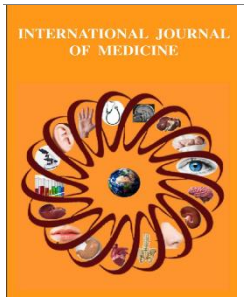
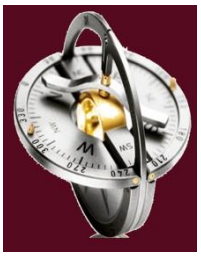


International Journal of Medicine

https://www.theinternationalmedicine.com



Original Research

Impact of Body Mass Index and Parity on Sacroiliac Joint Variants: Evidence from CT Imaging in Himachal Pradesh Population

Dr Arvind Chopra[1], Dr Anju Partap[2*], Dr Yogesh Diwan[3], Dr Kunal Chawla[4], Dr Kavita Negi[5] and Dr Shruti Thakur[6]

[1]*Junior Resident, Department of Anatomy, Indira Gandhi Medical College, Shimla, Himachal Pradesh*
[2]*Professor & Head, Department of Anatomy, Indira Gandhi Medical College, Shimla, Himachal Pradesh*
[3]*Professor, Department of Anatomy, Indira Gandhi Medical College, Shimla, Himachal Pradesh*
[4]*Professor, Department of Anatomy, Indira Gandhi Medical College, Shimla, Himachal Pradesh*
[5]*Professor, Department of Anatomy, Indira Gandhi Medical College, Shimla, Himachal Pradesh*
[6]*Assistant Professor, Department of Radio Diagnosis, Indira Gandhi Medical College, Shimla,*

Received -16/08/2025 | Reviewed - 28/08/2025 | Accepted - 04/09/2025 |Published - 18/09/2025

Abstract

Background: The sacroiliac joint (SIJ) is a key load-transmitting articulation, frequently exhibiting morphological variations that may mimic pathology. While age and gender are well-established determinants of SIJ anatomy, the influence of body mass index (BMI) and parity remains less explored, particularly in South Asian populations with high prevalence of obesity and multiparity. ***Materials and Methods***: This retrospective, cross-sectional CT-based study conducted in the Department of Anatomy and Department of Radiodiagnosis, IGMC, Shimla , included 108 adults (58 males, 50 females). Anatomical variants (accessory SI joints, bipartite and crescentic iliac bones, semi-circular defects, iliosacral complex, intra-articular new bone formation) and degenerative changes (sclerosis, cysts, joint space narrowing, ankylosis) were evaluated. Participants were stratified into normal-BMI and overweight/obese groups; parity was analyzed among women. Statistical associations were tested using chi-square/Fisher's exact test and ANOVA, with $p < 0.05$ considered significant. ***Results***: Overweight/obese individuals demonstrated a significantly higher prevalence of accessory SI joints (left: 18.3%, $p = 0.035$; right: 26.8%, $p = 0.012$), semi-circular defects (37.8% vs. 4.5%, $p = 0.001$), and degenerative changes (left: 23.2% vs. 9.1%, $p = 0.006$; right: 25.6% vs. 9.1%, $p = 0.008$). Symmetry was more frequent in normal-BMI individuals (86.4% vs. 70.7%). In women, parity correlated strongly with bipartite (left: $p = 0.002$, right: $p = 0.030$) and crescentic iliac bones (left: $p = 0.012$, right: $p = 0.030$), with prevalence increasing progressively with number of children. Other variants showed no significant parity-related association. ***Conclusion***: BMI and parity exert distinct influences on SIJ morphology. Excess body weight predisposes to accessory joints, semi-circular defects, and degenerative remodeling, while parity selectively correlates with bipartite and crescentic iliac variants. Consideration of these demographic factors is essential for accurate interpretation of SIJ imaging and to avoid misdiagnosis of normal variants as pathological changes.

Keywords: Sacroiliac joint; Computed tomography; BMI; Parity; Anatomical variants; Degenerative changes.

Introduction

The sacroiliac joint (SIJ) is a biomechanically unique articulation that transmits body weight between the axial skeleton and the lower limbs, while allowing limited but essential movement [1,2]. Its complex anatomy renders it susceptible to a range of morphological variations–such as accessory joints, bipartite iliac bones, crescentic shapes, and degenerative changes–which are increasingly recognized with the advent of high-resolution computed tomography (CT) and magnetic resonance imaging (MRI) [3-5]. These variants are clinically important because the SIJ is implicated in 15-30% of patients with chronic low back pain [6-8].

While age and gender have been well-established as determinants of SIJ morphology [9,10,16-18], the influence of body mass index (BMI) and reproductive history (parity) remains less clearly defined, despite their potential biomechanical and hormonal relevance. Excess body weight increases axial loading across the lumbosacral region and may accelerate degenerative processes within the SIJ [9,10,20]. Studies have suggested that overweight and obese individuals demonstrate a higher prevalence of degenerative skeletal changes due to repetitive stress and altered biomechanics [17,19], yet systematic analyses specifically focusing on SIJ variants are scarce.

Parity, on the other hand, represents a unique factor in women that may profoundly impact pelvic and SIJ morphology. During pregnancy, hormonal changes, particularly increased levels of relaxin and estrogen, promote ligamentous laxity and remodeling of pelvic joints to facilitate childbirth [11,12]. Repeated exposure to such biomechanical and hormonal influences has been proposed to predispose women to specific SIJ variants, including bipartite and crescentic iliac configurations [13-15]. These variants may be adaptive but also carry clinical relevance, as they may mimic erosive lesions or degenerative pathology on imaging [18]. However, the precise relationship between parity and SIJ variants remains underexplored, particularly in South Asian populations where high parity and distinct occupational and lifestyle factors may accentuate such associations [19-21].

Address for Correspondence: Dr Anju Partap, *Professor & Head, Department of Anatomy, Indira Gandhi Medical College, Shimla, Himachal Pradesh*

DOI: 10.5455/im.258898
This is an Open Access article under the terms of the Creative Commons Attribution-Noncommercial 4.0 International License (https://creativecommons.org/licenses/by-nc/4.0/)

Despite these compelling hypotheses, there is a paucity of systematic research evaluating SIJ morphology in relation to BMI and parity. Most available studies have focused on age- and gender-related changes, leaving a critical gap in understanding how body habitus and reproductive history shape SIJ anatomy. Region-specific data are especially important given that lifestyle, body composition, and reproductive trends differ significantly across populations [19-21].
The present study was therefore designed to investigate the association of BMI and parity with sacroiliac joint anatomical variants and degenerative changes using CT imaging. By stratifying findings according to body habitus and reproductive history, this study aims to provide new insights into biomechanical and hormonal influences on SIJ morphology, thereby refining anatomical knowledge and improving radiological interpretation in clinical practice.

Materials and Methods

Study Design and Setting

This was a retrospective, cross-sectional observational study conducted in the Department of Anatomy and Department of Radiodiagnosis, IGMC, Shimla based on computed tomography (CT) imaging of the sacroiliac joints. The study received approval from the Institutional Ethics Committee, and all procedures adhered to the principles of the Declaration of Helsinki.

Study Population

A total of 108 adult patients (58 males and 50 females) who underwent pelvic CT scans were included in this analysis. Patients were aged between 18 years and above 60 years. Individuals with pelvic fractures, known sacroiliitis due to infectious or inflammatory causes, or prior pelvic surgery were excluded to avoid confounding pathological changes.
The focus was specifically on:

1. **Body Mass Index (BMI):** Participants were stratified into two groups–Normal BMI and Overweight/Obese–according to WHO-recommended cut-offs.
2. **Parity:** Among the female subgroup (n = 50), parity status (number of children) was recorded and correlated with SIJ morphological and degenerative variants.

Imaging Protocol

All CT scans were performed using a multi-detector CT scanner. Thin-section axial images were acquired through the pelvis, followed by coronal and sagittal reconstructions using a high-resolution bone algorithm. This approach enabled optimal visualization of the sacroiliac joints and adjacent bony structures.

Evaluation Parameters

Two experienced radiologists independently evaluated all images, with discrepancies resolved by consensus. The following categories were analyzed:

- **Anatomical Variants:** Accessory sacroiliac joint (ASI), bipartite iliac bone, crescentic iliac bone, semi-circular defects, iliosacral complex, intra-articular new bone formation (IANBF), and other morphological variations.
- **Degenerative Variants:** Subchondral sclerosis, subchondral cysts, joint space narrowing, and ankylosis.
- **Joint Space Symmetry:** Bilateral assessment for symmetry versus asymmetry in joint configuration.
- **Sociodemographic Characteristics:** Age group, sex, and occupation were additionally recorded to contextualize findings.

Data Categorization

- **BMI-based Analysis:** Prevalence of anatomical variants, degenerative changes, and symmetry patterns was compared between normal-BMI and overweight/obese participants.
- **Parity-based Analysis (females only):** Associations between number of children and specific variants (particularly bipartite and crescentic iliac bones) were evaluated.

Joint Space Measurement

Joint space width was measured bilaterally at the narrowest articular point in millimeters, following standardized methods described in prior literature.

Statistical Analysis

Data were compiled and analyzed using the Epi Info software version 7. Categorical variables (e.g., presence or absence of variants) were expressed as frequencies and percentages, whereas continuous variables (e.g., BMI, joint space measurements) were presented as mean ± standard deviation (SD).

Comparisons between categorical variables were performed using the chi-square test or Fisher's exact test, as appropriate. Independent samples t-test was applied for two-group comparisons (BMI groups), and one-way analysis of variance (ANOVA) was used to evaluate parity associations across subgroups. A p-value <0.05 was considered statistically significant.

Results

Table 1 presents the sociodemographic distribution of the 108 participants, comprising 58 males and 50 females. The majority of participants belonged to the middle-age group (41-60 years; 44.4%), followed by ≤40 years (30.6%) and >60 years (25.0%). While women were more commonly represented in the 41-60-year group (50.0%), men were more frequent in the ≤40-year group (37.9%). Occupational patterns differed substantially by gender: 40.0% of women were housewives, while none of the men were. Conversely, occupations such as carpentry (20.7%) and driving (13.8%) were exclusively male-dominated, reflecting gender-based differences in occupational load exposure. Farmers and laborers were represented among both genders, while the "other" occupational group, including less physically demanding jobs, was the largest category overall (40.8%). These demographic and occupational trends highlight lifestyle differences that may contribute to biomechanical variations in sacroiliac joint (SIJ) morphology.

Table 1. Sociodemographic Characteristics of the Study Population

Variable	Female (n=50)	Male (n=58)	Total (N=108)
Age group			
≤40 years	11 (22.0%)	22 (37.9%)	33 (30.6%)
41-60 years	25 (50.0%)	23 (39.7%)	48 (44.4%)
>60 years	14 (28.0%)	13 (22.4%)	27 (25.0%)
Occupation			
Housewife	20 (40.0%)	-	20 (18.5%)
Labourer	6 (12.0%)	7 (12.1%)	13 (12.0%)
Carpenter	0 (0.0%)	12 (20.7%)	12 (11.1%)
Driver	0 (0.0%)	8 (13.8%)	8 (7.4%)
Farmer	5 (10.0%)	6 (10.3%)	11 (10.2%)
Other	19 (38.0%)	25 (43.1%)	44 (40.8%)

Table 2 demonstrates the association between BMI and anatomical variants of the SIJ. Accessory sacroiliac joints (ASI) were significantly more common in overweight/obese individuals compared to those with normal BMI, both on the left (18.3%, p = 0.035) and right (26.8%, p = 0.012). Semi-circular defects showed the strongest BMI-related association, being present in 37.8% of overweight/obese participants versus only 4.5% of normal BMI individuals (p = 0.001 for both sides). Bipartite and crescentic iliac bones were more frequent among overweight/obese individuals, though not statistically significant. These findings suggest that elevated BMI may predispose to structural remodeling of the SIJ, particularly in the form of accessory joints and semi-circular defects, likely due to increased axial loading and stress redistribution across the pelvic girdle.

Table 2. Anatomical Variants by BMI

Variant	Normal BMI n (%)	Overweight/Obese n (%)	Total n (%)	p-value
ASI (Left)	0 (0.0)	15 (18.3)	15 (13.9)	**0.035**
ASI (Right)	0 (0.0)	22 (26.8)	22 (20.4)	**0.012**
Bipartite Iliac (Left)	2 (9.1)	14 (17.1)	16 (14.8)	0.304
Bipartite Iliac (Right)	2 (9.1)	15 (18.3)	17 (15.7)	0.237
Crescentic Iliac (Left)	2 (9.1)	18 (22.0)	20 (18.5)	0.183
Crescentic Iliac (Right)	0 (0.0)	12 (14.6)	12 (11.1)	0.067
Semi-Circular Defect (Left)	1 (4.5)	31 (37.8)	32 (29.6)	**0.001**
Semi-Circular Defect (Right)	1 (4.5)	31 (37.8)	32 (29.6)	**0.001**
Iliosacral Complex (Left)	2 (9.1)	10 (12.2)	12 (11.1)	0.662
Iliosacral Complex (Right)	1 (4.5)	10 (12.2)	11 (10.2)	0.387
IANBF (Left)	1 (4.5)	14 (17.1)	15 (13.9)	0.149
IANBF (Right)	1 (4.5)	17 (20.7)	18 (16.7)	0.095
Other Variations (Left)	1 (4.5)	10 (12.2)	11 (10.2)	0.387
Other Variations (Right)	1 (4.5)	10 (12.2)	11 (10.2)	0.387

Table 3 highlights the distribution of degenerative changes according to BMI. Overweight/obese participants demonstrated a significantly higher prevalence of overall degenerative changes compared to those with normal BMI (left: 23.2% vs. 9.1%, p = 0.006; right: 25.6% vs. 9.1%, p = 0.008). Subchondral cysts, ankylosis, joint space narrowing, and subchondral sclerosis were also more frequently observed among overweight/obese individuals, although most differences did not reach statistical significance. Importantly, none of these degenerative features were observed in normal BMI individuals on the left side, emphasizing a possible protective effect of lower body weight. These findings strongly implicate obesity as an independent risk factor for SIJ degeneration.

Table 3. Degenerative Variants by BMI

Variant	Normal BMI n (%)	Overweight/Obese n (%)	Total n (%)	p-value
Degenerative Changes (Left)	2 (9.1)	19 (23.2)	21 (19.4)	**0.006**
Degenerative Changes (Right)	2 (9.1)	21 (25.6)	23 (21.3)	**0.008**
Subchondral Cysts (Left)	1 (4.5)	6 (7.3)	7 (6.5)	0.561
Subchondral Cysts (Right)	1 (4.5)	8 (9.8)	9 (8.3)	0.387
Ankylosis (Left)	0 (0.0)	4 (4.9)	4 (3.7)	0.293
Ankylosis (Right)	0 (0.0)	5 (6.1)	5 (4.6)	0.214
Joint Space Narrowing (Left)	0 (0.0)	9 (11.0)	9 (8.3)	0.149
Joint Space Narrowing (Right)	0 (0.0)	11 (13.4)	11 (10.2)	0.073
Subchondral Sclerosis (Left)	0 (0.0)	12 (14.6)	12 (11.1)	0.096
Subchondral Sclerosis (Right)	1 (4.5)	12 (14.6)	13 (12.0)	0.261

Table 4 explores the effect of BMI on SIJ symmetry. Symmetry was more common in normal BMI individuals (86.4%) compared to overweight/obese participants (70.7%), while asymmetry was more frequent among the overweight/obese group (29.3% vs. 13.6%). Although these differences were not statistically significant (p = 0.195), the observed trend suggests that higher BMI may contribute to asymmetric remodeling of the SIJ, potentially due to uneven load distribution and altered gait mechanics.

Table 4. Symmetry vs Asymmetry by BMI

Parameter	Normal BMI n (%)	Overweight/Obese n (%)	Total n (%)	p-value
Symmetry	19 (86.4)	58 (70.7)	77 (71.3)	0.195
Asymmetry	3 (13.6)	24 (29.3)	27 (28.7)	0.195

Table 5 demonstrates the association between parity and SIJ variants among women. Significant correlations were observed for bipartite iliac bones (left: p = 0.002, right: p = 0.030) and crescentic iliac bones (left: p = 0.012, right: p = 0.030), both of which increased with higher parity. In contrast, accessory SI joints, iliosacral complexes, semi-circular defects, IANBF, and degenerative variants such as ankylosis showed no significant correlation with parity (p > 0.05). These findings emphasize that parity exerts a selective influence on SIJ morphology, with bipartite and crescentic variants being particularly associated with childbearing.

Table 5. Correlation of Parity with Anatomical and Degenerative Variants (Women only, n=50)

Variant	p-value
ASI (Left)	0.85
ASI (Right)	0.316
Bipartite Iliac (Left)	**0.002**
Bipartite Iliac (Right)	**0.030**
Crescentic Iliac (Left)	**0.012**
Crescentic Iliac (Right)	**0.030**
IANBF (Left)	0.300
IANBF (Right)	0.440
Iliosacral Complex (Left)	0.280
Iliosacral Complex (Right)	0.820
Semi-Circular Defect (Left)	0.170
Semi-Circular Defect (Right)	0.160
Ankylosis (Left)	0.760
Ankylosis (Right)	0.850

Table 6 further elaborates the effect of parity on bipartite iliac bone variants. Women with no children rarely exhibited bipartite iliac bones (0% on the left, 10% on the right). In contrast, prevalence increased progressively with higher parity, reaching 50% on the right and 45.5% on the left among women with three children, and peaking at 100% for the left side in women with four children (p = 0.002 for left, 0.030 for right). These highly significant associations confirm that bipartite iliac bone formation is strongly parity-dependent, reflecting repeated biomechanical and hormonal adaptations of the female pelvis to pregnancy and childbirth.

Table 6. Parity vs Bipartite Iliac Bone

No. of Children	Bipartite Right Absent	Bipartite Right Present	Total	p-value	Bipartite Left Absent	Bipartite Left Present	Total	p-value
0	9	1	10	**0.030**	10	0	10	**0.002**
1	8	0	8		8	0	8	
2	12	6	18		12	6	18	
3	5	6	11		6	5	11	
4	1	2	3		0	3	3	
Total	**35**	**15**	**50**		**36**	**14**	**50**	

Table 7 highlights the relationship between parity and crescentic iliac bone variants. Crescentic configurations were absent in nulliparous women (0%), but prevalence increased with the number of children. Among women with three children, crescentic iliac bones were seen in 45.5% (right) and 63.6% (left), while among those with four children, prevalence reached 33.3% (right) and 66.7% (left). These associations were statistically significant for both right (p = 0.010) and left (p = 0.030) sides, demonstrating a clear link between multiparity and crescentic iliac morphology. This reinforces the hypothesis that repetitive obstetric stresses and hormonal factors, particularly pelvic ligamentous laxity during pregnancy, contribute to structural remodeling of the SIJ.

Table 7. Parity vs Crescentic Iliac Bone

No. of Children	Crescentic Right Absent	Crescentic Right Present	Total	p-value	Crescentic Left Absent	Crescentic Left Present	Total	p-value
0	10	0	10	**0.010**	10	0	10	**0.030**
1	8	0	8		6	2	8	
2	15	3	18		14	4	18	
3	6	5	11		4	7	11	
4	2	1	3		1	2	3	
Total	**41**	**9**	**50**		**35**	**15**	**50**	

Discussion

The present study provides novel insights into the impact of **body mass index (BMI)** and **parity** on sacroiliac joint (SIJ) morphology and degenerative changes, based on high-resolution CT imaging. While previous research has focused primarily on the influence of age and gender on SIJ variants [9,10,16-18], the role of BMI and reproductive history has remained underexplored, particularly in South Asian populations with distinct demographic, lifestyle, and reproductive characteristics [19-21].

Our analysis revealed a strong association between elevated BMI and several SIJ variants. Notably, accessory sacroiliac joints (ASI) and semi-circular defects were significantly more frequent in overweight and obese individuals compared to those with normal BMI. This pattern supports the hypothesis that increased axial loading from higher body mass induces structural remodeling of the sacroiliac articulation, leading to accessory articulations and surface irregularities. Similar biomechanical influences of obesity on other joints, such as the knee and hip, have been well documented, with degenerative changes linked to altered load distribution and repetitive stress [9,10,20]. The SIJ, being a load-bearing articulation, appears to undergo comparable adaptive remodeling under the influence of excessive body weight.

Semi-circular defects, in particular, showed a dramatic increase among overweight/obese individuals (37.8% vs. 4.5%), suggesting that obesity may exacerbate stress-induced erosions or remodeling at the iliac articular surface. Previous CT-based studies have described such defects as markers of chronic mechanical overload rather than purely degenerative features [13-15]. Our findings extend this interpretation by demonstrating that high BMI is a significant determinant of their occurrence.

Degenerative changes–including subchondral sclerosis, cysts, ankylosis, and joint space narrowing–were consistently more prevalent in overweight/obese individuals, with overall degenerative changes reaching statistical significance (p = 0.006 left, p = 0.008 right). This observation is consistent with prior reports linking obesity to accelerated degeneration in weight-bearing joints [17,19]. In particular, the absence of left-sided degenerative features among normal BMI individuals highlights the protective effect of lower body weight. The biomechanical rationale lies in the increased shear and compressive forces acting on the SIJ in overweight individuals, which accelerate microtrabecular stress remodeling and subchondral cyst formation [9-12]. These results emphasize BMI as an independent risk factor for SIJ degeneration, paralleling its role in other axial and appendicular joints.

Interestingly, while degenerative markers were more common in overweight/obese individuals, the differences in specific variants such as cysts and ankylosis did not always achieve statistical significance. This may reflect multifactorial influences on degeneration, including age, activity levels, and occupational exposure, as highlighted in earlier studies [16,17, 22, 23]. Nevertheless, the consistent trend across all categories reinforces the pathophysiological contribution of obesity to SIJ degeneration.

Another notable finding was the higher prevalence of asymmetry in overweight/obese participants compared to those with normal BMI (29.3% vs. 13.6%). Although not statistically significant, this trend aligns with the hypothesis that increased body mass and altered gait mechanics predispose to asymmetric remodeling of the SIJ. Prior biomechanical models have suggested that uneven load distribution, particularly in obese individuals, results in asymmetric stress across the sacroiliac articulations [19-23]. The present findings lend clinical weight to these models, suggesting that obesity not only increases the risk of degeneration but may also disrupt symmetry, complicating radiological interpretation of SIJ morphology.

The influence of parity on SIJ morphology emerged as another key finding of this study. Significant correlations were observed between higher parity and the prevalence of **bipartite** and **crescentic iliac bones**, while no significant associations were found with degenerative changes or other variants. This selective effect underscores the role of reproductive history in shaping SIJ anatomy, mediated by both hormonal and mechanical factors.

Pregnancy induces profound hormonal changes, particularly elevated levels of relaxin and estrogen, which increase ligamentous laxity and pelvic mobility [11,12]. These changes, coupled with repetitive biomechanical stresses during childbirth, may remodel the iliac articular surface, predisposing to bipartite and crescentic configurations. Previous studies have suggested similar adaptive pelvic changes with repeated pregnancies [13-15,18], though systematic radiological evidence has been limited. Our findings confirm these associations, particularly within the South Asian context where high parity is relatively common [19, 22,23].

The prevalence of bipartite iliac bones increased progressively with the number of children, peaking at 100% on the left side in women with four children. Similarly, crescentic iliac bones were absent in nulliparous women but became increasingly frequent with multiparity, affecting

over 60% of women with three or more children. These clear dose-response relationships strengthen the argument that parity is a powerful determinant of SIJ morphological variants. Importantly, such variants may mimic erosions or inflammatory changes on CT or MRI, and misinterpretation may lead to unnecessary further investigations or inappropriate treatment. Thus, awareness of parity-related changes is essential in radiological reporting and clinical decision-making.

Clinical and Anatomical Relevance

Taken together, these findings highlight BMI and parity as distinct but complementary factors influencing SIJ morphology. Elevated BMI primarily predisposes to **degenerative remodeling**–manifesting as accessory joints, semi-circular defects, and sclerosis–while parity exerts its effect mainly through **anatomical reshaping** of the iliac articular surface in the form of bipartite and crescentic variants. Both influences carry significant implications for radiological interpretation, particularly in differentiating normal anatomical variants from pathological lesions such as sacroiliitis.

Clinical Implications

The findings of this study have direct clinical relevance for radiologists and musculoskeletal physicians. Elevated BMI was strongly associated with accessory SI joints, semi-circular defects, and degenerative remodeling, while parity was selectively linked to bipartite and crescentic iliac variants. Awareness of these associations is essential to prevent misinterpretation of normal anatomical variants as pathological lesions. For instance, semi-circular defects in overweight/obese patients may mimic erosive sacroiliitis, and bipartite or crescentic iliac bones in multiparous women could be mistaken for inflammatory or degenerative pathology. Recognizing these demographic influences ensures more accurate differentiation between normal anatomical variation and true disease. Clinically, this has important implications in the evaluation of chronic low back pain, where the sacroiliac joint accounts for up to 30% of cases. Accurate recognition of BMI- and parity-related remodeling may therefore prevent over-diagnosis, reduce unnecessary investigations, and guide more appropriate therapeutic strategies.

Strengths and Limitations

A major strength of this study is that it is one of the few CT-based evaluations of sacroiliac joint morphology that systematically analyzes the effects of BMI and parity, providing much-needed data in a South Asian population where high parity and obesity are prevalent. The use of high-resolution imaging allowed precise evaluation of anatomical and degenerative variants, while independent radiologist review minimized observer bias. Importantly, the stratified analysis of both BMI and parity provided clarity on their distinct but complementary influences.
However, some limitations must be acknowledged. Being a retrospective single-center study, selection bias cannot be excluded, and the results may not be generalizable to all populations. The study did not control for detailed occupational history, physical activity, or lifestyle factors, which are known to influence SIJ morphology and may interact with BMI. Hormonal profiles and obstetric details such as mode of delivery, which could further refine the parity analysis, were not included. Lastly, while the sample size was sufficient to detect significant associations for major variants, it may have been underpowered for less common morphological changes.

Conclusion

This CT-based study demonstrates that **BMI and parity exert distinct influences on sacroiliac joint morphology**. Overweight and obese individuals showed significantly higher prevalence of accessory SI joints, semi-circular defects, and degenerative changes, underscoring the role of excess body weight in accelerating SIJ remodeling. In contrast, parity was selectively associated with bipartite and crescentic iliac bones, with prevalence increasing progressively with the number of children, reflecting the cumulative hormonal and biomechanical stresses of childbirth.

These findings emphasize the importance of considering both **body habitus and reproductive history** when interpreting sacroiliac joint imaging. Incorporating these demographic factors into radiological assessment enhances diagnostic accuracy, prevents misdiagnosis of normal variants as pathology, and ultimately improves clinical management of patients presenting with sacroiliac joint-related disorders.

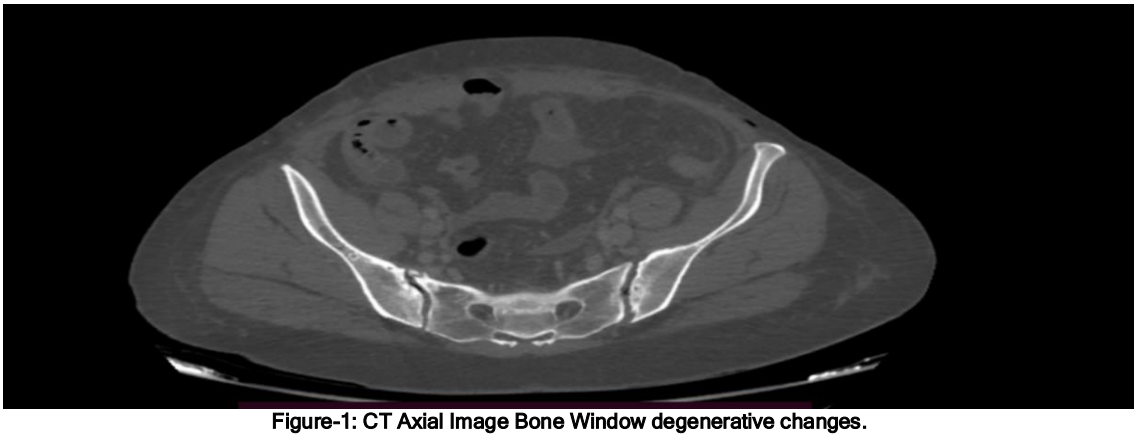


Figure-1: CT Axial Image Bone Window degenerative changes.

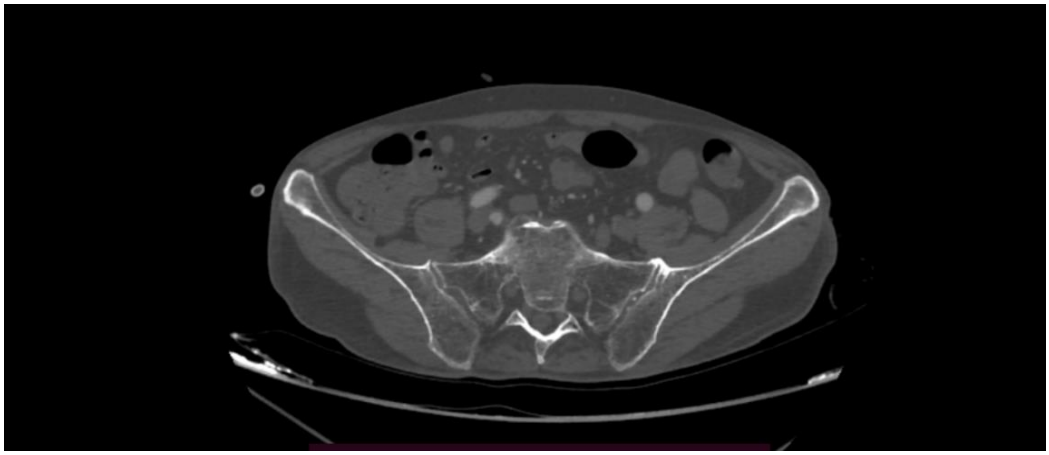


Figure-2:CT Axial Image Bone Window Intra-Articular New Bone Formation (IANBF)

Figure-3:CT Axial Image Bone Window Subchondral Cysts

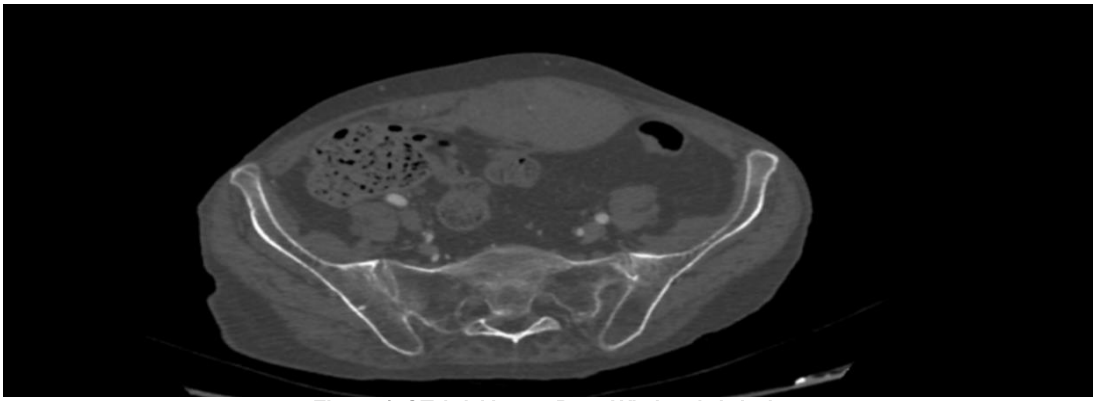


Figure-4: CT Axial Image Bone Window Ankylosis

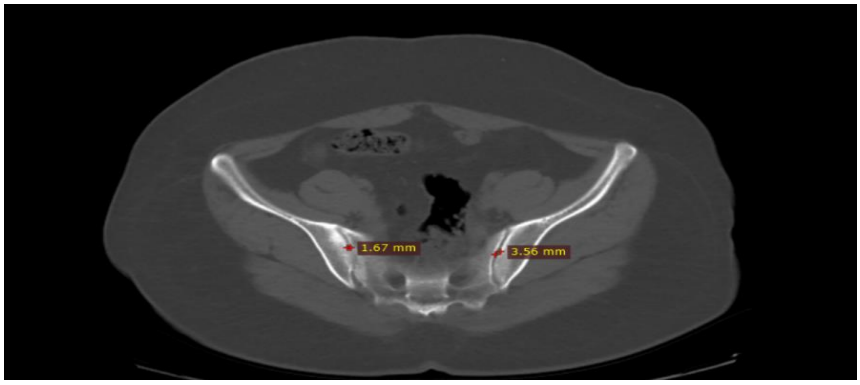


Figure-5:CT Axial Image Bone Window joint space narrowing

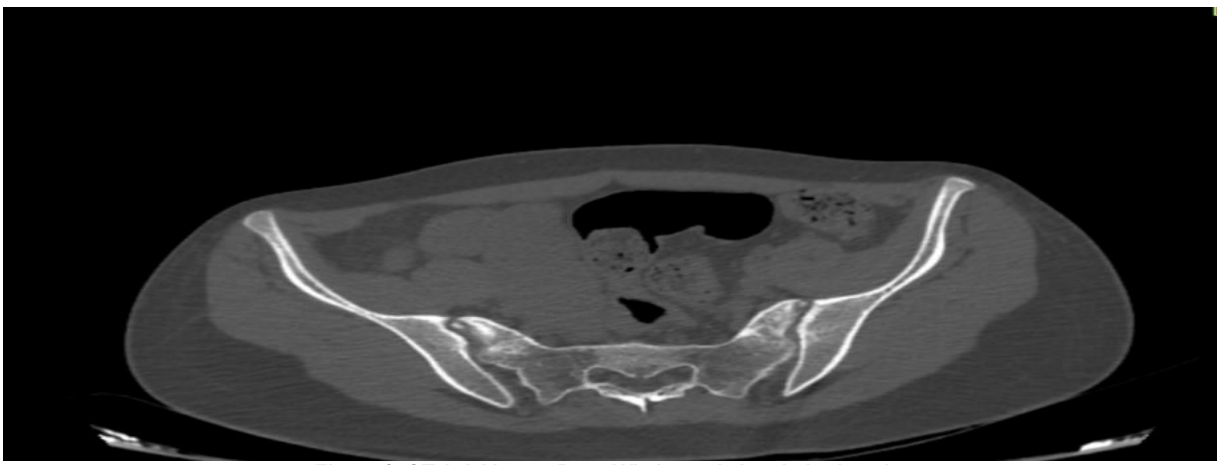


Figure-6: CT Axial Image Bone Window subchondral sclerosis.

References

1. Standring S, Ellis H, Healy CH, Johnson D, Williams A, Collins P, editors. *Gray's Anatomy: The anatomical basis of clinical practice*. London: Elsevier Churchill Livingstone; 2008.
2. Tubbs RS, Shoja MM, Loukas M. *Bergman's comprehensive encyclopedia of human anatomic variation*. Hoboken: John Wiley & Sons; 2016.
3. Trotter M. Accessory sacroiliac articulations in East African skeletons. *Am J Phys Anthropol*. 1964;22(2):137-41.
4. Solonen KA. The sacroiliac joint in the light of anatomical, roentgenological and clinical studies. *Acta Orthop Scand*. 1957;28(sup27):3-127.

5. Cihan Ö, Karabulut M, Kılınçoğlu V, Yavuz N. The variations and degenerative changes of sacroiliac joints in asymptomatic adults. *Folia Morphol (Praha)*. 2021;80(1):87-96.
6. Fortin JD, Tolchin RB. Sacroiliac arthrograms and post-arthrography computerized tomography. *Pain Physician*. 2003;6(3):287-94.
7. Bernard Jr T. The sacroiliac joint syndrome. In: Frymoyer JW, editor. *The adult spine: principles and practice*. New York: Raven Press; 1991. p. 2107-30.
8. Forst SL, Wheeler M, Fortin JD, Vilensky JA. The sacroiliac joint: anatomy, physiology and clinical significance. *Pain Physician*. 2006;9(1):61-7.
9. Wilder D, Pope M, Frymoyer J. The functional topography of the sacroiliac joint. *Spine (Phila Pa 1976)*. 1980;5(6):575-9.
10. Harrison DE, Harrison DD, Troyanovich SJ. The sacroiliac joint: a review of anatomy and biomechanics with clinical implications. *J Manipulative Physiol Ther*. 1997;20(9):607-17.
11. Tilvawala K, Kothari K, Patel R. Sacroiliac joint: A review. *Indian J Pain*. 2018;32(1):4-15.
12. Mahato NK. Variable positions of the sacral auricular surface: classification and importance. *Neurosurg Focus*. 2010;28(3):E12.
13. Willard F. The anatomy of the lumbosacral connection. In: Frymoyer JW, editor. *Spine*. Philadelphia: Hanley & Belfus; 1995. p. 333-.
14. Bowen V, Cassidy JD. Macroscopic and microscopic anatomy of the sacroiliac joint from embryonic life until the eighth decade. *Spine (Phila Pa 1976)*. 1981;6(6):620-8.
15. Beal MC. The sacroiliac problem: review of anatomy, mechanics, and diagnosis. *J Am Osteopath Assoc*. 1982;82(6):73-86.
16. Kim L. Pelvic torsion: a common cause of low back pain. *Orthop Rev*. 1984;13(4):206-11.
17. Lavignolle B, Vital JM, Senegas J, Destandau J, Toson B, Bouyx P, et al. An approach to the functional anatomy of the sacroiliac joints in vivo. *Anat Clin*. 1983;5(3):169-76.
18. McGrath M, Zhang M. Lateral branches of dorsal sacral nerve plexus and the long posterior sacroiliac ligament. *Surg Radiol Anat*. 2005;27:327-30.
19. Murata Y, Takahashi K, Yamagata M, Takahashi Y, Shimada Y, Moriya H. Sensory innervation of the sacroiliac joint in rats. *Spine (Phila Pa 1976)*. 2000;25(16):2015-9.
20. Hansen H, Manchikanti L, Simopoulos TT, Christo PJ, Gupta S, Smith HS, et al. A systematic evaluation of the therapeutic effectiveness of sacroiliac joint interventions. *Database of Abstracts of Reviews of Effects (DARE): Quality-assessed Reviews* [Internet]. 2012.
21. Schwarzer AC, Aprill CN, Bogduk N. The sacroiliac joint in chronic low back pain. *Spine (Phila Pa 1976)*. 1995;20(1):31-7.
22. Maigne JY, Aivaliklis A, Pfefer F. Results of sacroiliac joint double block and value of sacroiliac pain provocation tests in 54 patients with low back pain. *Spine (Phila Pa 1976)*. 1996;21(16):1889-92.
23. Irwin RW, Watson T, Minick RP, Ambrosius WT. Age, body mass index, and gender differences in sacroiliac joint pathology. *Am J Phys Med Rehabil*. 2007;86(1):37-44.