant in the control group, namely 18 people (41.9%), and in the intervention group at the high school level, or equivalently, as many as 22 people (51.2%). The p value of 0.489 indicates that the difference in the distribution of respondents' education between the control and intervention groups is not statistically significant.

In the table of respondent characteristics based on parity in both groups, parity 1 dominated with results in the control group as many as 17 (39.5%) and the intervention group as many as 18 (41.9%). A p-value of 0.375 indicates that the difference in the parity distribution of respondents between the control group and the intervention is not statistically significant.

In the table of respondent characteristics based on occupation, in both groups not working dominated with the results in the control group as many as 35 (81.4%) and the intervention group as many as 36 (83.7%). The p-value of 0.776 indicates that the difference in the distribution of respondents' parity between the control and intervention groups is not statistically significant. From the results of the distribution of data on respondent characteristics, it can be concluded that the characteristics of respondents based on age, education, parity, and employment show statistically insignificant results, meaning that the distribution of data on respondent characteristics between the control group and the intervention group is homogeneous.

Table 2. Distribution Frequency Characteristics Respondents Based on Pregnancy Spacing

Variables	**Confounding Variables**						**P-Value***
	Control Group (PY)		**Intervention Group (PY+QR)**		**Total**		
	n	**%**	**n**	**%**	**n**	**%**	
2-10 years	37	86	40	93	77	89.5	0.291
<2Years and > 10years	6	14	3	7	9	10.5	

Note: Chi-Square Test, Abbreviations : PY = Prenatal Yoga, QR = Quran Recitation

In the table of respondent characteristics based on pregnancy distance, respondents with a pregnancy distance of 2-10 years dominated in the control group as many as 37 (86%) and the intervention group as many as 40 (93%). The p value of 0.291 indicates that the difference in the distribution of respondents' gestational distance between the control and intervention groups is not statistically significant. This means that pregnancy spacing had no effect on the control and intervention groups. This indicates that gestational distance does not interfere with the results of the study.

Table 3. Data Normality Test

Variables	*Kolmogorov smirnov*		*Shapiro Wilk*	
	Control Group (PY)	**Intervention Group (PY+QR)**	**Control Group (PY)**	**Intervention Group (PY+QR)**
Cortisol Levels	P-Value*	P-Value*	P-Value*	P-Value*
	0.008	0.200	0.007	0.025

Note : Kolmogorov-Smirnov Test, Abbreviations : PY = Prenatal Yoga, QR = Quran Recitation

Based on Table 3. Normality test of data with Kolmogorov-Smirnov test shows a value of p = 0.200 (p> 0.05), which indicates that the data of cortisol hormone levels are normally distributed in the intervention group, but in the control group the value of p = 0.08 (p < 0.05) which means that the data of cortisol hormone levels are not normally distributed so that the statistical test to be used is mann-whitney test.

Table 4. Effect of Prenatal Yoga and Quran Recitation on Hormone Levels Cortisol

Variables	**Cortisol Hormone Levels**				**P-Value***
	n	**Mean Rank**	**Median**	**Mean ± SD**	
Control Group (PY)	43	62.74	39.84	43.19 ± 26.22	< 0.000
Intervention Group (PY+QR)	43	24.26	9.35	9.61 ± 3.62	

Note: *mann-whitney test*, Abbreviations : PY = Prenatal Yoga, QR = Quran Recitation

Based on Table 4. the mean rank value in the control group (62.74) is higher than the intervention group (24.26), which indicates that the cortisol hormone levels in the control group are significantly higher than the intervention group. Although the cortisol level of the control group was higher than that of the intervention group, it was still within normal limits according to the examination using the ELISA kit. The significance value (p = 0.000), indicates that there is a significant difference in cortisol hormone levels between the control group and the intervention group (p < 0.05). Mean in the control group = 43.19, then the mean in the intervention grup = 9.61 thus, it can be concluded that there is an effect of prenatal yoga and Quran recitation on cortisol hormone levels.

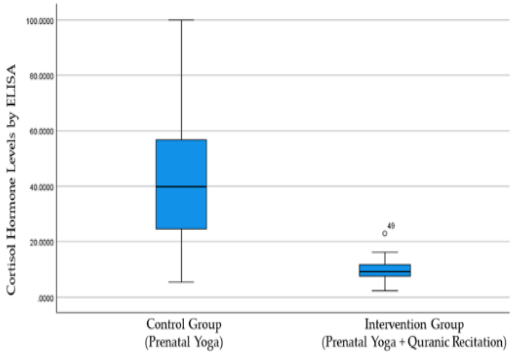

Figure 1. Differences in Hormone Levels Cortisol In Groups Control and Groups Intervention

Table 5.The Effect of Prenatal Yoga and Quran Recitation on Readiness Labor

Variables	Labor Readiness				Median	Mean ± SD	P-Value*
	Ready		Not Ready				
	n	%	n	%			
Control Group (PY)	35	81.4	8	18.6	2	1.81 ± 0.394	0.366
Intervention Group (PY+QR)	38	88.,4	5	11.6	2	1.88 ± 0.324	

Note: Chi-Square Test, Abbreviations : PY = Prenatal Yoga, QR = Quran Recitation

Based on the results of the Chi-Square test shown in table 5, the p value = 0.366 (p>0.05) means that there is no significant relationship between prenatal yoga and Quran recitation interventions with labor readiness. Because the p value is greater than 0.05, it can be concluded that prenatal yoga and Quran recitation interventions do not significantly affect labor readiness in this study sample.

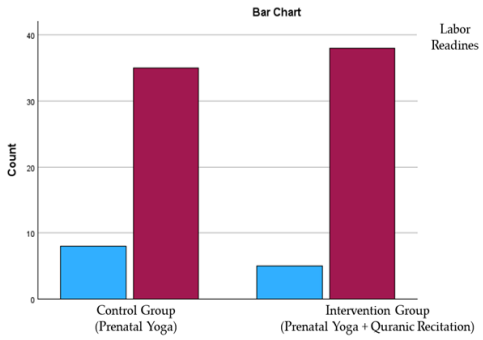

Figure 4.2 Difference in Labor Readiness in the Control Group and the Intervention Group

DISCUSSION

In this study, the demographics of respondents based on age, gestational age, education, parity and occupation showed a homogeneous distribution of data between the control group and the intervention group, thus reducing intervention bias.

This study examines the influence of pregnancy spacing on the control and intervention groups as one of the important characteristics of the respondents. Based on the respondent characteristics table, it was found that the majority of respondents in both groups had a pregnancy interval of 2 to 10 years. The results of the statistical test showed a p-value of 0.291. This p-value, which is greater than 0.05, indicates that there is no statistically significant difference between the control and intervention groups in terms of pregnancy distance. This means that the distribution of pregnancy distances in both groups is relatively balanced and does not affect the main outcomes of the study. This equivalence is important to ensure that the variable of pregnancy spacing does not become a confounding factor in comparing the effects of the given intervention. Based on research, a pregnancy interval of more than two years is associated with lower health risks for both the mother and the baby. Thus, the dominant characteristic of pregnancy spacing in this study serves as a protective factor that can contribute to more stable outcomes in intervention research [29].

The control group has a mean rank of 62.74, which is significantly greater than that of the intervention group, which has a mean rank of 24.26, according to the analysis results. This suggests that there was a substantial difference in the levels of cortisol hormone between the control and intervention groups. The ELISA kit examination results revealed that both groups' cortisol hormone levels were within normal ranges, despite the control group's higher cortisol hormone levels. Still, it is evident that there are distinct disparities between the two groups. The statistical test yielded a significance value of p = 0.000. This result indicates that there is a significant difference in the data, as it is less than 0.05 (p < 0.05). This research aligns with previous findings regarding the effects of listening to Quran recitation, which has been proven to significantly reduce stress levels in pregnant as prenatal yoga also have been proven to be effective strategies for reducing physiological stress, as

indicated by a decrease in cortisol hormone levels (30,31). Both approaches are consistent with research findings that show a positive impact on reducing stress in pregnant women (32).

This study aims to evaluate the effect of prenatal yoga and Quran recitation on the level of labor readiness. The results of the statistical test using bivariate analysis with the Chi-Square test show that the p-value = 0.366 ($p > 0.05$), which means there is no statistically significant difference between the control group and the intervention group in terms of labor readiness. In other words, prenatal yoga and Quran recitation do not have a significant impact on labor readiness according to this test result. Although these results do not show a significant difference, there are several factors that may influence labor readiness that might not be detected in this statistical test, such as stress levels, anxiety, or the overall physical and psychological condition of pregnant women. Prenatal yoga activities and listening to Quran recitation have been known to have benefits in reducing stress and anxiety during pregnancy, which can indirectly contribute to a sense of mental and physical readiness to face childbirth, although not significantly measurable in this study (33). Additionally, external factors such as social support, previous pregnancy experiences, and health conditions can affect the outcome (34). Therefore, although prenatal yoga and the recitation of the Quran are not directly related to labor readiness in this study, both can provide other immeasurable benefits through the analysis conducted (35). Although not highly measurable in this study, prenatal yoga exercises and listening to Quran recitation have been shown to help reduce stress and anxiety throughout pregnancy, which can potentially contribute to a sense of mental and physical preparation to face childbirth (36). The result can also be impacted by outside variables like health issues, prior pregnancy experiences, and social support. Thus, despite the fact that the study did not directly link prenatal yoga and Quran recitation to being ready for labor, both practices can offer additional enormous advantages based on the analysis that was done.

CONCLUSION

Based on the results of data analysis, this study showed that the combination of prenatal yoga and Qur'anic recitations significantly reduced cortisol hormone levels in pregnant women compared to the group that only did prenatal yoga. However, this intervention did not significantly affect labor readiness. These findings support the hypothesis that spiritual approaches can help reduce stress in pregnant women, although they were not shown to be directly related to labor readiness.

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AUTHORS' CONTRIBUTIONS

GR was responsible for the design of the experiments, data collection, and writing of most of the manuscript. MA, ANU, S, and MT performed statistical data analysis and revised the manuscript. MA, ANU, S, and MT provided valuable input on the interpretation of the results. All writers participated in the critical revision of the paper.

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