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Indian Journal of Obstetrics and Gynecology Research

Journal homepage: www.ijogr.org

Original Research Article

Effects of Antenatal exercise on childbirth experience

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Abstract

Background: Researchers worldwide are proving that exercise is safe and beneficial in pregnancy. Structured physical activity prepares the body for childbirth and helps reduce interventions.
Materials and Methods: One hundred eight women booked for antenatal care participated in a comparative study involving a ten week program designed by the Physiotherapy Department. Entry was at 24-27 weeks gestation with three physical sessions once in three weeks, interspersed with seven virtual weekly sessions. Minimum three home sessions/week were mandatory. Women fulfilling inclusion criteria were divided into two groups based on acceptance to join. Outcomes studied included mode of birth, requirement of analgesia, need for episiotomy, back/pelvic pain, maternal exertion during labour, preterm births and neonatal outcomes.
Results: 46.3% mothers had spontaneous vaginal births in exercise group vs 24% in control. Elective Caesarean for maternal request was more in control group. Mean weight gain was 9.33kg in study group and 12.51kg in control. Incidence of back pain was 18% in exercise group compared to 72% in controls. 64% in exercise group took epidural analgesia vs 84% in control group. Maternal exertion perceived in labour was comparatively less in exercise group. Episiotomy rates in spontaneous births in exercise group was 8% vs 30.77% in controls.
Conclusion: Women practicing regular antenatal exercises had significantly lower rates of maternal request Caesarean Sections, comparable newborn weight, lower weight gain and perception of back pain/discomfort, less maternal exhaustion during labour and reduced need for episiotomy. Pregnant women should be active and follow a supervised exercise program.

Keywords: Exercise, Pregnancy, Childbirth, Interventions.

Received: 18-04-2024; **Accepted:** 17-10-2024; **Available Online**: 28-05-2025

1. Introduction

India, like other developing countries, is undergoing rapid urbanisation and with it changes in lifestyle among urban population. Almost 60% of pregnant women in rural India work right until the day of delivery, but in the urban setup, only 10.7% of pregnant women achieve recommended level of physical activity during pregnancy. This may be associated with an increase in medical complications like gestational diabetes, gestational hypertension, and an increased incidence of caesarean section.

Pregnancy not only gives a woman's physiological function a greater shift, it is also a special stage where lifestyle behaviours including physical activity, can significantly affect maternal and foetal health.[1] Pregnancy and labour entail complex happenings that are different with each mother. Preparing the body and mind for birth in the antenatal period is traditionally not concentrated upon much by obstetricians. Structured physical activity, in fact, prepares the body for the above and simultaneously decreases the incidence of many medical complications in pregnancy.

Pregnant women require a safe, effective and productive way to improve or maintain muscular and cardiovascular strength and endurance throughout their pregnancy. Their bodies may thus be able to face the increasing physical demands of pregnancy in a more comfortable way.

Prescribed activity allows their bodies to compensate for the anterior shift in the centre of gravity as term approaches. This shift, if not compensated for, causes biomechanical

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https://doi.org/10.18231/j.ijogr.2025.042

abnormalities that usually cause physical discomfort and need activity limitations. The effects of aerobic exercise during pregnancy are increasingly being studied in the literature. However, the cardiovascular component is simply one of the elements influencing prenatal, natal, and postpartum function. Equally crucial is the neuromuscular component, which has been largely overlooked throughout pregnancy for a variety of reasons.[2]

Variables in exercise protocol included intensity, duration and type of exercise, temperature and humidity of the exercise environment and diet. It is important that the training is supervised because pregnant women are generally unaware of what factors elevate the catecholamine response to exercise and foetal hypoxia is a realistic concern.[2]

Despite the benefits of exercise in pregnancy supported by the most updated guidelines, the physical exercise program adherence revealed itself as a limitation and as a significant challenge in many randomised control trials (RCT).[3] Nevertheless, the loss to follow-up seems to be higher and adherence to the intervention was lower for unsupervised versus supervised group exercise.[4]

Keeping this in mind, this study was designed to assess the effect of a structured physical activity regime supervised by trained professionals on low risk nulliparous women. We included low risk pregnant women who were willing to join and offered them the structured exercise program.

2. Aims and Objectives

1. Primary objective: To compare the effects of antenatal exercises on mode of delivery, need for episiotomy and analgesia during labour, gestational weight gain, incidence of back pain during antenatal period and maternal exertion perceived during labour.
2. Secondary objective: To assess the impact of antenatal exercises on incidence of preterm birth and neonatal outcome.

3. Materials and Methods

This study was conducted in a tertiary care hospital in an urban area of Hyderabad. Out of one hundred twenty one mothers who consented for the study, thirteen mothers had to be withdrawn as they missed more than two sessions in the exercise program. Institutional ethical committee clearance was obtained prior to the start of the study.

3.1. Inclusion criteria

1. Age group:18-40 yrs
2. Nulliparous women –singleton pregnancy
3. BMI : 18 – 34.9
4. Gestational age 24 -27 weeks
5. No physical or mental disability preventing participation in the antenatal exercise programme.

3.2. Exclusion criteria

1. Pre-existing diabetes / hypertension/ Cardiac diseases
2. Prior experience of attending regular exercise / yoga classes
3. Abnormal foetus / Early onset foetal growth restriction
4. Indications for elective caesarean section

3.3. Withdrawal criteria

1. Absence for more than two sessions
2. Subjective lack of cooperation with home sessions.

A written and informed consent was taken from patients participating in the study. Data collection was done using a structured proforma.

After taking consent they were divided into two groups based on their consent to join the program. Women were recruited into study at 24-27 weeks after preliminary history and clinical examination, nutrition counselling and screening oral glucose tolerance test. Mothers were divided into two groups Exercise group and control group. A total of one hundred and eight mothers were included in the final study, fifty-four in each group.

Exercise group mothers were offered a ten week exercise program devised by the Physiotherapy Department, which had three physical visits and seven virtual visits. The first session was a physical visit with the Physiotherapist in which a one set of exercises was taught. Next three weeks were virtual sessions with stipulated exercises added each week. The fifth week was a physical visit followed by three more virtual visits. Ninth week was again a physical visit and the program ended with a virtual visit.

It was mandatory for mothers to practice these exercises at home at least 4 days /week till 37 weeks. Weekly follow up was done through phone calls by the primary investigator. Along with exercises, in these sessions mothers were also educated about different aspects of pregnancy, labour, positions during labour, pain relief methods, immediate child care and breastfeeding.

Various outcomes were compared between the exercise and control groups. These included mode of delivery, duration of second stage of labour, need for epidural analgesia, need for induction and neonatal outcomes.

The tools used during this study were

1. Visual analogue scale[5]

   Mothers were asked to label the degree of pain on the scale of ten in VAS chart.

2. BORG scale on 1st postnatal day[6]

For exertion during labour as perceived by the women (**Figure 1**)

Figure 1: BORG scale

Table 1: Exercise schedule followed during study

1	**2**	**3**	**4**	**5**
Shoulder press	Chest press	Dynamic hug	Bilateral Rotations	All 4s hand raises
Rowing	V arm lifts	Shoulder level rowing	Bilateral shoulder extension	Bruggers
T.A activation	Diaphragmatic breathing	Breath stacking	Paced breathing practice	Transitional breathing
Fast Kegels	Slow Kegels	Elevator Kegels	Midline labia	Isolating splinters
VMO activation	Sitting knee extensions	Mini Squat	Side walk mini squat	Reverse plank
Supine Pelvic tilts	Sitting Pelvic tilts	Hip circles	Drop the hip- smiling hip with mini squat	Figure of 8
Side clamp	Ball lean side leg raises	Bridging	All 4s leg lifts	Bird Dog
Sitting side stretch	Sitting Cat and camel	Cat- Camel	All 4s Physio ball rolls	All 4s upper body rotations
Chest stretch	Chest opener with opp arm	Sitting Twists	Windmill	Forward wall stretch
Neck stretch	Levator stretch	Posterior capsule Shoulder stretch	Triceps stretch	Neural glides
6	**7**	**8**	**9**	**10**
Triceps extension	Sitting windmill	Wall push ups	All 4s Lunges- Side and Forward	Standing Pelvic tilts
Sitting windmill	Drop the hip- smiling hip- hip mobility	Standing Pelvic tilts	Pelvic floor opener (with ball)	Standing lean forward options
Abdominal sifting	Rebozo squat	Pelvic Rocking	Double hip squeeze with rebozo	All 4s feet out options
Isolating splinter and gleutals	Elevator Kegels	Isolating the splinters	Zipping up and zipping down	Kneeling options

Table 1 continued…				
Standing forward lunges	Camel walks	Elephant walks	Charlie Chaplin walks	Reclined sitting options/peanut ball
Cradling the leg	Side lying Release	Sitting Butterfly – Stirring the pot	Long Sitting - Stirring the pot	Ball Options
Calf Stretch	Hamstring stretch	Forward wall stretch	Standing side wall stretch	Side lying peanut ball/pillows
Windmill	Piriformis Stretch	Tailbone writing	Shake the apple tree	Squatting options
Breath work Practice with pelvic relaxation	Breath work Practice with pelvic relaxation	Breath work Practice with pelvic relaxation	Breath work Practice with pelvic relaxation	Breath work Practice with pelvic relaxation
Progressive muscle relaxation	Progressive muscle relaxation	Progressive muscle relaxation	Progressive muscle relaxation	Progressive muscle relaxation

4. Results

This study was done in 108 mothers and relevant outcomes were investigated.

4.1. Mode of delivery

In total, 46% of subjects in the exercise group had a spontaneous vaginal delivery compared to 24% of the subjects in the control group ($p < 0.05$). The Caesarean section rate was 26% in the exercise group compared to 28% in the control group.

Elective caesarean rate for maternal request is significantly more in control group (18%) compared to exercise group (1%). (**Figure 2**)

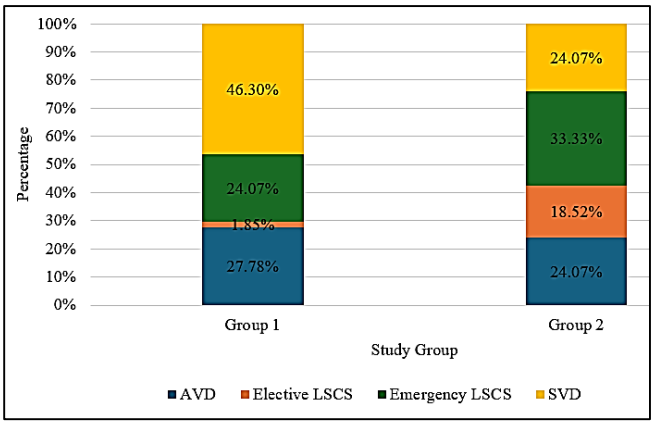

Figure 2:

4.2. Need for epidural analgesia during labour

The need for epidural analgesia in labour was studied. 84% of mothers in Control group needed epidural during labour compared to 64% in Exercise group, which is statistically significant with *p value <0.05.* (**Figure 3**)

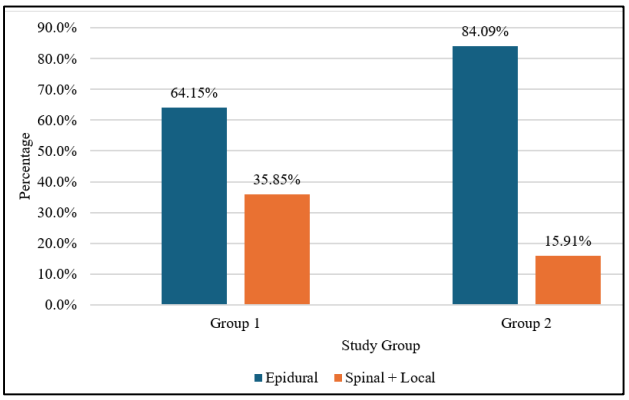

Figure 3:

4.3. Need for episiotomy

Need for episiotomy was calculated in all spontaneous vaginal deliveries. Only 8% of mothers in exercise group compared to 30% in the control group required episiotomy. Perineal warm compress at crowning of foetal head and restricted episiotomy with documented indications are followed as Institute policy.

4.4. Back pain during antenatal period

There was significant change in back pain as experienced by women during antenatal period.

Only 18% mothers in exercise group experienced Back pain compared to 39% in control group. The pain was scored on a visual analogue scale by mothers in which 92% mothers in Exercise group had less severe pain (VAS</= 7) as compared to 33% in Control group (*p value <0.05).*

4.5. Gestational weight gain

The mean weight gain in the Exercise group is 9.33 kg and in control group is 12.51 kg. (*p value <0.05*). So, mothers in the Exercise group gained significantly less weight during pregnancy.

4.6. Maternal exertion perceived during labour

Maternal exertion as perceived by the woman was scored by a BORGs scale which included light, hard and very hard components. Mothers who perceived exertion of labour as very hard was 5% in Exercise Group and 18% in Control group. (*p value 0.05*).

Table 2: Comparison of variables in study and control groups

Variables	Exercise group	Control group	P value
Back pain during Antenatal			
Yes	10(18.52)	39(72.22)	<0.001
No	44(81.48)	15(27.78)	
VAS score < 7	50(92.59)	33(61.11)	<0.001
VAS score >7	4(7.41)	21(38.89)	
Need for Episiotomy (SVD)			
Yes	2(8)	4(30.77)	0.154
No	23(92)	9(69.23)	
Gestational weight gain			
	9.33	12.51	<0.001
Maternal exertion perceived during labour (BORG scale)			
Light (<12)	13(24.53)	5(11.63)	0.107
Hard (12-16)	37(69.81)	30(69.77)	0.996
Very Hard (>16)	3(5.66)	8(18.60)	0.059

Other factors studied like preterm labour, Apgar scores at 1 and 5 minutes, baby birth weight and breast feeding rates within 1hr of birth were similar and did not show any statistical difference in both groups.

Table 3: Comparison of neonatal variables in study and control groups

Variables	Exercise Group	Control Group	P value
Preterm			
Yes	2 (3.70%)	2 (3.70%)	1.00
No	52 (96.3%)	52 (96.3%)	
APGAR score			
Apgar at 1 minute	9.00(8.0 to 9.0)	8.00(8.0 to 9.0)	0.0475
Apgar at 5 minute	9.00(9.0 to 9.0)	9.00(9.0 to 9.0)	0.2486
Baby weight (in kg)	2.94 ± 0.40	2.96 ± 0.45	0.8383
Breast feeding rates within 1 hour of birth			
Yes	50 (92.59%)	46 (85.19%)	0.2207
No	4 (7.41%)	8 (14.81%)	

5. Discussion

Physical activity is not a routine part of a pregnant woman's lifestyle in urban India. It is seen more as implementary rather than a way of life. This study is a step towards healthy pregnancy outcomes by formulating a structured regime for antenatal exercises in pregnancy. This study indicated that physical activity improves maternal and foetal health, which is consistent with existing literature. The intervention group had better control over maternal weight gain, fewer caesarean deliveries at maternal request and improved quality of birth experience.

The study was conducted in an urban tertiary care centre with mothers who belong to upper socio-economic status with moderate to sedentary lifestyle.

The exercise regime was designed by the physiotherapy department and included mothers who were low risk nulliparas with singleton pregnancies and excluded pre-existing hypertension, mothers detected to have gestational diabetes by oral glucose tolerance test done at 24 weeks, any indications for elective caesarean section and fetal anomalies/ early onset fetal growth restriction

Recruited mothers practised these exercises as per the program.

The primary outcomes studied were

1. Mode of birth (Vaginal birth or caesarean section), Requirement of labour analgesia, need for episiotomy, back pain/pelvic pain (VAS) during antenatal period, gestational weight gain, maternal exertion perceived during labour{Borg scale}.

Secondary outcomes are

1. Neonatal APGAR and birth weight, Preterm birth.

5.1. Mode of delivery

In this study, the incidence of spontaneous vaginal births was 46.3% in exercise group compared to 24.07% in the control group ($p<0.05$) which was statistically significant. A structured program for physical activity in pregnancy seemed to have improved the success of rates of vaginal births, which emphasized the importance of inculcating changes in the lifestyle of pregnant women in our population.

Incidence of emergency caesarean sections was 24.07% in exercise group and 33.33% in control group.

Interestingly in our study, elective caesarean section for maternal request was significantly higher in the control group (18% compared to 1.8% in the exercise group). This was probably because the mothers who regularly exercised were better motivated and less apprehensive about labour than control group.

In the study conducted by Barakat et al, the percentages of caesarean and instrumental deliveries in the exercise group were lower than in the control group ($p = 0.03$).[7] In a study conducted by Wadhwa et al, total 63% of subjects in the

exercise group delivered vaginally compared to 5% of the subjects in the control group ($p < 0.05$).[8]

The results of our study were consistent with the above studies.

5.2. Need for episiotomy

Our study showed that the incidence of episiotomy in spontaneous vaginal births was less in exercise group compared to control group (8% vs 30%). Although there was no statistical significance, the numbers were encouragingly low in the exercise group.

Study done by Silva Jose C showed significant differences in the percentage of episiotomies, lower episiotomy rate in the intervention group compared to the Control group (p =0.031).[9] In another study done by Rodriguez-Blanque R et al the women in the Exercise group had a greater rate of intact perineum than those in the Control group (odds ratio [OR] 13.54).[10]

5.3. Incidence of back pain

The frequency of back discomfort among pregnant women has been found to be as high as 49%.[11] This pain restricts women from performing daily tasks and being physically active.[12]

In our study, only 18.52% women experienced back pain in Exercise group compared to 72.22% in Control group. The visual analogue scale (VAS) was used to assess back pain throughout pregnancy and self-perceived pain during labour. The subjects were asked to rate their worst pain on a scale of 0 to 10, with zero representing no pain and ten representing the most severe pain possible. The overall self-perceived pain intensity was considerably lower in the exercise group. VAS score above seven in the Exercise Group was experienced only by 7.4% women as compared to 38.8% women in the control group.

In a study done by Garshasbi A et al, in the exercise group 73 women (68%) and in the control group 78 women (70.5%) experienced some kind of low back pain during pregnancy before doing exercises. Intensity of low back pain in the exercise group before and after exercise was significantly decreased, but in the control group, it was increased,[13] This complements our findings that exercising during pregnancy can help minimise the severity of back pain. In the study done by Wadhwa et al, the mean score of the worst pain on the VAS was significantly lower in the exercise group (6.5 points) compared with the control group (8.0 points) ($p < 0.05$).[8]

5.4. Requirement of analgesia

Pain management during labour is a special challenge. To relieve labour pain, analgesics may be used and potential for adverse side effects must be monitored. For example, epidural analgesia can result in prolongation of second stage of labour, foetal malrotation and increased chances of assisted birth.[14] It is in the best interests of patients and healthcare practitioners to offer a multi-convergent approach that incorporates both pharmaceutical and non-pharmacological techniques for pain relief in labour.

In our study, although most of the mothers from either group required labour analgesia, only 64.15% requested for epidural analgesia in exercise group compared to 84.09% in the control group, which is statistically significant. (*p value* 0.027)

In the study done by Baciuk E et al, labour analgesia was requested by significantly fewer women in the water aerobics group (27% vs 65%).[15] In a study done by Melzer K, there is no significant difference in both groups, but the study is of smaller sample size.[16]

5.5. Gestational weight gain

Gestational weight gain occurs because of maternal tissue accretion, fluid expansion and the growth of the foetus and placenta. Gestational weight increase is vital for the health of a foetus, although it should be regulated.[17] Excessive weight gain raises the risk of gestational diabetes, hypertension and preeclampsia. In the study done by L R Sagedal et al,[18] lifestyle changes like nutritional modifications and weekly twice exercise program did not show any significant difference in weight gain in both groups.

Our study found that the mean gestational weight gain in Exercise group was 9.33 kg whereas it was 12.51 kg in control group, which was statistically significant. (*p value <0.001)*

5.6. Maternal exertion perceived during labour

A pregnant woman who understands the mechanics of labour and the physiological processes involved, is less likely to become tense and fearful through labour. This may bring about a reduction in her perception of labour discomfort. Childbirth preparation programmes can teach women how to regulate their pain during labour. This in turn can help with their perception of exertion in labour.[14]

In our study, maternal exertion as experienced by the women during labour was evaluated by Borg scale. Most of the mothers from either group perceived labour as hard or very hard, but the percentage of mothers who identified labour as very hard were more in control group-5% in Exercise group vs 18% in Control group (*p value 0.05*) which was statistically significant.

The results of our study were homogenous with the study done by Songporn Chuntharapata where the experimental group was found to have higher levels of maternal comfort during labour.[19]

5.7. Baby birth weight

In our study, there was not much difference in mean birth weight of babies in both groups, which was correlating with the results of the study done by Barakat et al in which neither maternal characteristics nor newborn characteristics differed between groups (all P>0.1).[20]

But in the study done by Hall D et al, data indicated that birth weights were approximately 150 gm higher for babies of women in the high-exercise group than for babies of control mothers.[2]

5.8. APGAR scores

In our study, there was no significant difference in APGAR scores in both groups which was correlating with the research done by Barakat et al where. Apgar scores at 1 and 5 min did not differ between groups and ranged within the upper scores, indicative of good prognosis for newborn.[20] In the study done by Hall D et al, babies of high-exercise mothers had slightly higher 1 minute Apgar scores (mean 8.9) than babies of mothers in the control group (8.6), low-exercise group (8.8), and medium-exercise group (8.7) ($p < 0.05$).[21] The mean 5-minute Apgar scores for babies of mothers in the high-exercise group were also slightly higher than those for babies of mothers in the control and medium exercise groups, that is, 9.6 versus 9.3 and 9.1 ($p < 0.05$).[2]

In our study, there was no significant difference in preterm birth in both groups, 2 mothers delivered preterm in either group following preterm rupture of membranes. All babies were breast fed in the 1st hour. Very few studies were done on incidence of preterm birth.

6. Limitations

1. Some of the mothers couldn't adhere to the exercise program despite rigorous follow up. Weekly telephonic calls were done by the primary investigator to follow all up the mothers.
2. Thirteen mothers had to be withdrawn from the study because they missed two or more sessions.
3. Qualitative assessment of the exercise sessions at home could not be done. This constraint resulted in difficulties in measuring the effectiveness of home sessions and the inability to evaluate its influence on pregnancy progression.
4. This study was done in a small group of low-risk mothers. Further studies have to be done in larger groups and mothers with risk factors.

7. Conclusions

According to the findings of this study, regular antenatal exercises can help to lower the rate of Caesarean section at maternal request, decrease maternal weight gain, decrease perception of pain and overall discomfort during labour, reduce back pain throughout pregnancy and decrease the need for epidural analgesia during labour.

Although there was no statistical difference, the number of mothers requiring episiotomy in spontaneous vaginal birth are less in exercise group.

The incidence of gestational hypertension and gestational diabetes was similar in both groups, this could probably be attributed to universal screening at 24 weeks and inclusion of only low risk nulliparas in this study.

Neonatal outcomes such as mean baby birth weight and APGAR scores did not show significant differences in both groups.

These findings suggest that pregnant women should be physically active during their pregnancy and participate in a supervised fitness programmes, unless contraindicated. To corroborate the reported findings, large-scale prospective research is required. The data suggests that obstetricians should advise every pregnant woman regarding the benefits of a supervised exercise program and incorporate structured activity into the antenatal journey.

Because each woman has a unique set of modifying factors, individualization of exercise prescription is crucial. Aside from her physiological needs, the woman's medical history, occupational and leisure interests, budgetary and time limits and psychological attitudes towards exercise must all be considered.

The physical changes of pregnancy are progressive, hence the obstetrician must reevaluate the exercise prescription at frequent intervals throughout the pregnancy.[2]

A woman's birth experience is an important aspect of her pregnancy journey, providing positivity and better understanding and support of physiological changes through a structured program can go a long way in reducing unindicated interventions.

8. Source of Funding

None.

9. Conflict of Interest

None.

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Cite this article: Satyala SP, Chandran JB, Balasundaram L, Bikumala P. Effects of Antenatal exercise on childbirth experience. *Indian J Obstet Gynecol Res*. 2025;12(2):235–242.