Original Article

Efficacy of Progressive Muscle Relaxation on Pregnancy Outcome among Anxious Indian Primi Mothers

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Abstract

Background: Progressive Muscle Relaxation (PMR) helps to improve the emotional state of antenatal mothers with stress and anxiety, which is necessary to keep the fetus healthy inside the womb. This study assesses the efficacy of progressive muscle repose on stress and anxiety among primigravidae. **Materials and Methods:** A randomized controlled study was conducted from May 2015 to June 2017 with 250 primigravidae. The women were assigned using a lottery method to intervention and control groups, 125 in each group. Information on background variables, pregnancy outcome, maternal complications, fetal complications, and postpartum depression was collected during the interval following delivery. PMR was the intervention (video) installed on one-to-one basis for two consecutive days. Pearson correlation, ANOVA, and regression analysis were used to evaluate the data to determine pregnancy outcome and performance of PMR. **Results:** There was a significant reduction ((F_3 = 24.81, $p < 0.001$) in all aspects of stress among the intervention and control groups during the posttest. The mean gestational age at birth was significantly different (F_2 = 6.08, p = 0.014) in the control group. There was significant increase in the occurrence of fetal complications such as birth asphyxia (F_2 = 5.67, $p < 0.050$), respiratory distress (F_2 = 8.68, $p < 0.050$), and jaundice (F_2 = 3.91, $p < 0.050$) in the control group. There was a negative correlation between PMR and stress (r = −0.22, $p < 0.001$), and PMR and state anxiety (r = −0.26, $p < 0.001$). There was an increased occurrence of maternal complications among the control group in comparison with the intervention group. **Conclusions:** The study suggests that PMR practice is useful during pregnancy to decrease stress, anxiety, and for reducing the occurrence of postpartum complications.

Keywords: *Anxiety, India, pregnancy outcome, progressive muscle relaxation, stress*

Introduction

Pregnancy and childbirth are momentous events in the life of every woman, which are surrounded by many positive values ranging from the enhancement of self-esteem to social approval. The physiological changes of pregnant women during pregnancy are the result of normal adaptations that a woman undergoes to better accommodate the embryo or fetus and ensure that the fetus grows properly and receives adequate nutrition.[1,2] Psychological changes also depend upon whether the pregnancy was planned or unplanned, wanted or unwanted, becoming pregnant after a long period or after medical intervention such as In Vitro Fertilization (IVF), changes in role, changes in relationships, fear of being a good parent, fear of problems associated with the pregnancy or the baby, fear of childbirth and lack of support, and being alone, the amount of help the couple expects to receive in raising the child, the type of relationship with the partner whether stable or transient and so on.[3,4] Cardiovascular and neuroendocrine factors play an important role in stress during pregnancy, and the length of physiological responses are found to be associated with the risk of depression, anxiety disorders, and diabetes. Stress and anxiety during pregnancy have exclusive implications on pregnant women's health, birth outcomes, and fetal development.[5]

The function of muscle relaxation is to de-stress the body and mind. Advantages of progressive muscle relaxation include lowering of blood pressure, muscle tension, level of anxiety, fatigue, and providing a sense of overall well-being.[6-8] The practice of progressive muscle relaxation assists in relieving muscle stress, greatly improves the overall feeling of well-being

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and, most importantly, reduces stress and anxiety during the pregnancy and makes the pregnancy a joyous one.[9] A progressive muscle relaxation technique is one of the simplest forms of relaxation techniques and might help to improve the emotional state of antenatal mothers experiencing stress and anxiety. Hence, helping antenatal mothers to practice this technique would help in reducing anxiety symptoms.

Keeping a conducive internal and external maternal environment is necessary to help the fetus get a healthy stay inside the womb. We evaluated the physical health of mother and fetus/newborn during pregnancy and assessed the effectiveness of progressive muscle relaxation on reducing maternal stress and anxiety among primigravidae at a selected hospital in Chennai.

Methods and Materials

It was a parallel randomized controlled study where a quantitative research design was used from May 2015 to June 2017 at the Department of Obstetrics and Gynecology, Sri Ramachandra Institute of Higher Education and Research.

The theoretical framework was Roy's adaptation model (1976) which considered a "systems" model developed specifically for the individual but also can be adapted to families and to communities.[10] The sample comprised 250 women equally distributed in the intervention and control groups, keeping the allocation ratio as 1:1. The sample size was determined by power analysis and effect size. Proportion in I group p1 = 0.10, proportion in II group p2 = 0.25, risk difference between p1 and p2, power (80%) = 80, alpha error = 5 %, Side (two tailed test)=2.

Low-risk primigravidae with 21-22 weeks of gestational age and planning to undergo delivery and postnatal care, having minimal to moderate stress, were included in this study. Each item was rated as never (0), almost never (1), sometimes (2), fairly often (3), and very often (4), and interpreted as minimal stress (1-25), mild (26-50), moderate (51-75), and severe (76-100) stress.

Primigravidae associated with medical and obstetrical complications, practicing any other relaxation technique, not willing to participate were excluded from the study. The control group primigravidae were requested to continue with the routine antenatal care, and the researcher completed the assessment at the same time intervals as that of the intervention group.

An extensive review of literature, discussions, and views of experts enhanced the development of the tool which had VII parts with sections. Part I-demographic variables; Part II-pregnancy-related stress based on Calvin Hobel scale for pregnancy; Part III-information for measuring state and trait form of anxiety based on the standardized State-Trait Anxiety Inventory (STAI) of Spielberger, C.D. It is a standardized tool and the original tool had established validity, the "r" obtained was 0.83. Part IV-data on pregnancy outcome; Part V-data on maternal complications obtained from medical records of the mother; Part VI-fetal/newborn complications; Part VII-Edinburgh Postnatal Depression Scale (EPDS) to assess postpartum depression. The original EPDS tool is an established tool tested for reliability using the test and retest method. This tool was validated by five experts and the "r" obtained was 0.87.

Participants' requirements are briefly described in Figure 1. After selection of the primigravidae, they were given information on the impact of stress and anxiety during pregnancy, meaning and benefits of progressive muscle relaxation. Along with the routine care, progressive muscle relaxation was taught by the researcher on one-to-one basis to the primigravidae from 21 to 22 weeks of gestation with the help of a video for two consecutive days, with each session lasting for 20-25 minutes. The routine was followed by the primigravidae in the following days. While giving training, the video was made of a researcher by the researcher himself and confirmed by a team of researchers. In progressive muscle relaxation, each muscle group such as arms, face, shoulder, upper, and lower extremities are tense for 10 seconds and released, taking a few deep breaths. It begins with the top of the body and goes down. The normal steps are tensing a particular body part muscles, squeezing them while holding the breath, and then releasing. To ensure daily practice, weekly reinforcement was given through phone; direct reinforcement was given during antenatal check and also, dairy of performance was maintained by the primigravidae. It was ensured that every day phone

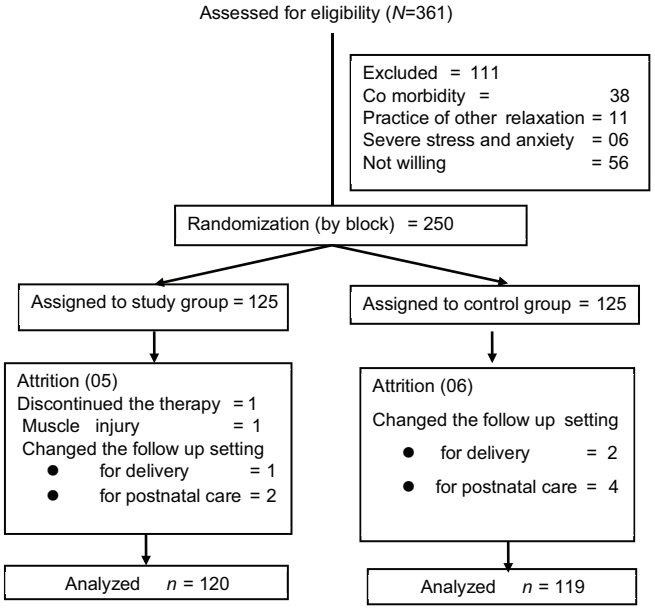

Figure 1: Flow chart of participants' recruitment

calls were made until the message was delivered. Data collection and follow-up are described in Figure 2.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS version 16). Pearson's correlation and ANOVA were used to identify the relationship between stress anxiety, pregnancy outcome, and the performance of progressive muscle relaxation. Chi-square test was used to find homogeneity between groups, and regression analysis evaluated the role of independent variables and dependent variables. In the analysis, a p value of < 0.05 and more was considered significant.

Ethical consideration

The study was approved by the Institutional Ethical Committee (IEC/NL/08/Dec/07/44) based on the Indian Council of Medical Research (ICMR) guidelines of biomedical research in human beings. Informed consent was obtained from the participants with the option to withdraw from the study at any time.

Results

Majority were in the age group of 25–29 years (intervention group 60 [48%]; control group 57 [45.60%]). It was seen that 37 (29.60%) in the intervention group and 35 (28.0%) in the control group had high school education, 63 (50.40%) of the intervention group and 59 (47.20%) of the control group were residing in suburban area, 72 (57.60%) in the intervention group and 68 (54.40%) in the control group belonged to nuclear families.

In the posttest, the groups exhibited significant difference for stress ($F_3 = 24.81$, $p < 0.001$) and overall anxiety ($F_3 = 19.80$ with $p < 0.001$). After the test, there was a significant reduction in state anxiety ($F_3 = 17.80$, $p < 0.001$) and trait anxiety ($F_3 = 18.60$, $p < 0.001$) between the intervention and control groups. There was a highly significant reduction in all aspects of stress among the intervention and control groups during posttest ($F_2 = 10.77$, $p < 0.001$) [Table 1].

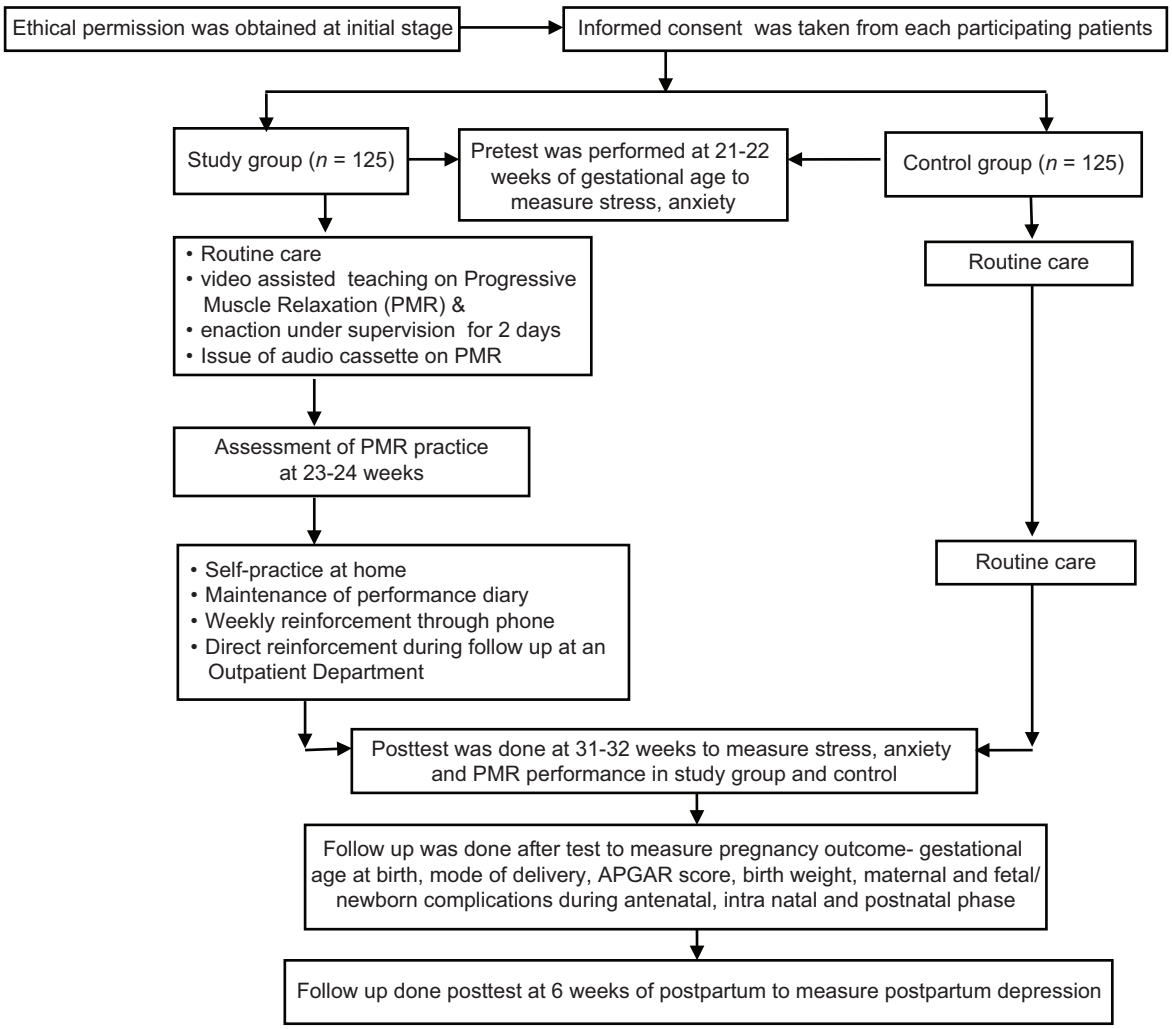

Figure 2: Data collection design and follow-up of study

Table 1: Stress and anxiety between the groups among primigravidae during pretest and posttest

Posttest	Stress				State Anxiety			
	No (%)		χ^2	*p*	No (%)		χ^2	*p*
	Intervention group	Control group			Intervention group	Control group		
Minimal	0 (0.00)	0 (0.00)	F_3=24.81	<0.001	0 (0.00)	0 (0.0)	F_3=17.80	<0.001
Mild	51 (41.60)	19 (15.20)			22 (17.90)	9 (7.20)		
Moderate	67 (54.40)	71 (56.80)			97 (78.90)	84 (67.20)		
Severe	5 (4.00)	35 (28.00)			4 (3.20)	32 (25.60)		
	Trait anxiety				Overall anxiety			
Minimal	0 (0.00)	0 (0.00)	F_3=18.60	<0.001	0 (0.00)	0 (0.00)	F_3=19.80	<0.001
Mild	24 (10.00)	10 (8.00)			26 (11.00)	11 (8.80)		
Moderate	95 (83.00)	83 (66.40)			93 (82.00)	82 (65.60)		
Severe	4 (3.00)	32 (25.60)			4 (32.00)	32 (25.60)		
	Different aspect of stress							
	Pretest				Posttest			
	Mean (SD)		Independent *t*	*p*	Mean (SD)		Independent *t*	*p*
	Intervention group	Control group			Intervention group	Control group		
Responsibilities	3.13 (0.77)	3.12 (0.77)	0.08	0.935	2.03 (0.77)	4.19 (0.81)	10.57	<0.001
Relationship	5.23 (1.64)	5.20 (1.67)	0.15	0.879	4.19 (1.64)	13.50 (3.03)	8.02	<0.001
Discomfort/illness	5.34 (0.87)	5.31 (0.91)	0.28	0.777	5.04 (0.87)	6.46 (1.13)	8.64	<0.001
Fetus	9.64 (2.38)	9.52 (2.37)	0.40	0.690	6.77 (2.43)	15.80 (2.89)	5.99	<0.001
Labor	16.78 (3.04)	16.07 (2.95)	1.85	0.065	14.17 (2.99)	22.03 (4.04)	6.34	<0.001
Newborn care	9.14 (2.17)	9.12 (2.18)	0.05	0.954	8.18 (2.20)	15.58 (2.27)	8.50	<0.001
Overall stress	49.47 (8.94)	48.38 (8.65)	0.97	0.329	40.52 (8.61)	77.56 (8.89)	10.76	<0.001

Intervention group (*n*=125); Control Group (*n*=125)

There was a statistically significant difference in gestational age at delivery between the groups ($F_2 = 6.08$, $p = 0.014$). Similarly, with regard to the mode of delivery, there was a statistically significant difference in the mode of delivery ($F_3 = 16.03$, $p < 0.001$). Birth weight of newborns between the groups revealed that 76 (62.30%) in the intervention group had a birth weight between 2.5–2.9 kg as against 56 (45.50%) in the control group, which was statistically significant ($F_2 = 27.34$ with $p < 0.001$). In the intervention group, the mean of gestational age at birth (weeks) was significantly different ($F_2 = 1.97$, $p < 0.042$). The mean birth weight for the intervention group was higher and statistically significant compared to the control group ($F_2 = 2.44$, $p = 0.004$). The mean (SD) score of postpartum depression was significantly less ($F_2 = 15.23$, $p < 0.001$) in the intervention group 6.90 (2.45) than the control group 10.54 (2.71) [Table 2].

An increased statistically significant occurrence of birth asphyxia ($F_2 = 5.67$, $p = 0.017$), neonatal jaundice ($F_2 = 3.91$, $p < 0.048$), and neonatal respiratory distress ($F_2 = 8.68$, p = 0.003) was observed [Table 3]. There was an increased occurrence of all maternal and fetal/neonatal complications among the control group in comparison with the intervention group. A statistically significant difference was found in the occurrence of pregnancy-induced hypertension (PIH) ($F_2 = 4.41$, $p = 0.037$), Gestational Diabetes Mellitus (GDM) ($F_2 = 4.35$, $p = 0.037$), induced labor ($F_2 = 5.50$, $p = 0.019$), delayed wound healing ($F_2 = 4.037$, $p = 0.015$), and anemia ($F_3 = 3.91$, $p = 0.048$) among the control group more than intervention group [Table 4]. All the participants followed core guidelines in both post-assessments I and II, and 92% participants in post-assessment I and 94% in post-assessment II followed core and prerequisite guidelines.

There was a strong negative correlation between PMR and stress (r = -0.22, $p < 0.001$), and PMR and state anxiety (r = -0.26, $p < 0.001$), and moderate negative correlation between PMR and postpartum depression (r = -0.20, $p = 0.008$), and PMR and trait anxiety (r = -0.19, $p = 0.037$) and moderate positive correlation between PMR and birth weight (r = 0.22, $p = 0.007$), and PMR and gestational age at birth (r = 0.19, $p < 0.033$) [Table 4].

The background variables had a linear relationship for the intervention group with pretest stress (R^2 value = 5.10%) and posttest stress (R^2 value = 3.60%), for the control group, this R^2 value was 6.80% and 4.10%, respectively. For state anxiety, R^2 value was 16.90% for the intervention group and the predictor's type of family and source of health information were strongly related to state anxiety. An estimated 16.30% of R^2 was calculated for intervention group liner combination on the seven background variables which were all strongly related to the pretest trait anxiety.

Table 2: Pregnancy outcome among primigravidae

	No (%)		χ^2	*p*
	Intervention group	**Control group**		
Gestational age at birth				
Before 37 weeks	14 (11.50)	25 (20.30)	F_2=6.08	0.01
After 37 weeks	108 (88.50)	98 (79.70)		
Mode of delivery				
Normal vaginal delivery	90 (74.20)	61 (49.60)	F_2=16.03	<0.001
Assisted vaginal delivery	5 (4.00)	12 (9.80)		
Caesarean section	27 (21.80)	50 (40.6)		
APGAR score				
0-3	0 (0.00)	3 (2.40)	F_2=5.49	0.06
4-6	2 (1.70)	10 (8.20)		
7-10	120 (98.30)	110 (89.40)		
Variables	**Mean (SD)**	**Mean (SD)**	**Independent *t***	***p***
Gestational age at birth (weeks)	38 (3.60)	37.2 (4.20)	1.97	0.04
APGAR score	8.3 (0.20)	8.00 (0.60)	0.36	0.19
Birth weight of newborn (kg)	2.71 (0.39)	2.59 (0.54)	2.44	0.00
Postpartum depression	6.9 (2.45)	10.54 (2.71)	15.23	<0.001
	No (%)		***t***	***p***
	Intervention group	**Control group**		
Birth weight (kg)				
<1.5	0 (0.00)	3 (2.30)	27.34	0.001
1.5-1.9	4 (3.30)	12 (10.40)		
2.0-2.4	8 (6.50)	29 (23.40)		
2.5-2.9	76 (62.30)	56 (45.40)		
3.0-3.4	32 (26.30)	17 (13.70)		
>3.5	2 (1.60)	6 (4.80)		
PPD	8 (7.00)	24 (20.00)		

Discussion

Pregnancy is a stage of huge physiopathological and psychosocial adaptation, often producing increased stress and anxiety.[11] The major focus of the intervention was to promote emotional well-being and reduce the level of stress and anxiety. The study findings were consistent with the those of the study done by Rondo *et al*. (2003) on the prevalence of stress and distress during pregnancy, which varied from 22.10 to 52.90% at Brazil[12]; in Washington, 78% of women had low-moderate and 6% had high stress during pregnancy.[13] An earlier study by Dumas *et al*. (2005) showed that stress was progressively worse over time; women in rural areas were less likely to develop stress during pregnancy.[14] There was a highly significant reduction in the mean difference of stress between the intervention and control groups at the level of $p < 0.001$. After each day of practice of PMR, the primigravidae verbalized that they "felt refreshed and relaxed," "all their fear and tension had drained from the body," and "it is energizing and creating confidence." These findings were consistent with Nasreen *et al*.'s study on the prevalence of Antepartum Depressive (ADS) and Anxiety Symptoms (AAS), which showed the prevalence of ADS and AAS to be 18% and 29%, respectively.[15] Faisal *et al*. (2007) found that the prevalence of antenatal anxiety state and trait were 59.5 (95 CI%: 54.8-64.1%) and 45.30% (95% CI: 40.6-50.0), respectively.[16]

PMR had a considerable effect and this supports the earlier study by Nasreen *et al*. (2011) which showed a significant difference during the posttest ($p < 0.001$).[15] Study of Lee *et al*. (2012) identified that antenatal anxiety and depression were prevalent and cause serious problems with changing courses.[17] As per Vieten and Astin (2008), an eight-week mindfulness-based intervention during pregnancy significantly reduced anxiety (effect size, 0.89, $p < 0.05$) and negative affect (effect size, 0.83, $p < 0.05$) among the receivers, compared to those who did not receive the intervention.[18]

A statistical significant ($p < 0.05$) difference at gestational age of delivery was indicated between the intervention and control groups, which was consistent with Glynn *et al*.'s study (2008) on the pattern of prenatal stress and Preterm Delivery (PTD) among pregnant women; the majority of women who delivered at term exhibited decline in stress and anxiety.[19] The mean birth weight of the newborn had a 120 gm difference, which was statistically significant at $p < 0.01$. Marci *et al*. (2008) have reported that pregnancy-specific stress and birth outcomes contributed directly to PTD and indirectly to low birth weight. Pregnancy-specific stress may be a

Table 3: Maternal and fetus/newborn complications among primigravidae

Maternal complications among primigravidae					Fetus/newborn complications among primigravidae				
Complications	**No (%)**		χ^2	*p*	**Complications**	**No (%)**		χ^2	*p*
	Intervention group *n*=122	**Control group *n*=123**				**Intervention group *n*=122**	**Control group *n*=123**		
Pregnancy-induced hypertension					Intrauterine growth retardation				
Yes	4 (3.00)	12 (10.00)	F_2=4.41	0.037	Yes	3 (4.00)	7 (6.00)	F_2=0.37	0.544
No	118 (97)	111 (90)			No	119 (96.00)	116 (94.00)		
Gestational diabetes mellitus					Fetal distress				
Yes	4 (3.00)	11 (10.00)	F_2=4.35	0.037	Yes	6 (4.80)	13 (11.00)	F_2=2.86	0.09
No	118 (97.00)	112 (90.00)			No	116 (95.00)	110 (89.00)		
Abruption of placenta			F_2=1.35	0.246	Birth asphyxia				
Yes	2 (2.00)	5 (4.00)			Yes	2 (1.60)	10 (8.00)	F_2=5.67	0.017
No	120 (98.00)	118 (96.00)			No	120 (98.00)	113 (92.00)		
Anemia					Hypoglycemia				
Yes	5 (4.00)	13 (11.00)	F_2=3.91	0.048	Yes	1 (2.40)	12 (10.00)	F_2=2.83	0.076
No	117 (96.00)	110 (89.00)			No	121 (98.00)	111 (90.00)		
Antepartum hemorrhage/shock					Respiratory distress				
Yes	2 (2.00)	6 (5)	F_2=2.10	0.147	Yes	2 (1.60)	13 (11.00)	F_2=8.68	0.003
No	120 (98.00)	117 (95.00)			No	120 (98.00)	110 (89.00)		
Premature rupture of membrane					Jaundice				
Yes	4 (3.00)	5 (4.00)	F_2=0.12	0.725	Yes	5 (4.00)	13 (11.00)	F_2=3.91	0.048
No	118 (97.00)	118 (96.00)			No	117 (96.00)	110 (89.00)		
Preterm Premature rupture of membrane					Seizure				
Yes	2 (2.00)	6 (5.00)	F_2=2.10	0.147	Yes	0 (0.00)	9 (8.00)	F_2=2.93	0.081
No	120 (98.00)	117 (95.00)			No	122 (100.00)	113 (92.00)		
Induced labor					Birth injuries				
Yes	11 (9.00)	23 (20.00)	F_2=5.50	0.019	Yes	1 (0.80)	4 (3.00)	F_2=1.86	0.172
No	111 (91.00)	100 (80.00)			No	121 (99.00)	119 (97.00)		
Prolonged labor					Neonatal death				
Yes	6 (5.00)	12 (10.00)	F_2=2.21	0.137	Yes	0 (0.00)	2 (2.00)	F_2=2.06	0.080
No	116 (95.00)	111 (90)			No	122 (100.00)	121 (98.00)		
Obstructed labor									
Yes	1 (1.00)	5 (9.00)	F_2=3.54	0.060					
No	121 (99.00)	118 (91.00)							
Reproductive tract injury									
Yes	5 (1.00)	5 (12.00)	F_2=4.30	0.078					
No	118 (99.00)	108 (88.00)							
Wound healing									
Yes	2 (3.00)	9 (7.00)	F_2=4.07	0.0150					
No	120 (97.00)	114 (93.00)							
Postpartum hemorrhage									
Yes	1 (1.00)	7 (6.00)	F_2=0.37	0.544					
No	121 (99.00)	116 (94.00)							

more powerful contributor to birth outcomes than general stress.[20] Pregnancy outcomes of the subjects indicate a statistically significant difference at gestational age at delivery and in the mode of delivery between the study and control groups. Intrapartum fetal monitoring, early detection, and management of fetal distress prevented the newborn suffering from birth asphyxia. The findings contradict the study done by Rondó *et al*. 2003 on social

Table 4: Correlation among PMR and stress, state anxiety and trait anxiety

Variable	*r*	*p*
PMR and stress	−0.22	<0.001
PMR and state anxiety	−0.26	<0.001
PMR and trait anxiety	−0.19	0.037
PMR and gestational age at birth	0.19	0.033
PMR and birth weight	0.22	0.007
PMR and postpartum depression	−0.20	0.008

PMR: Progressive Muscle Relaxation

and psychological stress factors which influence pregnancy outcomes such as birth weight, gestational age; 1 and 5 minutes APGAR scores confirmed that life events stress accounted for significant variation in both 1 and 5 minutes APGAR scores, birth weight, gestational age at birth.[21]

A statistically significant difference was found in the occurrence of PIH, GDM, induced labor, and wound healing, and these findings are supported by the study of Leeners *et al*. (2007) which state the risk for Hypertensive Diseases In Pregnancy (HDP) which was associated with a 1.6-fold increased risk for HDP. Psychosocial interventions to reduce emotional stress during pregnancy may help to decrease the risk to develop HDP.[22] Another study on the anxiety levels of women diagnosed with GDM and compared with Glucose-Tolerant (GT) women revealed that women with GDM, compared with GT women, had a higher level of anxiety (state rather than trait) at the time of the first assessment.[23] There was a positive correlation between stress and state anxiety, trait anxiety, and postpartum depression, and negative correlation between stress and gestational age at birth and birth weight. Correlation among PMR and stress, state anxiety, and trait anxiety of primigravidae in the study during assessment II showed there was a strong negative correlation between PMR and stress and PMR and state anxiety at $p < 0.001$.

Since psychological distress is associated with adverse pregnancy outcomes, the findings raise the possibility that the benefits of progressive muscle relaxation might be clinically meaningful. Some of the implications derived from this study could be applied in various fields such as practice, education, administration, and research. Studies may be replicated in other settings, especially community areas, and biochemical markers can be used to assess stress and anxiety on the efficacy of the intervention. According to Sr. Callista L. Roy's adaptation model theory, individuals are biopsychosocial beings in constant interaction with a changing environment, and they need to cope with stimuli from the internal and external environments.[24] Thus this study supports the theoretical concept that by simple, cost-effective intervention, we can modify the stimuli and bring a positive internal environment for the primigravidae.

A limitation of this study was that participants were limited to low-risk primigravidae at 21–22 weeks of gestational age. Hence, the extension of the present results to a more diverse group of women, including high-risk pregnant women, is not appropriate. The researcher had no control over pregnancy outcomes as they could be influenced by various other factors such as nutritional and familial factors. Measurement of the psychological components is complex and very difficult, yet the baseline values for anxiety and postpartum depression among the participants were all above the population-based mean, thus confirming that this population also was, in fact, distressed.

Conclusion

The study suggests that progressive muscle relaxation practice is useful during pregnancy to decrease stress, anxiety, and in improving pregnancy outcomes in terms of gestational age at birth, mode of delivery, birth weight, and reducing the occurrence of postpartum complications.

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Conflict of interest

Nothing to declare.

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