International Journal of EXERCISE SCIENCE

Original Research

Influence of Physical Activity Including Squat Exposure on Trunk Muscle Strength and Labour Outcome in Pregnant Women

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ABSTRACT

International Journal of Exercise Science 17(1): 504-516, 2024. Daily living physical activities of rural pregnant women, across most continents in the world, involve adoption of high-flexion postures like deep-squat. Deep-squat elicits substantial activation of major trunk and lower extremity muscles. Adequate strength of trunk muscles is known to facilitate forward-downward propulsion of baby during labour. Therefore, current study aimed to explore influence of overall physical activity including squat exposure on trunk and lower-extremity muscle strength and labour outcomes in rural and urban primigravida women. Twenty-eight primi-gravida women were stratified into 2 groups: rural habitual-squatters (n=14) and urban non-squatters (n=14). Daily squat exposure was measured using MGM-Ground-Level-Activity-Questionnaire; lower-lumbar spine motion with modified-Schober-test; lower-extremity muscle strength using 30-sec-chair-raise-test, trunk muscle endurance with pressure biofeedback, calf muscle endurance was measured using calf raise test. Duration of second stage of labour and type of delivery was recorded. Habitual Squatters (average squat exposure=68.9±25.3min) demonstrated lower waist: hip ratio (p=0.02); greater overall physical activity level (p=0.001), lumbo-pelvic mobility (p=0.02), lower-extremity muscle strength (p=0.001); and shorter duration of 2nd stage of labour (p=0.001) compared to non-squatters. Excellent positive correlation was observed between daily-squat exposure and back muscle endurance (Spearman's rho=0.98, p=0.001). Normal vaginal delivery was conducted in 83% squatters and in 71% non-squatters. Present findings indicate strong influence of habitual physical activity including squat exposure on improved trunk-lower-extremity strength, lumbo-pelvic mobility and shorter duration of second stage of labor.

KEY WORDS: Pregnancy, ground level activity, primi-gravid pregnant women

INTRODUCTION

Daily life of pregnant women varies in rural and urban settings in terms of physical activity profile and indoor-outdoor work environment (15). Positive influence of physical activity on maternal health and pregnancy outcomes such as decreased maternal weight gain, reduced risk of gestational hypertension and diabetes mellitus, reduced depression in the postnatal period,

decreased incidence of caesarean birth, operative vaginal delivery, and lesser postpartum recovery time is well established (19).
Physical activity involves bodily movements and encompasses large number of activities that can be stratified as mild, moderate and vigorous. Numerous benefits conferred by involvement in moderate to vigorous physical activity includes better physical and mental health, decreased incidence of non-communicable diseases and reduction in morbidity and mortality (16). WHO and the US Department of Health and Human Services (28) recommends engagement in moderate physical activity of 50 min or 75 min of moderate intensity training per week for pregnant women (28). Similar guidelines are provided by the American College of Obstetricians and Gynecologists (3), which recommend daily 20-30 min of engagement in safe exercises such as walking, aerobic activities and stretching exercises for pregnant women. It is reported that most pregnant women belonging to the United States self-restrict physical activity and spend their leisure time passively and less than 14% pregnant women engage in recommended level of physical activity (35).

Furthermore, involvement in physical exercise is influenced to a large extent by cultural beliefs. In a recent study, Guelfi et al. (9) studied the attitudes and beliefs of pregnant Australian and Chinese women towards exercise during pregnancy. Their observations indicated that Caucasian (Australian) women reported higher levels of exercise and presented with greater intentions to exercise compared to Asian (Chinese) women (9). Several studies indicate poor exercise behaviour in pregnant women. However, studies done on pregnant women from low- to middle-income countries such as China, Malaysia, and India demonstrated that despite low leisure-time physical activity, pregnant women engaged in higher level of habitual physical activity for performing household chores and occupational activities (26, 39).

Lifestyle profile of rural pregnant women includes walking long distances for daily living activities such as shopping for groceries, occupational activities and leisure time activities such as visiting the religious places. Additionally, their lifestyle also demands adoption of various ground level high-flexion postures like deep squat, bending and cross-legged sitting for daily chores such as cooking, washing, cleaning and self-care activities like bathing and toileting. Not only do activities performed in these postures demand greater energy consumption, activities performed in deep squat moves spine, pelvis, hip, knee and ankle through considerable range of motion and recruits multiple major muscles of trunk and lower extremity (33). However, it is observed that pregnant women residing in urban areas do not perform all household chores themselves because they rely on house help for major domestic household chores. Moreover, the working environment for day to day activities predominantly involves performance of activities in upright standing or sitting postures resulting in limited need to adopt squat posture at ground level.

From a biomechanical perspective, the squat posture increases pelvic outlet by 20-30% (0.51cm) (21). Mechanical advantage conferred by upright squat posture during birthing confers ease of delivery and is associated with a shorter second stage of labour and reduced incidence of perineal tears compared to other childbirth positions (14, 23, 39, 40). Yet the most commonly

adopted childbirth posture in the hospital of low middle countries and by midwives worldwide is supine position or dorsal position (13, 14). The dorsal posture offers greater access and convenience to the medical practitioner, however, puts the mother at a disadvantage as a horizontal uterine axis impedes descent of the baby demanding greater effort form the mother and prolongation of the second stage of labour.

Further, during pregnancy, increase in abdominal girth, ligament laxity, abdominal muscles weakness and gain in body weight shifts the body's centre of gravity (CoG) anteriorly, increasing anteriorly directed forces on lumbar spine, leading to anterior pelvis titling and increase in thoracic and lumbar curves (16). Hence it is important to maintain strength-endurance of trunk muscles in order to facilitate effective muscle force required for downward propulsion of baby during second-third stage of labour and to de-stress lumbar region from excessive axial loading (33). A previous study demonstrated that habitual squat exposure in individuals with knee pain demonstrated greater knee flexion, muscle strength-endurance and balance performance compared to individuals with no squat exposure (1). Although it is known that partial squat exercises are beneficial in pregnancy to maintain strength of the trunk and lower extremity muscles influence of habitual deep-squatting on back and lower extremity strength in women with daily squat exposure remains unknown. Hence, an exploratory study was designed to evaluate influence of physical activity including habitual squatting on trunk-lower extremity muscle strength and duration of second stage of labour in pregnant women without complications.

METHODS

Participants

The study was approved by Institutional Ethics Review Committee, MGM Institute of Health Sciences, Navi Mumbai, India and followed all ethical guidelines in line with declaration of Helsinki and ethical standards of the International Journal of Exercise Science (24).

A priori power analysis conducted with G*POWER 3.1 determined that 28 participants (addition of 20 % attrition rate) were required in the current study for a power of 0.80, $\alpha = 0.05$ with an effect size of 0.56 (was calculated based on results of pilot study conducted). Twenty-eight primi-gravida, ≥ 37 week of pregnancy women without secondary complications were recruited following informed consent.

Participants were recruited from semi-urban and urban hospitals. The pregnant women were categorized as urban and rural based on the location of the residence as per the description of the Rural Indian subsection of the Indian National Portal. Urban areas are places with a population density of at least 400 persons per sq. km, towns with population of 100000 and cities with local municipal governance (31). Whereas rural areas house a population less than 5000 or density of population less than 400 per sq. km (31).

Fourteen women who performed squatting for daily activities were categorized as habitual-squatters, whereas 14 women who did not squat at all for daily activities were categorized as non-squatters. Women with multi-gravid pregnancy, >50 years, uncontrolled hypertension (systolic pressure ≥ 140 mmHg or diastolic pressure ≥ 100 mmHg), diabetes or thyroid, multiple pregnancies (twins, triplets, etc.), persistent bleeding after first trimester, preeclampsia, intrauterine growth retardation, abnormal presentation (breech, transverse lie, face, brow and shoulder presentation) post 28 weeks, severe cardiovascular or respiratory disease, incompetent cervix were excluded.

Protocol

The MGM Ground Level Activity Exposure Questionnaire is a validated tool (Cronbach's alpha for reliability: 0.89) that enables quantification of daily, monthly, yearly, and previous squat exposure for self-care activities of daily living (ADL) and occupational activities. However, in the present study, daily squat exposure is reported at ≥ 37 weeks of pregnancy. The tool provides self-reported quantification of daily squat exposure for self-care (defecation and bathing), instrumental activities of daily living (household chores such as washing clothes, utensils, cleaning, cooking, and sweeping), occupation, sport and leisure time activities (1). Demographic information included age, occupation, body-height, body-mass, body mass index, waist: hip ratio, abdominal girth, squat exposure, obstetric history (gravida, parity, number of children living, abortion, death, last menstrual date and expected date of delivery), and current week of pregnancy.

History of low back pain was recorded and the Numeric Rating Scale 0-10 where 0 represents no pain and 10 represents the worst pain imaginable was used to record pain scores (17). The International Physical Activity Questionnaire(IPAQ)is a valid and reliable questionnaire was used to record habitual physical activity (11). The tool enables quantification of physical activities categorized as moderate, vigorous activity performed for more than 10 min and walking activity reported as MET min/week (11). The Pregnancy Mobility Index (PMI), tool is specifically designed for evaluating difficulty in performing day-to-day activities in pregnant women. It includes 24 items categorized as daily mobility within the house; ability to perform routine household activities, and mobility outdoors. The items are scored on a scale from 0-100, where 0 equates to 'normal performance' and 100 indicate 'maximum disability. The Pregnancy Mobility Index demonstrates excellent reliability, construct and criterion validity (Cronbach's alpha 0.8 or higher) (38).

Mobility of lumbar spine was evaluated using Modified Schober's test as per standard protocol. The examiner placed the thumb on the inferior margin of the participant's Posterior Superior Iliac spines (PSIS). A line was drawn along the midline of the lumbar spine horizontal to the PSIS (lower landmark). A second line was drawn 15 cm above the lower landmark (higher landmark). The participant was instructed to flex anteriorly and the distance between the lower and higher landmarks were measured in cm. The participant returned to upright neutral position and the difference between the two landmarks was recorded. The difference of distance between landmarks in neutral and flexed position indicated the amount of lumbar flexion.

Validity (r=0.67; 95%CI 0.44-0.84), reliability (intra: ICC=0.95; 95%CI 0.89-0.97; inter: ICC=0.91; 95%CI 0.83-0.96) of MMST is well established (37).

Trunk muscle endurance was evaluated using pressure biofeedback device (Chattanooga Stabilizer Pressure Biofeedback, USA) with the participants in supine lying position, with both knees flexed to 90°. Participants were instructed to draw in their lower abdomen slowly, as if they were holding their urine and then draw up their pelvic floor muscle so that it could contract, together with their lower abdomen, while continuing to breathe normally. The device was placed at the level of posterior superior iliac spin. The pressure gauge was inflated to 40 mmHg before drawing-in maneuver and participants were instructed to increase pressure by 10 mmHg using the drawing-in maneuver and maintain intra-abdominal pressure. The time for which intra-abdominal pressure was maintained was recorded in seconds (5). Lower-limb muscle strength was evaluated using 30-seconds chair raise test. Participants were instructed to cross hands around chest, sit on a chair and stand up repeatedly for 30 seconds and number of chair-stands was recorded (30).

Calf raise test was used to evaluate strength of ankle plantar flexors. Participants were asked to perform single leg heel raises without bending the knee, continuously for 30 seconds and allowed to take one-finger support bilaterally if necessary. Number of heel raises performed was recorded. Test was terminated if the participant complained of fatigue or if the participant required more than two-finger support (25). Labour outcome was recorded in duration of second stage of labour, type of delivery (vaginal or caesarean) and cause for caesarean delivery as reported in medical notes.

Statistical Analysis

Data were analysed using SPSS version 24 (SPSS IBM, New York, USA). Normality of data was determined using Shapiro-Wilk test. Measures of central tendency and distribution were presented for further analysis. Mann Whitney U test was used for comparing outcomes between habitual squatters and non-squatters with alpha level set at p =0.05. Difference was considered significant with at $p \leq 0.05$ Effect size was interpreted as small = 0.2, medium = 0.5, large 0.8 and very large 1.3 (34). Correlation between average daily squat exposure, back muscle endurance, lumbo-pelvic motion and duration of 2ndlabour stage was studied using Spearman's correlation test.

RESULTS

Present study compared clinical outcome of back-lower extremity muscle strength and labour outcomes in pregnant habitual squatters and non-squatters. Table.1 shows demographics characteristics of study participants. Both groups were matched on age, weeks of pregnancy, body mass index and abdominal girth. However, waist hip ratio was significantly greater (p = 0.02) in non-squatters by 3%. Habitual physical activity (IPAQ score) was greater 40% in squatters compared to non-squatters (p=0.001). Squat exposure of all 28 participants was recorded at ≥ 37 weeks of pregnancy. Although the tool is designed to provide previous squat

exposure, it was not measured specifically for each trimester. Squatters were exposed to squatting for average 69 minutes/day (measured using MGM Ground Level Activity Questionnaire) whereas non-squatters reported nil squat exposure. Pregnancy Mobility Index score was non-significant between two groups (p=0.51).

Table 1. Demographic data and baseline characteristics of habitual squatters and non-squatters at the end of 3rdtrimester (mean gestational age 38 weeks).

Demographic Data and Baseline characteristics	Habitual Squatters (n=14) Mean Mean(SD)	Non-Squatters (n=14) Mean (SD)	p value using Mann Whitney U test
Age (years)	21.6 (2.8)	25.3 (1.9)	0.09
Current weeks of pregnancy (weeks)	37.4 (2.7)	38.5 (2.5)	0.2
Body mass (kg)	55.3 (6.5)	58.1 (12.1)	0.6
Body Mass Index (kg/m²)	25.1 (3.2)	25.7 (6.1)	0.9
Waist Hip Ratio	0.80 (0.01)	0.83 (0.04)	0.02*
Abdominal Girth (cm)	92.3 (6.9)	96.1 (9.8)	0.28
Physical Activity Measures			
International Physical Activity Questionnaire Score MET min/week	3441.8 (2078.5)	1189.3 (1147.2)	0.001*
Average daily squat exposure (min)	68.9 (25.3)	0	0.00*
Pregnancy Mobility Index	1.4 (1.8)	2.1 (2.4)	0.51
Pain History			
Number of participants having back pain	7	8	-
Visual Analog Scale Score	1.5 (1.7)	1.9 (1.8)	0.60

**(p value ≤ 0.05 is considered significant)*

Table 2 Demonstrates Comparison of Lumbar mobility, Lower-Extremity and trunk muscle strength endurance, labour outcome findings between habitual squatters and non- squatters. Forward flexion in lumbo-pelvic segment was 34% greater (p=0.002) in squatters compared to non-squatters. Lower extremity muscle strength and back muscle endurance was significantly higher (p=0.00) in squatters as compared to non-squatters. Higher number of squatters with respect to labour outcomes (83.33%, n=12 out of 14) underwent normal vaginal delivery compared to non-squatters (71.42%, n=10 out of 14), whereas 16.67% squatters and 28.58% non-squatters underwent caesarean section. Most common cause of lower segment caesarean section was fetal distress (3/28); followed by oligohydroamnios (1/28), breech presentation (1/28) and meconium-stained liquor (1/28). Second stage of labour was significantly shorter by 28% (p = 0.001) in squatters compared to non-squatters. Duration of second stage of labour was 45.8±7.3 minutes in squatters whereas it was 59±7.7 minutes in non-squatters. All women delivered in dorsal position. Habitual squatters demonstrated strong positive correlation between back muscle endurance and average daily squat exposure. Strong positive correlation was observed between average daily squat exposure and back muscle endurance (Spearman's rho 0.98, p<0.001). However, there was no association between IPAQ score and back muscle endurance.

Table 2. Comparison of lumbar mobility, lower-extremity, and trunk muscle strength endurance between habitual squatters and non- squatters.

Outcome measure	Habitual Squatters (n=14) Mean (SD)	Non-Squatters (n=14) Mean (SD)	p value using Mann Whitney U test	Effect Size (Cohen's d)
Lumbar Mobility				
Modified-Modified Schober's test- Flexion (cm)	6.2 (1.7)	4.1 (1.2)	0.002*	1.42
Modified-Modified Schober's test- Extension (cm)	2.5 (0.9)	2.3 (0.9)	0.6	0.22
Muscle Strength-Endurance				
30second chair raise test (reps)	10.3 (1.8)	7.0 (1.4)	0.000*	2.04
30seconds calf raise test-Left(reps)	16.5 (3.3)	16.2 (5.3)	0.80	0.06
30seconds calf raise test-Right(reps)	16.1 (4.3)	15.9 (5.5)	0.70	0.04
Back muscle endurance (seconds)	12.2 (3.9)	10.9 (3.7)	0.42	0.34

**(p value less than ≤ 0.05 is considered significant, effect size interpreted as small = 0.2, medium = 0.5, large 0.8 and very large 1.3)*

DISCUSSION

Present study explored influence of habitual squatting exposure on trunk and lower extremity muscle strength and labour outcome in pregnant women. It was observed that women belonging to rural areas squatted habitually for performing activities of daily living such as toileting, bathing, cooking, and washing utensils and clothes and other household chores. Rural women reported high level of overall physical activity and were daily wage workers who performed all daily household chores themselves without seeking any assistance. Whereas non-squatters resided in urban setting who belonged to moderate-high socio-economic group and hired people to help in household work.

Higher level of overall physical activity is known to benefit maternal health (19). WHO recommends 75-150min of intense physical activity (28). Physical activity is proven to shorter duration of labour and lower incidence of operative delivery, in uncomplicated pregnancies physical activity is also known to impart positive benefits for fetal health in terms of reduced fat mass, better stress tolerance, and improved neuro-behavioral maturation (16, 19, 33). In the present study, rural women reported greater physical activity (3441.8 (2078.5) MET/min per week) which is above the WHO's recommendation for level of physical activity (28). However, exercise behaviours are known to alter during pregnancy (32). Largely, women stop exercising and adopt a sedentary lifestyle during pregnancy, which can then lead to a series of complications such as musculoskeletal pain, gestational hypertension, obesity, diabetes and

longer recovery postnatal time (20). Higher level of habitual prenatal physical activity is beneficial in prevention of these conditions and result in better labour outcomes (20).

Squatters presented significantly lower waist: hip ratio compared to the non-squatters. Waist Hip Ratio was not recorded prior to pregnancy. However, squatters were engaged in activities of daily living and physical activity, including high flexion postures such as squat for household chores namely cooking, cleaning floor, washing utensil, and farming activities. This is reflected as greater habitual physical activity (IPAQ score) by 40% in squatters compared to non-squatters ($p=0.001$). Another study has reported that 12-week physical activity intervention involving walking in the 6-week to 6-month postpartum phase demonstrated a lesser waist-hip ratio compared to the control group receiving routine postpartum healthcare (18, 36). Hence, it is speculated that higher level of overall physical activity inclusive of activity in squat may be associated with lower waist hip ratio in habitual squatters.

The current study reported no significant difference in Pregnancy mobility index but demonstrated greater physical activity score measured using IPAQ in habitual squatters (40% greater score than non-squatters). The possible reason for this difference in results might be due to the different domain between the two questionnaires. Pregnancy mobility index informs about the difficulty faced during daily mobility in indoor and outdoor activities whereas IPAQ briefs about MET for activities and accordingly classifies an individual as low, moderate and high physically active individual (4).

A recent study (19) demonstrated that pregnant women who were moderately active (69.1 ± 26.6 min) as compared to inactive women (16.6 ± 9.2 min) and engaged in activities such as walking, climbing of stairs and other household activities for 30 min daily, reported significantly higher relative and absolute VO2max and lower sleeping heart rate. Higher level of fitness and improved cardiorespiratory endurance in active women were associated with shorter second stage of labour duration compared to inactive women (88 vs. 146 minutes, respectively) with crude odds ratio (OR) of operative delivery of 3.67 in inactive women (95% CI, 0.87–16.08; $P < .08$) (20). These findings corroborate with findings of present study, where in squatters demonstrated 26% shorter second stage of labour. Further an Odds Ratio of 1.2 was observed for caesarean section delivery in women with no habitual squat exposure. Similar observations are reported previously. A study by Dani et al. (7) reported a reduction in second stage of labour by 9 min in both primpara and multipara women in squat position compared to dorsal position.

Moraglu et al. (22) compared labour outcomes between squatting positions holding onto a hand bar and modified supine semi-fowler (45 to the horizontal) position during the second stage of labor, in Turkish women who were accustomed to defecating in squatting posture. They reported a reduction in mean duration of the second stage of labor by 34 min in the squatting group compared to the supine group (21.02 ± 5.60 min versus 55.40 ± 6.91 min; $P < 0.001$). Thus, indicating the benefits conferred by the upright posture during birthing is speculated that habitual activities in deep-squat posture for moderate duration of time stretch perineal muscles and soft tissues, which facilitate descent of the fetus during labour (22). A previous study using

computational simulation suggests that maternal joint loading in squatting could widen the pelvic outlet and generate greater pelvic mobility (12). Such an effect coupled with greater muscle strength of abdominal, back extensors and lower extremity is likely to facilitate reduction of duration of 2nd phase of labour. A randomized controlled trail evaluating sitting position with birth seat, revealed that women using a birth seat had a significantly shorter second-stage of labor compared to other positions (95%CI: 0.96-0.98; $P < 0.01$) and were less likely to receive synthetic oxytocin for augmentation of uterine contractions (13).

In terms of daily functioning, squatters demonstrated greater lumbar motion, lower extremity muscle strength and back muscle endurance. The lifestyle of rural women in India, demands considerable quantum of time spent in domestic and agricultural activities in squatting posture, as electrical appliances and mechanized instruments are yet not commonly used. Domestic work includes cooking, washing utensils and clothes, and sweeping the floor in the squat posture. Preparation of three meals a day for the entire family requires cooking over a traditional earthen stove, preparing dough, rolling bread, cleaning and cutting vegetables, and grinding spices for daily consumption. Washing utensils and clothes too form a part of daily chores performed in squat posture. Women also help in milking the cows/buffaloes, agricultural activities such as cutting grass, sowing of seeds, replanting crops and harvesting. These tasks demand adopting squat posture for a considerable duration of time which can be categorised as light to moderate intensity activity with substantial muscle activation and energy expenditure of 5-24 kJ min^{-1}. This level of habitual physical activity meets the global recommendations for physical activity in pregnant women (29). In comparison, the lifestyle of urban pregnant women is more sedentary. With greater affordability and higher monthly family income, the women have access to mechanical aids for performing daily activities such as cooking. Greater dispensable income enables hiring workforce for daily activities. Having received higher education, the women are engaged in sedentary occupations and do not engage in physical labour. Long hours at desk work leaves less time for engaging in leisure time physical activity thus predisposing most women to lower levels of overall physical activity. A westernized lifestyle does not require adoption of squatting for performing daily activities as most functions such as bathing, cooking, household chores and others are performed either in upright stand or sitting postures. Thus, depriving women with westernized lifestyle from the benefits of adopting deep-squat posture.

Furthermore, previous studies have demonstrated that habituation to daily activities in squat results in adaptation of soft tissues thus providing full range of motion at, hip and knee joints in sagittal plane during squatting. Previous biomechanical exploration of squat (with feet flat in ground position) in pregnant women reveals that pelvic inlet plane is perpendicular to sagittal plane of lumbar spine in this posture, making it an optimal posture for birthing (8). Furthermore, squatting activates trunk and lower extremity muscles such as erector spinae, gluteus maximus, rectus femoris, hamstrings and gastrocnemius (33). Moreover, greater habitual muscle activation during squatting for activities of daily living in rural women would contribute towards maintenance of lower extremity and trunk muscle strength which is essential during bearing down stage of labour. Reduced trunk muscle strength in urban women could be a plausible reason for prolonged labour (2).

Thus, it can be inferred that, moderate habitual body weight deep-squat exposure with an average of (68.9 ±25.3) min/day and physical activity may be beneficial in maintaining core muscle strength, lumbo-pelvic motion and reducing duration of second stage of labour in young women with uncomplicated pregnancy.

Positive preliminary findings from present pilot exploratory study on influence of lower extremity-trunk muscle strength and labour outcomes in rural pregnant women prompt further studies to investigate effect of squat exercise intervention in women with uncomplicated pregnancies and monitor the effect of squat on postnatal physiological changes with respect to diastasis recti, regain of abdominal strength, prenatal and postnatal complications including urinary incontinence and pelvic inflammatory in postnatal period.

The weakness of the study is small sample size. Moreover, squat performance was not recorded in 1st and 2nd trimesters. Hence, further longitudinal studies are warranted to measure the influence of physical activity and habitual squatting on labour outcome in urban and rural settings and to study the quantum and kinematic pattern of squat performance pre-pregnancy, in each trimester and post-partum.

Pregnant women with greater habitual physical activity including squat exposure presented lower waist-hip ratio, greater lumbo -pelvic mobility, greater trunk and lower extremity strength-endurance and shorter time-duration in second stage of labour. The findings of the study can be used to educate pregnant women on benefits of engaging in ground level physical activities involving high flexion postures.

Present findings can be used to recommend body-weight squatting as an ante-natal exercise during 2nd and 3rd trimester to maintain strength of trunk-lower extremity muscles and optimize labor outcome in uncomplicated pregnancies. Squat posture can be integrated into activities of daily living during 2 and 3 trimesters among primi-gravid women with uncomplicated pregnancy. Primi-gravid pregnant women with uncomplicated pregnancy can be educated regarding benefits of engaging in ground level activities involving high flexion postures to maximize labour outcomes in settings where pregnant women do not engage in ground level activity.

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