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CLINICoSCope - A Prospective Observational Study in India on "Clinic on Some Common Orthopedic Pregnancy Related Problems Explored"

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ABSTRACT

Introduction: The biomechanical, hormonal, and vascular changes that are induced by pregnancy results in variety of musculoskeletal problems. It has been found that majority of women during pregnancy experience temporary disabilities. The assessment was done to observe the impact of age, parity, and body mass index (BMI) of the pregnant ladies on the bone and muscular symptoms experienced during pregnancy. **Aim of the Study:** It was to find out the data on orthopedic problems in pregnant ladies. **Materials and Methods:** Hundred patients attending obstetrics and gynecology outpatient department after 30 weeks of gestation were subjected to a pre-structured questionnaire regarding bone and joint or muscle pain during pregnancy. The variables in the patient population under study were parity, age, and BMI. All the data were compiled and statistical analysis was done. **Results and Observations:** Data were analyzed using analysis tool pack visual basic for application in Excel. A positive correlation between age, BMI >25, and parity was found with regard to orthopedic problems. Lower back pain was found to be the most frequent complaint across all age groups. The study also suggests that overweight pregnant women, high order parity women are risk factor for musculoskeletal problems such as low back pain, tingling, pain in leg, calf swelling, paraesthesia, pubic pain, knee pain, pain in back, pelvic pain, pain in arm, and pain in groin. **Conclusion:** This study would create awareness regarding bone and muscle disorders in pregnancy leading to timely diagnosis and management.

Keywords: Body mass index, Bone and joint pain, Hormonal changes, Musculoskeletal problems, Pregnancy

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Introduction

The physiological changes affect various systems of the woman's body during pregnancy in which the musculoskeletal system is one of them. Orthostetrics is the study of the musculoskeletal problems during pregnancy. Nonetheless, physiological changes can occur at any pattern, it is distinguished more in the third trimester. An enlarged gravid uterus transforms the body's center of gravity exerting mechanical stress on the body.[1] It strains the musculoskeletal system thereby resulting in injuries and the majority of the injuries can

be given conservative management except in some which may need an emergency intervention with surgeries. The biomechanical, hormonal, and vascular systems undergo changes that are induced by pregnancy resulting in a variety of musculoskeletal problems.[2] The postural and hormonal fluctuations, weight gain, and fluid retention may account for increased musculoskeletal pain in the advanced trimester.[3] It has been found that the majority of the women during pregnancy complaints of musculoskeletal problems and a portion of them experience temporary disabilities.[4] Musculoskeletal problems have been found as a prime source of disability and lack of effort among pregnant women.[5,6] The most frequent disorder reported is spinal pain.[7] Additional common problems reported are neuropathies.[4,7] During pregnancy, spinal and pelvic joints undergo biomechanical changes leading to an increase in sacral promontory, an increase in lumbosacral angle, a forward rotatory movement of the innominate bones, and symphysis pubis. Normally pubic symphyseal gap is 4–5 mm and during pregnancy, there is an increase of 3 mm. Stress over the musculoskeletal system can occur because of two hormones that are the relaxin and elastin which increase during pregnancy making the joints, ligaments, and tendons lose causing strain in axial and pelvic systems during movement. Particularly the pubic symphysis and sacroiliac joints get affected which benefits the birth of the baby. This laxity occurs due to the breaking down of collagen in selected tissues restoring it by a modified form containing high water content increasing the connective tissue pliability and extensibility. Fluid retention results in compression of tissues in pregnancy. Relaxin is produced in the corpus luteum initially but later on, is produced by the placenta and decidua and it increases in the first trimester and has an effect on the pelvic floor muscle relaxation. At 10 weeks, the pelvic joint begins loosening and reaches a maximum near term. At 4–12 weeks postpartum joints return to normal. The sacrococcygeal joints also loosen. By the last trimester, the hip abductors, extensors, and therefore the ankle plantar flexors increase their net power during gait and there is a rise in load on the hip joints of 2.8 times the usual value when standing. As the uterus rises within the abdomen, the rib cage is forced laterally and therefore the diameter of the chest may increase by 10–15 cm.[8] Hence, to understand the musculoskeletal problems during pregnancy better, this study was undertaken in the tertiary care institute in north eastern India.

Materials and Methods

This study was conducted to evaluate the orthopedic problems occurring during pregnancy. Hundred patients were recruited from the patients attending the Department of Obstetrics and Gynaecology at North Eastern Indira Gandhi Regional Institute of Health and Medical Sciences (NEIGRIHMS), Shillong (India) for antenatal care after 30 weeks of pregnancy. The patients were subjected to a prestructured questionnaire regarding any bone and joint or muscle pain which these patients perceived during pregnancy. The variables in the patient population under study were parity, age, and body mass index (BMI). All the data were compiled and statistical analysis was done.

Observations and results

The total number of pregnant women with more than 30 weeks of pregnancy enrolled for the study was 100.

Age - The distribution of age group [Table 1] in patients included in the study is given below.

It was found that most of the pregnant women were in the age group of 26–35 years, that is, 58%.

For BMI, the women were divided into two groups, namely, those with normal BMI (19–25) and overweight women with BMI >25 [Table 2]. Some weight gain is normal in pregnancy due to the growth of the fetus in the mother, most of the women were in the overweight group, that is, 54% with BMI >25.

The parity of the patients under study is given in Table 3.

Orthopedic problems - distribution with correlation between age of the patients and orthopedic problems [Table 4] is as follows

Low back pain was the most common complaint seen in all the patients in all age groups. About 63% patients in 18–25 age group suffered from it, followed by 50% patients in elderly age group. Enlarging uterus may cause stretching of ligaments and muscles resulting in back pain. The other most frequent complaints were cramping in calf muscles,

Table 1: Distribution of the patients in the study based on age group

Age group	No of patients
18–25	30
26–35	58
36–45	12
Total	100

Table 2: Distribution of the patients in the study based on BMI

Body mass index	No of patients
19–25	46
>25	54
Total	100

Table 3: Distribution of the patients in the study based on Parity

Parity	No of Patients
Prima	35
G2-G4	60
≥G5	5
Total	100

and pelvic pain seen in all age groups with differing frequency.

Orthopedic problems - distribution with correlation between the parity of the patients and orthopedic problems [Table 5] is as follows

Low back pain was the most common problem, seen in pregnant women of all parities as shown in the table above. Calf cramps and pain in pelvic girdle were frequent in primigravida, as the tone of the ligaments and muscles is better in primigravida. Overstretching of these tissues in primi more than in multiparous women whose soft tissues may be more relaxed, due to the previous pregnancies.

Orthopedic problems - distribution with correlation between the BMI of the patients and orthopedic problems [Table 6] is as follows

According to the table above, low back pain was the most common complaint found in 61% patients with normal weight and 76% of overweight patients. Most of the complaints related to bone and soft tissues were seen more frequently in overweight patients than those having normal BMI.

(Tables 7-11 are indicating "ANOVA statistics").

Statistical analysis

Data were analyzed using analysis tool pack visual basic for application in Excel. The data were treated in a descriptive and inferential manner. The data on quantitative characteristics are presented as mean ± standard deviation (SD). The skewness and kurtosis tests were used to test the data frequency and distribution. The statistical significance of the equality of the distribution of quantitative characteristic is tested using one-way analysis of variance (ANOVA), that is, F test is used. The underlying normality assumption was tested before subjecting the parameters to ANOVA test. The correlation analysis is done using Pearson's methods. The entire data were entered and validated into MS Excel before its statistical analysis. Linear regression models were used to investigate the associations of age, BMI, and parity independently of each other with orthopedic problems/outcomes adjusting with confounding factors such as ethnicity, socio economic status, and education. The statistical significance level was determined at $P < 0.05$.

From Table 4, the mean of women with listed orthopedic problem was found to be 7 in the age group of 18–25, 16

Table 4: Distribution of different orthopedic problem vis-a-vis age group

Orthopedic problems	18–25 years (30)	26–35 years (58)	36–45 years (12)	Total	Correlation coefficient (r)
Low back pain	19	20	6	45	0.83
Tingling in finger	9	18	4	31	0.99
Pain in leg	5	21	4	30	0.94
Calf swelling, cramps	13	21	1	35	0.97
Tingling, paresthesia in thigh	3	12	0	15	0.99
Pubic pain	9	22	6	37	0.98
Knee pain	3	11	1	15	0.98
Pain in back	2	11	0	13	0.97
Pelvic pain	9	21	6	36	0.98
Pain in forearm	3	10	1	14	0.98
Pain in groin	3	12	11	26	0.22
Total	78	179	40	297	

Table 5: Distribution of different orthopedic problem vis-a-vis Parity

Orthopedic problems	Prima (35)	G2-G4 (60)	G5 (5)	Total	Correlation coefficient (r)
Low back pain	26	41	2	69	0.99
Tingling	13	15	3	31	0.95
Pain in leg	12	18	2	32	0.99
Calf swelling	15	18	2	35	0.96
Tingling	4	10	2	16	0.94
Pubic pain	13	21	2	36	0.98
Knee pain	4	11	1	16	0.96
Pain in back	7	7	1	15	0.89
Pelvic pain	17	19	1	37	0.93
Pain in arm	10	3	1	14	0.26
Pain in groin	10	8	0	18	0.79
Total	131	171	17	319	

Table 6: Distribution of different orthopedic problem vis-a-vis BMI

Orthopedic problems	19-25 (46)	>25 (54)	Total	Correlation coefficient (r)
Low back pain	28	41	69	1
Tingling	13	18	31	1
Pain in leg	12	18	30	1
Calf swelling	17	18	35	1
Paraesthesia	5	11	16	1
Pubic pain	13	23	36	1
Knee pain	9	8	17	1
Pain in back	3	12	15	1
Pelvic pain	17	20	37	1
Pain in arm	3	11	14	1
Pain in groin	5	13	18	1
Total	125	193	318	

Table 7: Statistical Analysis

Age group (AG)-1	
Mean	7.09
Standard error	1.61
Median	5
Mode	3
Standard deviation	5.34
Sample variance	28.49
Kurtosis	1.07
Skewness	1.21
Range	17
Minimum	2
Maximum	19
Sum	78
Count	11
Confidence level (95.0%)	3.59

Table 8: Statistical Analysis

Age group (AG)-2	
Mean	16.27
Standard Error	1.50
Median	18
Mode	21
Standard Deviation	4.98
Sample Variance	24.82
Kurtosis	-2.22
Skewness	-0.13
Range	12
Minimum	10
Maximum	22
Sum	179
Count	11
Confidence Level (95.0%)	3.35

in the age group of 26–35, and 3 in the age group of 36–45. Hence, it is evident that the orthopedic problem is more common in 26–35 age groups. Statistical analysis establishes a positive correlation between orthopedic problems and age which is statistically significant.

Table 9: Statistical Analysis

Age group (AG)-3	
Mean	3.64
Standard error	1.04
Median	4
Mode	6
Standard deviation	3.44
Sample variance	11.85
Kurtosis	0.44
Skewness	0.86
Range	11
Minimum	0
Maximum	11
Sum	40
Count	11
Confidence level (95.0%)	2.31

Table 10: Statistical Analysis

ANOVA: Two-factor without replication						
Summary	Count	Sum	Average	Variance		
19	2	26	13	98		
9	2	22	11	98		
5	2	25	12.5	144.5		
13	2	22	11	200		
3	2	12	6	72		
9	2	28	14	128		
3	2	12	6	50		
2	2	11	5.5	60.5		
9	2	27	13.5	112.5		
3	2	11	5.5	40.5		
3	2	23	11.5	0.5		
AG2	11	179	16.27	24.82		
AG3	11	40	3.64	11.85		
ANOVA						
Source of Variation	**SS**	**df**	**MS**	**F**	***P*-value**	**F crit**
Rows	240.45	10	24.05	1.90	0.16	2.98
Columns	878.23	1	878.23	69.55	0.00	4.96
Error	126.27	10	12.63			
Total	1244.95	21				

From Table 5, the mean of women with listed orthopedic problems is highest in G2-G4 (15.5) than in Prima (11.9) and G5 (1.15) which suggests that G2-G4 women are risk factors for orthopedic ailments. There is a positive correlation of orthopedic problems with parity which is statistically significant.

From Table 6, the mean of women with listed orthopedic problems is more in BMI >25 than in BMI <25 which suggests that obesity/overweight is a risk factor for orthopedic ailments. This establishes a positive correlation of orthopedic problems with BMI >25 and it is statistically significant.

Based on the above three analyses, it can be inferred that there is a positive correlation between age BMI

Table 11: Regression and correlation statistics

Summary output								
Regression statistics								
Multiple R	0.73							
R Square	0.54							
Adjusted R Square	0.48							
Standard Error	3.83							
Observations	11							
ANOVA	**df**	**SS**	**MS**	**F**	**Significance F**			
Regression	1	152.79	152.79	10.41	0.01			
Residual	9	132.12	14.68					
Total	10	284.91						
	Coefficients	**Standard Error**	**t Stat**	***P*-value**	**Lower 95%**	**Upper 95%**	**Lower 95.0%**	**Upper 95.0%**
Intercept	−5.68	4.12	−1.38	0.20	−15.00	3.65	−15.00	3.65
AG2	0.78	0.24	3.23	0.01	0.23	1.33	0.23	1.33

>25 and parity with orthopedic problem among women 18–45 years. Lower back pain was found to be the most frequent complaint across all age group. It was highest in 18–25 age groups with 63% followed by 50% in elderly group. The study also suggests that overweight pregnant women have a higher incidence of lower back problems than their normal weight peers. However, it is to be differentiated that the weight gain is due to progression of pregnancy or other physiological conditions. Higher order parity is suggestive of a risk factor of an orthopedic ailment in this study. Hence, it may be recommended that third Ante natal checkup should also include care of the back pain for multigravida and multiparous women in elderly women particularly.

Discussion

Low back pain is a public health concern as it affects 50–75% of pregnant women.[9] We also found in our case that low back pain was the most common symptom affecting 63% of pregnant women in the age group of 18–25 and 50% in the middle age group and 76% of low back pain was found in over-weight pregnant women. It presents as lumbar pain or pelvic girdle pain. Prevention and treatment of low back pain during pregnancy should be initiated as women continue to have low back pain beyond the postpartum period.[10] The cause of low back pain is numerous. As discussed earlier the physiological changes, hormonal changes and the increase in body mass leads to altered compliance and increased mechanical stress on the spine. The gravid uterus, lumbar lordosis, center of gravity exerting mechanical stress on the body increase strain on bones, muscles, ligaments of the lumbar region, and relaxed abdominal wall muscles, primarily the rectus abdominis, during pregnancy may not be able to maintain posture. Therefore, the paraspinal muscles are strained to tackle the whole task, become tired, and thus cause low back pain.[9,10] Pelvic girdle pain is more common and results in greater disability than lumbar pain. A detailed history should be taken to distinguish between pelvic girdle pain and lumbar pain based on the site of the pain, intensity, disability and pain provocation tests, and clinical examination. Risk factors that have been found are genetic predisposition, multiparity, a previous history of pelvic trauma, raised BMI, elevated relaxin hormone levels, asymmetrical laxity of the sacroiliac joint, excessive abduction during labor, strenuous work during pregnancy, and hypermobility of the joints.[11] Imaging for diagnosis is rarely used.[12] Radiographs, ultrasound (US), and magnetic resonance imaging (MRI) may only be helpful in cases with severe or uncommon symptoms. US can be used in the assessment of joint diastasis and can be repeated for follow-up if necessary whereas MRI is useful to assess the lumbar spine.[12,13] In pregnancy for lumbar pain, its management is conservative with physical exercise and minimizing activities that will increase pain. For pelvic girdle pain, analgesics and bed rest, and avoiding abduction beyond the pain-free zone in labor can be followed. During postpartum, for patients with pelvic girdle pain stabilizing exercises can be followed. Furthermore, pelvic belts, transcutaneous electrical nerve stimulation, spinal manipulative therapy, acupuncture, and complementary therapy with yoga are often followed.

The variation of the mechanics requires lower-extremity joints to adapt by absorbing extra force during pregnancy.[3] The most common lower-extremity problems experienced during pregnancy are hip, knee, foot, and leg spasms. The hip is the most often affected area within the lower extremity. About 34% of pregnant women experienced hip pain.[14] Many pregnant women experience hip pain as the trimester advances because of an increase in mechanical load to hip joints.

Transient osteoporosis of the hip or osteonecrosis of the femoral head can also be considered which is an infrequent disorder of unspecified etiology occurring during the advanced trimester of pregnancy involving primigravidas in two-thirds of cases[15] with one-third occurring in pregnancy or early postpartum[15] with one-third of cases involving bilaterally.[16]

It's identified by sudden or gradual onset intense hip pain preventing gait, persisting at rest, and worsening when bearing weight, without hip limitation on clinical examination. Symptoms may begin from the early trimester of pregnancy or after delivery which causes pelvic instability.[15]

Radiographs show pronounced unilateral or bilateral transparency of the femoral head and neck with conservation of the joint space.[12,13]

Deformities are generally seen within 48 h after the beginning of symptoms and voluntarily resolve within 6–8 months.[12] Continuously weight-bearing leads to a fracture of the femoral head therefore, advanced diagnosis is vital to stop complications.[13] MRI can distinguish between osteonecrosis and transient osteoporosis. Other uncommon causes of hip pain in pregnancy are sacral fractures, acetabular labral tears, symphysis pubis diastasis or dysfunction, cauda equina syndrome, and sacroiliitis.[17-21] In our study also, sacroiliac and pelvic girdle pain was the common complaint and was most common in primi (49%) as compared to multiparous women.

Pregnancy-related carpal tunnel syndrome is the most frequent mononeuropathy during pregnancy. In our study, pain in thumb, wrist, and forearm due to carpal tunnel syndrome were found in 14% patients, most of whom were primigravida. In pregnancy, carpal tunnel syndrome is accredited to hormonal changes, with no etiology. Hormonal fluctuations, fluid accumulation with a tendency to edema, nerve hypersensitivity, and glucose level fluctuations are factors that predispose pregnant women to carpal tunnel syndrome.[22]

Conclusion

Many musculoskeletal problems in pregnancy are commonly self-limiting with a good outcome but although, a scarcity of awareness by failing to recognize these problems leads to long-term morbidity. Thus, our study was a small beginning to quantify orthopedic problems in pregnancy and many more studies would help to create awareness, leading to timely diagnosis and management.

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Conflict of Interest

None.

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