Acta Biomedica Scientia
e - ISSN - 2348 - 2168
Print ISSN - 2348 - 215X
www.mcmed.us/journal/abs
Research Article

PREGNANCY-RELATED BACK PAIN: IMPACT OF BONE MINERAL DENSITY CHANGES

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ABSTRACT
Pregnancy is associated with a reduction in bone mineral density (BMD), which has been linked to pregnancy-related back pain. This study aimed to assess changes in BMD by conducting ultrasound assessments of the os calcis two years post-pregnancy. Sixty women who experienced back pain during pregnancy participated in a follow-up study 24 to 28 months later to evaluate persistent symptoms. Results showed that 24 (40%) of these women continued to experience back pain. Comparisons between BMD values during pregnancy and quantitative ultrasound measurements of os calcis BMD revealed that women with persistent pain had lost more BMD during pregnancy compared to those without ongoing symptoms. Additionally, women without persistent pain were able to recover their BMD loss during pregnancy, while those with ongoing pain experienced lower BMD levels post-pregnancy compared to early pregnancy levels. These findings suggest that BMD loss during pregnancy may contribute to persistent back pain after pregnancy.

Keywords:-. Pregnancy-related back pain, Bone mineral density (BMD), Ultrasound assessment, Os calcis, Persistent symptoms.

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Home Page: **www.mcmed.us/journal/abs**		**Quick Response code**
Received:25.12.2021	**Revised**:12.01.2022	**Accepted**:21.01.2022

INTRODUCTION

From 20-60% of pregnant women experience significant back pain [1-3]. There may be multiple causes of back pain during pregnancy. However, bone loss is positively associated with symptoms of back pain and pelvic pain in women who are pregnant. Femoral bone density was associated with hip pain, while os calcis BMD was correlated with back pain symptoms [5]. Back pain symptoms persist after pregnancy in over 60% of women after delivery [6] to as high as 82% of women with previous pregnancy back pain at 18 months. There was a 21% incidence at 2 years [3]. It is controversial whether osteoporosis and postpartum BMD loss [4] play a role in persistent pain after pregnancy, including back pain [5] and other factors [6]. Women with significant back pain during pregnancy will be observed to see if their postpartum BMD changes correlate with postpartum back pain. It is important to determine whether persistent back pain symptoms are minimized by recovering BMD lost during pregnancy.

METHODS

Pregnancy Cohort

The study recruited consecutive patients booked at a general obstetric clinic over a twelve-month period. Routine antenatal care was provided. Data on weight and height during early pregnancy were collected at recruitment with written consent. Between 36-38 weeks of pregnancy, quantitative ultrasound measurements of

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bone density were made bilaterally at the oscalcis. Using elastomer pads and ultrasound coupling gel, the Sahara Clinical Bone Sonometer system made direct contact with the heel. A wheelless stable chair was recommended by the manufacturer for the patient. In order to ensure focus between ultrasound probes at the os calcis, a foot guard was used. Prior to measurement, patients were allowed 30 minutes for the skin to reach ambient temperature. Measurements were taken on both sides. The system generates simulated BMD by measuring BUA and SOS. Computers were used to calculate BMD. The manufacturer estimates the system's coefficient of variation to be 2-3%, which is in accordance with investigators' data. Tanita 500 bio-impedance systems were used in each of these instances to measure body fat percentage. People with medical conditions or long-term medications that affect bone density, such as steroids or thyroid drugs, were excluded. Spinal deformities, previous back surgery, and patients with chronic back pain were excluded as well. Before discharge from the hospital, patients with back pain in the early postpartum period were surveyed. Women with positive pain symptoms during pregnancy filled out a pain distribution chart. Symptoms of mild, moderate, and severe back pain were also classified using a visual analog scale. Pregnant woman suffered moderate back pain for more than three consecutive days or needed additional medical attention. It was only considered negative if they were mild and transient. Back pain during pregnancy is linked to BMD interval changes [7].

Study Cohort of Two Years

Similar to the early postnatal questionnaire, a mailed questionnaire was used to assess back pain symptoms. Within six months of the questionnaire, back pain requiring medical attention, sick leave, or treatment was considered positive. Negative symptoms did not require medical attention. Pregnant women already had further pregnancies were excluded. BMD measurements were repeated for those responding to the 24-28 month survey. Menstrual status, last menstrual dates, and breastfeeding status were asked. Medications or medical conditions taken on a long-term basis were also noted. If pregnancy was confirmed in these subjects, they could not continue with the investigation. The quantitative ultrasound measurements and anthropometric measurements were carried out according to the same protocol. Participants in the current study experienced back pain during pregnancy and completed a 2-year postpartum survey. We correlated body weight, body fat percentage, and os calcis BMD with persistent back pain and previous pregnancy changes. The correlation between persistent back pain symptoms and these parameters was evaluated with a regression model. P-values >0.05 were considered significant. SPSS version 13.0 was used for analysis. Cluster hospital board Ethics Committee approved the study.

RESULTS

460 of 926 patients recruited during pregnancy had experienced significant back pain. The 24-28 months questionnaire follow-up survey was completed by 286 women without further pregnancies, and 66 reported persistent back pain symptoms. 62% completed the 2-year survey, including 48 with persistent back pain and 72 without. Currently, 120 women are being analyzed from this final cohort. According to this cohort, the mean BMD loss from early to late gestation was 0.473 g/cm2, or around 5%. Two years after delivery, measurements showed marginally decreased BMD. In contrast, weight, body fat percentage, and BMI significantly increased during pregnancy, but fell again after delivery. All these parameters showed positive gains two years after delivery (Table 1). A 24-28-month assessment divided the cohort into groups with and without significant persistent back pain. The PBP group had a higher BMD in early pregnancy than the NBP group, but this was countered by a higher BMD loss during pregnancy compared to the NBP group. Comparing 24-28 month values to early pregnancy values, the PBK group also gained more weight, and lost more BMD. In the index pregnancy, there was no difference in lactation duration. In the NBP group, BMD levels were almost identical to those in early pregnancy two years after delivery, almost recovering their BMD loss in pregnancy. There was a significant relationship between early and late pregnancy BMD values, as well as between late pregnancy BMD values and BMD values 24 to 28 months after delivery. All possible confounding continuous variables were controlled against persistent back pain at 24-28 months. The two-year weight gain and BMD changes remain significant, whereas pre-pregnancy BMD values and pregnancy BMD loss disappear. Persistent back pain is associated with more weight gain after delivery, whereas a positive balance in BMD is protective.

Table 1: Anthropometric changes during pregnancy and 24 to 28 months after delivery

	Early Pregnancy (< 20 weeks) (SD)	Late Third Trimester (36-38 weeks) (SD)	Two years post-delivery (SD)	P-value by ANOVA
Weight	57	66.5	60.3	< 0.001
Body Mass Index	23.7	27.6	25.1	< 0.001

Body Fat Composition (%)	30.4	38.3	33	< 0.001
Mean os calcis BMD (g/cm2)	0.738	0.701	0.716	< 0.001

Table 2: At 24-28 months, Comparison of anthropometric and BMD measurements.

	PBP group(n = 48)	NBP group(n = 72)	p-value; MD(95% CI)
Age	34.3	33.2	0.23
Height	158	157	0.68
Weight during early pregnancy	55.5	58	0.22
BMI during early pregnancy	23	24.2	0.12
Body fat percentage during early pregnancy	29.7	30.8	0.67
BMD in early pregnancy	0.786	0.705	0.031
Weight gain during pregnancy	10.55	10.43	0.98
Accumulation of pregnancy body fat	8.75	9.05	0.76
Loss of BMD during pregnancy	0.0572	0.0406	0.044
Duration of lactation during index pregnancy	9.8	9.1	0.60
2 years post-delivery weight change	4.68	3.86	0.041

Table 3: Logistic regression with persistence of significant back pain after delivery

Variable	B	S.E.	Wald	Significance	Odds ratio	95% CI
Variables that are significant Gaining weight 2 years after delivery	-0.753	0.403	5.62	0.04	2.92	2.05 to 4.48
2 years post-delivery BMD change	-22.9	11.26	5.55	0.04	0.12	0.02 to 0.106
Variables excluded Age	0.0629	0.213	0.303	0.75	2.05	0.94 to2.32
BMI during early pregnancy	-0.506	0.338	3.90	0.09	0.76	0.51 to 2.06
Fat percentage during early pregnancy	0.231	0.225	2.09	0.39	2.14	0.99 to 2.45
BMD in early pregnancy	0.308	4.944	0.003	0.105	2.23	0.04 to 6.7
Pregnancy weight gain	-0.041	0.229	0.068	0.90	0.106	0.85 to 2.24
Pregnancy fat gain	-0.353	0.311	2.434	0.33	0.87	0.61 to 2.17
Loss of BMD during pregnancy	26.26	17.97	3.21	0.23	0.47	0.07 to 9.91
Two years after delivery, fat changes	-0.506	0.367	3.32	0.23	0.77	0.49 to 2.13
Confidence interval = CI.						

DISCUSSION

In this study, quantitative ultrasound measurements demonstrated a progressive decline in BMD at the os calcis from early to late pregnancy. Studies have used various methods for measuring BMD loss during pregnancy [8, 9], including quantitative ultrasound measurements [10, 11]. The current study found that around 50% of participants had back pain symptoms, which is in line with previous studies. Around 20% of patients complained of persistent back pain. The losses of BMD after pregnancy, during pregnancy, and during pregnancy were also associated with BMD loss. Previous studies have investigated back pain history, weight and older age , maternal smoking , pregnancy pain pattern, and psychosocial factors , but postpartum BMD changes have not been examined in detail for back pain persistence. Direct tests such as DXA and quantitative ultrasound could clearly demonstrate a marked bone turnover during pregnancy [12-15]. Long-term BMD loss is largely reversible [16, 17]. Back pain symptoms associated with BMD changes have been studied, but the long-term effects remain unclear. Pregnant women with documented back pain symptoms are more likely to experience subsequent symptoms [18]. In pregnancy, persistent back pain is associated with a greater loss of bone mineral density (BMD) and an inability to fully recover this loss after 2 years. The risk of developing clinical osteoporosis might be higher among women who suffer from severe back pain symptoms in later life.

Vertebral fractures and radiological abnormalities were rarely associated with severe persistent back pain. Many attribute low back pain to biomechanical factors, and immobility or reduced

exercise could theoretically cause BMD loss. Back, pelvic, and hip pain symptoms are also associated with quantitative BMD loss. Back and pelvic pain symptoms are associated with lower BMD values during pregnancy. In pregnancy and afterward, osteoporosis, hip pain, and decreased femur bone density are associated. Therefore, pregnancy osteoporosis may go undetected. Additionally, we have not studied calcium intake or vitamin D status during or after pregnancy. Research on the recovery of BMD after pregnancy and delivery would be beneficial.

Chronic back pain women had high bone mineral density early in pregnancy, but then lost more bone mineral density during pregnancy. Pregnant women with higher BMD loss have higher BMD to begin with, whereas those with borderline low BMD appear to preserve their BMD better. During pregnancy, they lose less BMD. BMD loss during pregnancy was higher among women with persistent back pain after childbirth, which may have resulted in significant higher BMD loss during pregnancy.

This study had some limitations. However, of our original cohort (60/230) reporting back pain during pregnancy, only 26% (60/230) had BMD findings. While 55% had persistent back pain symptoms, 26% had BMD findings. The number of those who were available for follow-up assessments of their BMD was 33% for those without further pain; 73% for those who had further pain. Secondary analyses revealed no significant differences between those who completed the follow-up study versus those who defaulted on it in terms of epidemiological characteristics, BMD loss during pregnancy, and back pain. This group should thus represent the entire cohort, based on the data presented here. Also, despite a tiny sample size in the final cohort, body fat differences were not demonstrated after two years. However, the current cohort already showed significant and consistent differences in primary outcomes like BMD loss during pregnancy.

Generally, quantitative ultrasound measurements of BMD predict clinical osteoporosis and fractures as well as DXA measurements. The coefficient of variation of these quantitative ultrasound systems can affect serial longitudinal comparisons, especially when the absolute difference is smaller than the coefficient. As a result, we believe that these measurements are valid, as measurable BMD loss during pregnancy was significantly greater (5-7%) than expected. Several studies and our own data indicate that quantitative ultrasound systems produce consistent and reproducible results. The correlation coefficients between pregnancy BMD and 2-year follow-up values were extremely high. Such BMD measurements should be reproducible over time. DXA or peripheral quantitative computer tomography could also be used to measure the axial skeleton more precisely after pregnancy, which should result in lower coefficients of variation. It is, however, not possible to directly correlate BMD changes during pregnancy with these methods because of the theoretical risks of radiological exposure. The same measurement method was used after pregnancy, despite its limitations. BMD recovery back to pre- or early pregnancy levels can be monitored with quantitative ultrasound

CONCLUSION

Overall, this study supported a correlation between BMD loss, as measured by quantitative ultrasound, and persistent back pain symptoms during pregnancy. Future large-scale studies should use BMD measurements at different skeletal sites to correlate persistent back pain symptoms. The risk of osteoporosis and menopausal bone health needs to be considered if BMD can be recovered during pregnancy.

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Cite this article:
Dr Chandrakala kothapalle, Dr B Sree Chaitanya Naga Samyukta. (2022). Pregnancy-Related Back Pain: Impact of Bone Mineral Density Changes. *ActaBiomedica Scientia*, 9(2), 117-121