Original Article

Prevalence of facet joint arthritis and its association with spinal pain in mountain population – A cross-sectional study

ABSTRACT

Introduction: People living in the mountains are subject to tough terrain and climbing biomechanics which lead to degeneration of the spine and Facet joint arthritis (FJA).

Aims: The goal of present study was (1) to know the prevalence of facet joint arthritis on CT scans in mountain population in regard to (a) different levels in spine (b) age (c) sex (2) to know if there is any significant association between FJA and spinal pain at that corresponding level.

Materials and Methods: Bilateral Facet joints of 210 participants (age range, 18 to 97 years) who underwent MDCT imaging for reasons other than spinal pain, were graded and statistically analysed with SPSS software in this study. FJA was defined as at least one joint affected by facet joint disease (grade 2).

Results: In our study, Seventy two men (68.5%) and eighty four women (80%) had Facet Joint arthritis. The difference between men and women in the prevalence of FJA was not statistically significant ($P = 0.058$). The increasing age demonstrated a higher prevalence of facet joint arthritis with statistical significance ($P = 0.000$). In dorsal and lumbar spine region, there was a statistically significant difference in prevalence of FJA according to spinal level. The prevalence of FJA grade 2 in cervical and dorsal spine region was associated with spinal pain in both men ($P = 0.000$) and women ($P = 0.000$). However, no statistically significant association was found between FJA grade 2 and spinal pain in lumbar spine region in both males ($P = 0.680$) and females ($P = 0.680$) as well as in total population ($P = 0.513$).

Conclusions: People residing and actually ambulating in the mountain regions and exposed to the terrain have higher prevalence of Facet joint arthritis as compared to general population and this may be an independent risk factor for development of facet joint arthritis. However, a statistically significant relation between FJA and spinal pain exists only in cervical and dorsal spine.

Keywords: Backache, computed tomography, facet joint arthritis, hill climbing, mountain population, prevalence, spinal pain, spine degeneration

INTRODUCTION

Almost 22% of the world's total land is classified as mountain region, which in turn hosts about 12% of the world's total population as per the World Conservation Monitoring Centre.[1]

People living in these areas are subject to harsh climatic conditions and tough geographical terrain. Steep slopes and narrow roads impose restrictions on transportation and carriage, which render many areas accessible only to pedestrians, particularly in developing countries.

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How hill climbing is different from walking in plains?

1. Shorter stride length means more steps for same distance, which in turn involves more muscle workout. Besides, one lifts the leg high for higher ground with every climbing step
2. Uphill climbing also causes postural changes, with the most noticeable being an increased forward lean of the upper body to keep your center of gravity over the center of thrust and *vice versa* with backward leaning of spine while coming downhill. This position puts added stress on the spine.

The biomechanics of climbing uphill is different than that of walking on the flats. The stride length changes, the posture changes, and the physical demands on the muscles change. The steeper the hill, the more noticeable these changes become.

The controversy regarding facet joint arthritis (FJA) as a possible cause of spinal pain fails to die ever since these paired Zygapophyseal joints were first implicated as the source of backache and limb pain in 1911 by Goldthwaite.[2]

Thousands of articles have been published since then, with many establishing FJA as the culprit behind spinal pain based on the diagnostic anesthetic blocks, while others have refuted it citing the false-positive results and no correlation between magnetic resonance imaging (MRI) findings and clinical symptoms.[3-11]

The only thing which has been agreed upon by all is that repetitive twisting and bending leads to degeneration of spine in general and facet joints (FJs) in particular.

The FJs themselves and the surrounding areas are richly supplied with nerves arising from posterior primary rami known as medial branch, and they may become the source of pain either due to direct impingement of nerves by degenerative osteophytes or due to release of inflammatory and pain mediators affecting the receptors in joint capsule, nerve endings in subchondral bone, and intra-articular inclusions.[12-14]

To the best of our knowledge, no study has been done till date to study the FJA in mountain people specifically and its association with spinal pain.

The goal of the present study was:

1. To know the prevalence of FJA on computed tomography (CT) scans in mountain population with regard to (a) different levels in spine, (b) age, and (c) sex
2. To know if there is any significant association between FJA and spinal pain at that corresponding level.

MATERIALS AND METHODS

The study has been approved by the institutional ethical committee (IEC/19/218). A total of 210 participants who were aged from 18 to 97 years were consecutively enrolled. Out of these, 10 patients were of cervical spine, 60 patients were of dorsal spine, 138 were of lumbar spine, and 2 patients had both dorsal and lumbar spine CT scan.

Sample

This cross-sectional study included patients who had undergone CT between December 1, 2018, and November 31, 2019, and met the following criteria: they were over the age of 18 years, gave us their informed consent, and underwent CT examinations to assess abdomen, thorax, or neck for reasons unrelated to spinal pain. Participants should have been living in hilly/mountain areas for at least 15 years and walking at least 5 km total distance (uphill and downhill) on an average in mountain terrain.

Patients with a history of spine trauma or metastasis/tumors of spine or not in condition to give information or complete the self-report questionnaire were excluded from the study.

To prevent a result bias, we excluded patients in whom a chief complaint of spinal pain was the primary indication for the CT examination.

Spinal pain evaluation

All the participants who had undergone multidetector CT (MDCT) scanning and fulfilled the inclusion criteria were asked to complete the questionnaire, which was administrated by trained postgraduate students who were not involved in this study. The individuals' answer to the question "Have you had spinal pain in the scanned part for past 12 months?" was used in the present study as the spinal pain outcome. The individuals who reported having pain on "all days" or "most of the days" were considered to have frequent spinal pain, and individuals who reported having no spinal pain, spinal pain on "a few days," or "some days" were considered to be without frequent spinal pain.

Scanning parameters

MDCT was performed on 128 slice scanner by Philips Medical System (Model no: Ingenuity Core 128). FJ parameters were taken in bone window in axial and sagittal planes. The axial slice thickness varied from 0.75 to 2.5 mm because the images were obtained from patients with different indications and by different protocols.

Facet joint evaluation

All the CT scans were analyzed by the second author herself independently. She was not involved in the process of asking and completing the clinical questionnaire. All the CT images that were initially reviewed were the axial as well as sagittal images. FJs were graded on both sides. Four grades of FJA were defined using criteria similar to those suggested by Pathria *et al*.[15] [Table 1]. FJA was defined as at least one joint affected by FJ disease (grade ≥2).

RESULTS

Epidemiologic characteristics

The epidemiologic characteristics of the 210 participants are listed in Table 2.

Prevalence of facet joint arthritis according to gender and age

The prevalence of FJA according to gender and age is listed in Table 3.

Table 1: Criteria for grading osteoarthritis of the facet joint

Criteria for grading osteoarthritis of the facet joint (adapted from Weishupt *et al*.[25])	
Grade	**Criteria**
0	Normal FJ space (2-4 mm width)
1	Narrowing of the FJ space (<2 mm) and/or small osteophyte and/or mild hypertrophy of the articular process
2	Narrowing of the FJ space and/or moderate osteophyte and/or moderate hypertrophy of the articular process and/or mild subarticular bone erosions
3	Narrowing of the FJ space and/or large osteophytes and/or severe hypertrophy of the articular process and/or severe subarticular bone erosions and/or subchondral cyst and/or vacuum phenomenon in the joints

FJ - Facet joint

Table 2: Epidemiological descriptive statistics of the study population (n=210)

Frequency	Men, *n* (%)	Women, *n* (%)	Total, *n* (%)
Population	105 (50)	105 (50)	210
Age group			
<40	36	27	63
40-49	18	24	42
50-59	6	21	27
60-69	18	21	39
>70	27	12	39
Spine pain	54 (51.4)	48 (45.7)	102 (48.5)
FJOA	72 (68.5)	84 (80)	156 (74.2)

Here FJA is Facet Joint Arthritis ≥ grade 2 at one facet joint or more

Among men seventy – two participants (68.5%) had FJA while in women FJA was found in eighty four cases (80%). There was no statistically significant difference between men and women on the prevalence of FJA (P = 0.058). The increasing age demonstrated a higher prevalence of FJA with statistical significance (P = 0.000).

Prevalence of facet joint arthritis according to spinal level

In cervical spine region, the difference in the prevalence of FJA according to the spinal level was not statistically significant in both men and women and in the total population [Table 4]. In men, the highest prevalence of FJA was found at C4–5, and the gender difference was statistically significant only at this level, i.e., C4–5 (P = 0.013). Men demonstrated a higher prevalence of FJA compared to women at C4–5 level.

In dorsal spine region, there was a statistically significant difference (P = 0.000) in the prevalence of FJA according to spinal level in men as well as in the total population though the difference was not statistically significant in females with P = 0.303 [Table 5]. Gender difference was statistically significant at both D2–3 (P = 0.038) and at D7–8 (P = 0.038). The highest prevalence of FJA in dorsal

Table 3: Prevalence of facet joint osteoarthritis according to gender and age

Prevalence of FJA ≥2 according to age and gender				
Variable	**FJA**		**Total**	***P***
	Presence (%)	**Absence**		
Gender				
Men	72 (68.6%)	30	105	0.058
Women	84 (80)	21	105	
Age				
<40	24 (38.09)	39	63	0.000*
40-49	36 (85.71)	6	42	
50-59	27 (100)	0	27	
60-69	33 (84.61)	6	39	
>70	36 (92.30)	3	39	

*P<0.05. Here FJA is Facet Joint Arthritis ≥ grade 2 at one facet joint or more

Table 4: Prevalence of facet joint arthritis according to cervical spine level

Prevalence of FJA ≥ Grade 2 according to cervical spine level				
Spinal level	**Men (%)**	**Women (%)**	**Total (%)**	**Chi-square test (*P*)**
C2-C3	3	0	3	3.043 (0.081)
C3-C4	3	3	6	0.000 (1.000)
C4-C5	6	0	6	6.176 (0.013)*
C5-C6	3	0	3	3.043 (0.081)
C6-C7	0	0	0	0.000 (1.00)
C7-T1	3	3	6	0.000 (1.000)
Chi-square test (*P*)	2.00 (0.736)	0.000 (1.00)	2.250 (0.690)	

*P<0.05. Here FJA is Facet Joint Arthritis ≥ grade 2 at one facet joint or mor

spine was found at D11–12 and D12–L1 in both men and women.

The results were similar again in lumbar spine with statistically significant difference in the prevalence of FJA according to spinal level in men ($P = 0.004$) and in the total population ($P = 0.015$), but the difference was not statistically significant in females with $P = 0.613$ [Table 6]. Gender difference was statistically significant at both L3–4 ($P = 0.031$) and at L4–5 ($P = 0.020$). In lumbar spine, another notable point is that in both total population and in men, the high prevalence of FJA is at either the upper lumbar L1–2, L2–3 level, or at the last L5–S1 level.

Table 5: Prevalence of facet joint arthritis ≥ Grade 2 according to dorsal spine level

Prevalence of FJA ≥ Grade 2 according to dorsal spine level				
Level	Men	Women	Total	Chi-square test (*P*)
D1-D2	12	9	21	0.476 (0.490)
D2-D3	15	6	21	4.286 (0.038)*
D3-D4	9	15	24	1.694 (0.193)
D4-D5	12	12	24	0.000 (1.00)
D5-D6	9	12	21	0.476 (0.490)
D6-D7	3	9	12	3.182 (0.074)
D7-D8	6	15	21	4.286 (0.038)*
D8-D9	15	12	27	0.383 (0.536)
D9-D10	12	15	27	0.383 (0.536)
D10-D11	18	18	36	0.000 (1.00)
D11-D12	24	18	42	1.071 (0.301)
D12-L1	24	18	42	1.071 (0.301)
P	0.000*	0.303	0.000*	

*P<0.05. Here FJA is Facet Joint Arthritis ≥ grade 2 at one facet joint or more

Table 6: Prevalence of facet joint arthritis ≥ Grade 2 according to lumbar spine level

Prevalence of FJA ≥ Grade 2 according to lumbar spine level				
Level	Men	Women	Total	Chi-square test (*P*)
L1-L2	36	36	72	0.000 (1.00)
L2-L3	36	33	69	0.194 (0.659)
L3-L4	18	42	60	4.667 (0.031)*
L4-L5	21	36	57	5.418 (0.020)*
L5-S1	36	42	78	0.734 (0.392)
Chi-square test (*P*)	15.646 (0.004)*	2.679 (0.613)	12.351 (0.015)*	

*P<0.05. Here FJA is Facet Joint Arthritis ≥ grade 2 at one facet joint or more

Facet joint arthritis and spinal pain

The prevalence of FJA ≥ Grade 2 according to spinal level in individuals with or without spinal pain is listed in Tables 7-9. The prevalence of FJA ≥ Grade 2 in cervical spine region was associated with spinal pain in both men ($P = 0.000$) and women ($P = 0.000$) and in the total population ($P = 0.014$).

Similar findings were found in dorsal spine with a significant association between both men ($P = 0.000$) and women ($P = 0.000$) with FJA ≥ Grade 2 and spinal pain, especially at D3–4 level in men ($P = 0.021$).

However, no statistically significant association was found between FJA ≥ Grade 2 and spinal pain in lumbar spine region in both males ($P = 0.680$) and females ($P = 0.680$) as well as in the total population ($P = 0.513$).

The relationship between FJA Grade 3 and spinal pain is given in Tables 10-12. In both cervical and dorsal spine, significant association between FJA ≥ Grade 3 and spinal pain was seen in men as well as in women. However, no significant association was found between spine pain and FJA ≥ Grade 3 in lumbar spine.

The prevalence of FJA according to age in individuals with or without spinal pain is shown in Table 13. The prevalence of FJA was statistically significantly associated with spinal pain (i.e., $P < 0.05$) in males greater than 50 years old and females who were in age group 50–59 and >70 years of age. However, if total population is taken into account, then a significant association is found between FJA and spinal pain in population <40 years old and in age group of 50–59 years.

Table 7: Prevalence of facet joint arthritis ≥ Grade 2 according to cervical spine levels in individuals with or without axial spine pain

Level	Men			Women			Total		
	With spine pain	Without spine pain	Chi-square test (*P*)	With spine pain	Without spine pain	Chi-square test (*P*)	With spine pain	Without spine pain	Chi-square test (*P*)
C2-C3	0	3	-	0	0	-	0	3	1.143 (0.285)
C3-C4	0	3	-	3	0	-	3	3	1.185 (0.276)
C4-C5	0	6	-	0	0	-	0	6	1.185 (0.276)
C5-C6	0	3	-	0	0	-	0	3	1.143 (0.285)
C6-C7	0	0	-	0	0	-	0	0	-
C7-T1	0	3	-	3	0	-	3	3	1.185 (0.276)
Whole cervical spine	0	18	18.963 (0.000)*	6	0	18.963 (0.000)*	6	18	6.000 (0.014)*

*P<0.05. Here FJA is Facet Joint Arthritis ≥ grade 2 at one facet joint or more. Chi-square test (cervical spine pain present vs. no cervical spine pain by cervical spinal level in men, women, and total population)

Table 8: Prevalence of facet joint arthritis ≥ Grade 2 according to dorsal spine levels in individuals with or without axial spine pain

Level	Men			Women			Total		
	With spine pain	Without spine pain	Chi-square test (*P*)	With spine pain	Without spine pain	Chi-square test (*P*)	With spine pain	Without spine pain	Chi-square test (*P*)
D1-D2	6	6	1.130 (0.288)	3	6	0.002 (0.967)	9	12	0.346 (0.557)
D2-D3	9	6	0.124 (0.725)	3	3	0.715 (0.398)	12	9	0.588 (0.443)
D3-D4	9	0	5.331 (0.021)	6	9	0.269 (0.604)	15	9	1.877 (0.171)
D4-D5	9	3	0.664 (0.415)	6	6	1.489 (0.222)	15	9	1.877 (0.171)
D5-D 6	6	3	0.026 (0.871)	3	9	0.465 (0.495)	9	12	0.346 (0.557)
D6-D7	3	0	1.709 (0.191)	3	6	0.002 (0.967)	6	6	0.000 (1.00)
D7-D8	3	3	0.543 (.461)	3	12	1.440 (0.230)	6	15	3.776 (0.052)
D8-D9	9	6	0.124 (0.725)	3	9	0.465 (0.495)	12	15	0.251 (0.616)
D9-D10	9	3	0.664 (0.415)	6	9	0.269 (0.604)	15	12	0.499 (0.480)
D10-D11	9	9	1.767 (0.184)	6	12	0.004 (0.952)	15	21	0.887 (0.346)
D11-D12	15	9	0.034 (0.855)	6	12	0.004 (0.952)	21	21	0.017 (0.896)
D12-L1	15	9	0.034 (0.855)	6	12	0.004 (0.952)	21	21	0.017 (0.896)
Whole dorsal spine	102	57	28.991 (0.000)*	54	105	28.991 (0.000)*	156	162	0.113 (0.737)

*$P<0.05$. Here FJA is Facet Joint Arthritis ≥ grade 2 at one facet joint or more. Chi-square test (dorsal spine pain present vs. no dorsal spine pain by dorsal spinal level in men, women, and total population)

Table 9: Prevalence of facet joint arthritis ≥ Grade 2 according to lumbar spine level with or without axial spine pain

Level	Men			Women			Total		
	With spine pain	Without spine pain	Chi-square test (*P*)	With spine pain	Without spine pain	Chi-square test (*P*)	With spine pain	Without spine pain	Chi-square test (*P*)
L1-L2	18	18	0.179 (0.672)	18	18	0.011 (0.916)	36	36	0.117 (.732)
L2-L3	18	18	0.179 (0.672)	15	18	0.456 (0.500)	33	36	0.545 (.460)
L3-L4	9	9	0.077 (0.781)	24	18	0.871 (0.351)	33	27	0.302 (.582)
L4-L5	12	9	0.164 (0.686)	15	21	1.482 (0.223)	27	30	0.020 (.888)
L5-S1	21	15	0.532 (0.466)	24	18	0.871 (0.351)	45	33	1.419 (.234)
Total lumbar levels	78	69	0.170 (0.680)	96	93	0.170 (0.680)	174	162	0.429 (.513)

*$P<0.05$. Here FJA is Facet Joint Arthritis ≥ grade 2 at one facet joint or more. Chi-square test (lumbar spine pain present vs. no lumbar spine pain by lumbar spinal level in men, women, and total population)

Table 10: Prevalence of facet joint arthritis Grade 3 according to cervical spine levels in individuals with or without axial spine pain

Level	Men			Women			Total		
	With spine pain	Without spine pain	Chi-square test (*P*)	With spine pain	Without spine pain	Chi-square test (*P*)	With spine pain	Without spine pain	Chi-square test (*P*)
C2-C3	0	3	-	0	0	-	0	3	0.148 (0.700)
C3-C4	0	3	-	3	0	-	3	3	1.778 (0.182)
C4-C5	0	3	-	0	0	-	0	3	0.148 (0.700)
C5-C6	0	0	-	0	0	-	0	0	-
C6-C7	0	0	-	0	0	-	0	0	-
C7-T1	0	0	-	0	0	-	0	0	-
Total cervical levels	0	9	7.259 (0.007)*	3	0	7.259 (0.007)*	3	9	3.000 (0.083)

*$P<0.05$. Here FJA is Facet Joint Arthritis ≥ grade 3 at one facet joint or more. Chi-square test (cervical spine pain present vs. no cervical spine pain by cervical spinal level in men, women, and total population)

DISCUSSION

This is the first study to know the prevalence of FJA in mountain population.

Many studies on FJA have been done previously, but most of them are based on the evaluation of FJs of patients presenting with Low Backache. In such studies, a potential objection remains that the participants are already known cases of spinal pain and hence, FJA in the absence of any other findings automatically leads to biased correlation between FJA and spinal pain.

The study was designed to avoid this fallacy as FJs of patients undergoing CT for complaints other than spinal pain were studied.

Table 11: Prevalence of facet joint arthritis Grade 3 according to dorsal spine levels in individuals with or without axial spine pain

Level	Men			Women			Total		
	With spine pain	Without spine pain	Chi-square test (*P*)	With spine pain	Without spine pain	Chi-square test (*P*)	With spine pain	Without spine pain	Chi-square test (*P*)
D1-D2	6	6	0.646 (0.199)	3	3	0.004 (0.951)	9	9	0.126 (0.723)
D2-D3	3	6	3.348 (0.067)	6	0	6.852 (0.009)	9	6	0.229 (0.632)
D3-D4	6	0	1.766 (0.184)	0	6	4.284 (0.038)	6	6	0.082 (0.775)
D4-D5	9	3	0.412 (0.521)	0	0	-	9	3	2.228 (0.135)
D5-D6	6	3	0.000 (1.000)	0	3	0.723 (0.395)	6	6	0.082 (0.775)
D6-D7	0	0	-	6	6	0.499 (0.480)	6	6	0.082 (0.775)
D7-D8	3	0	0.384 (0.536)	6	9	0.002 (0.968)	9	9	0.126 (0.723)
D8-D9	9	6	0.338 (0.771)	6	3	1.713 (0.191)	15	9	0.765 (0.382)
D9-D10	9	3	0.412 (0.521)	6	9	0.002 (0.968)	15	12	0.028 (0.866)
D10-D11	9	0	3.348 (0.067)	6	12	0.445 (0.505)	15	12	0.028 (0.866)
D11-D12	15	9	0.228 (0.633)	6	12	0.445 (0.505)	21	21	0.326 (0.568)
D12-L1	15	9	0.228 (0.633)	6	12	0.445 (0.505)	21	21	0.326 (0.568)
Whole	90	45	17.998 (0.000)*	51	75	17.998 (0.000)*	141	120	1.690 (0.194)

*$P<0.05$. Here FJA is Facet Joint Arthritis ≥ grade 3 at one facet joint or more. Chi-square test (dorsal spine pain present vs. no dorsal spine pain by dorsal spinal level in men, women, and total population)

Table 12: Prevalence of facet joint arthritis Grade 3 according to lumbar spine level with or without axial spine pain

Level	Men			Women			Total		
	With spine pain	Without spine pain	Chi-square test (*P*)	With spine pain	Without spine pain	Chi-square test (*P*)	With spine pain	Without spine pain	Chi-square test (*P*)
L1-L2	9	12	0.800 (0.371)	9	12	1.803 (0.179)	18	24	2.615 (0.106)
L2-L3	12	15	0.743 (0.389)	6	0	3.240 (0.072)	18	15	0.004 (0.951)
L3-L4	9	3	2.688 (0.101)	18	15	0.044 (0.834)	27	18	0.803 (0.370)
L4-L5	9	6	0.915 (0.339)	15	18	2.074 (0.150)	24	24	0.000 (1.00)
L5-S1	12	12	0.025 (.873)	21	9	3.114 (0.078)	33	21	1.431 (0.232)
Total levels	51	48	0.091 (0.763)	69	54	1.829 (0.176)	120	102	1.459 (0.227)

*$P<0.05$. Here FJA is Facet Joint Arthritis ≥ grade 3 at one facet joint or more. Chi-square test (lumbar spine pain present vs. no lumbar spine pain by lumbar spinal level in men, women, and total population)

Table 13: Prevalence of facet joint arthritis ≥; 2 according to age in individuals with or without axial spinal pain

Age	Men			Women			Total		
	With spine pain	Without spine pain	Chi-square test (*P*)	With spine pain	Without spine pain	Chi-square test (*P*)	With spine pain	Without spine pain	Chi-square test (*P*)
<40	9	3	1.646 (0.200)	9	3	3.023 (0.082)	18	6	5.107 (0.024)*
40-49	9	6	0.022 (0.883)	12	9	0.318 (0.573)	21	15	0.379 (0.538)
50-59	0	6	9.164 (0.002)*	6	15	6.154 (0.013)*	6	21	13.139 (0.000)*
60-69	3	12	11.455 (0.001)*	12	6	2.035 (0.154)	15	18	1.186 (0.276)
>70	21	3	12.6 (0.000)*	3	9	4.068 (0.044)*	24	12	3.095 (0.079)
All ages	42	30	2.00 (0.157)	42	42	0.111 (0.739)	84	72	0.923 (0.737)

*$P<0.05$. Here FJA is Facet Joint Arthritis ≥ grade 2 at one facet joint or more. Chi-square test (spine pain present vs. no spine pain by spinal level in men, women and total population)

Moreover, to make it more focused, those patients were not included in the study who have been living in mountain areas for <15 years and those whose lifestyle/job profile requires them to walk <5 km daily on an average in mountain terrain.

FJs are best evaluated on CT scans with precise osseous details.

The prevalence of FJA in this study was higher than that in the study by Kalichman *et al.*,[10] Ko *et al.*,[16] and Jentzsch *et al.*[17] [Table 14]. This is perhaps because of altered biomechanics of walking, as described earlier, leading to higher prevalence of FJA in hilly population.

As expected, FJA increases with age, with almost 92.3% of the study population greater than 70 years having it [Figure 1]. However, FJA is not a corollary of long age, with many people having age-defying findings on CT spine [Figures 2 and 3].

Noteworthy is the 38.09% of the young population<40 years old having FJA, which is significant as compared to 25% of Kalichman *et al*.,[10] 17.54% of Ko *et al*.,[15] and 27% of Thorsten Jentzsch *et al*. (though in this study authors have taken ≥ Grade 1 as FJA)[17] [Figure 4].

The high prevalence of FJA at either the upper lumbar L1–2 and L2–3 level or at the last L5–S1 levels is perhaps due to the proximity to comparatively more mobile dorso-lumbar and lumbo-sacral motion segments. However, the presence of FJA at a particular region cannot be generalized to other regions of spine as well [Figure 5].

Out of the 210 patients, 48.5%, i.e., 102, had spinal pain which included 51.4% of the total men and 45.7% of the total women.

This is higher than that published by Damian Hoy *et al*. (31.0%);[18] Beaudet *et al*. (1.4%) in all adults of Quebec, Canada;[19] Goetzel *et al*. (15.6%) in industry workers in the USA;[20] Joud *et al*. (3.0%) in Sweden;[21] and Spijker-Huiges *et al*. (1.7%) in the Netherlands[22] and comparable to reviews done by Quinette *et al*. (50%) in Africa.[23]

However, this high prevalence of FJA was associated with statistically significant spinal pain only in cervical and dorsal spine regions. In lumbar spine region, no significant relation could be established between FJA and spinal pain.

When we found that FJA ≥ Grade 2 had no statistically significant relation with spinal pain in lumbar region, then a possibility arose that may be Grade 3, i.e., severe FJA may be related to spinal pain. On analysis, we found that even

Table 14: Comparison of the prevalence of facet joint arthritis

Study	Prevalence
Kalichman *et al*.[10]	59.6% of males and 66.7% of females had ≥ Grade 2 FJA
Ko S *et al*.[16]	17.58% of the study population with ≥ Grade 2 FJA
Jentzsch T *et al*.[17]	49.7% of the population (though ≥ Grade 1 has been taken as FJA)
Our study	74.2% of the study population had ≥ Grade 2 FJA

FJA - Facet joint arthritis

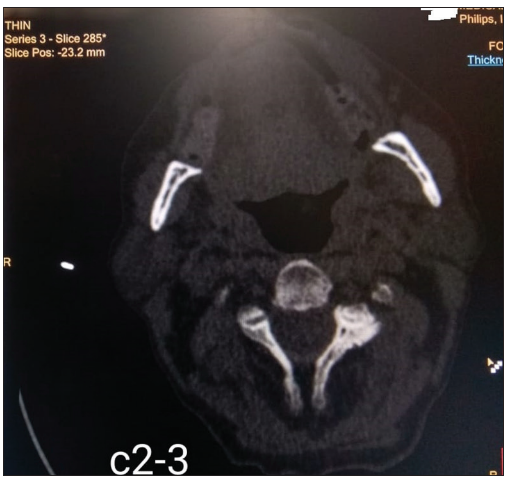

Figure 1: Axial section of cervical spine in a 70-year-old male showing facet joint arthritis


Figure 2: Sagittal section of L-S spine: Even at 72 years of age, this female had normal space in facet joints

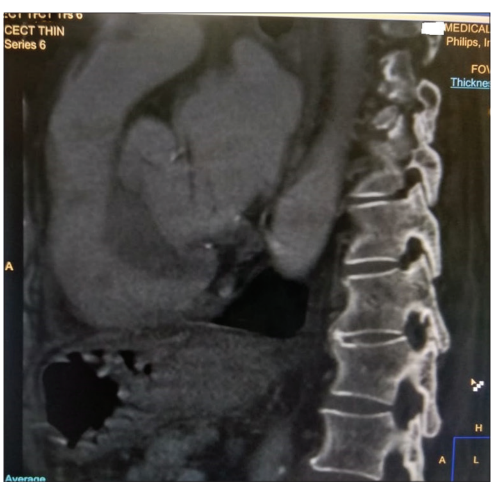

Figure 3: Dorsal spine facet joint arthritis in a 97-year-old male – oldest participant in our study

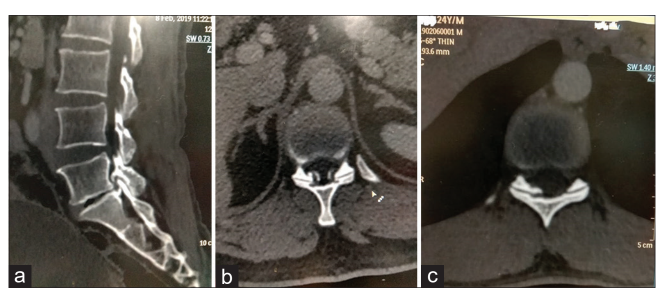

Figure 4: Grade 3 FJA in a young 24 years old male, who also had spinal pain. Large osteophytes and decreased joint space is evident in sagittal (a) and axial section (b and c)

Grade 3 FJA had no statistically significant relation with spinal pain in lumbar region in both men and women as well as in the total population. Ashraf *et al*.[24] concluded in their study that there is a significant enhancement in patient disability with increasing the severity of spine osteoarthritis only in female group. However, we found no such association even in females.

Our observations regarding the relation between FJA and spinal pain in lumbar spine are almost same as concluded by Borenstein[3] and Schwarzer *et al*.[6]

All previous classifications are mainly based on axial computed tomographic (CT) images.

However, over the course of the present study, we have found that sagittal view and imaging is equally important for the assessment of FJs, especially in dorsal and cervical joints. On axial imaging, many times, FJ space narrowing is overreported and joints may appear to be overlapped.

In the sagittal view, the FJ space measurement values are more at same level as compared to axial sections [Figure 6].

Decrease in joint space is not uniform; especially at margins and along the inferior aspects of joints [Figure 7].

We encountered many cases where joint space was normal but osteophytes or sclerosis was seen [Figure 8].

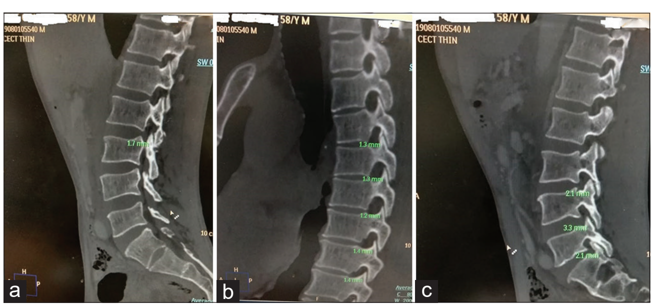

Figure 5: Facet joint arthritis seen in dorsal spine, upper lumbar (a and b) is Grade 3, but in the same patient, facet joint space at lower lumbar levels (c) is normal

The radiological diagnosis of FJA may not necessarily correlate with the clinical picture [Figure 9].

The advent of cross-sectional imaging techniques such as MRI and CT has made it possible to diagnose and manage a myriad variety of pathologies with far greater accuracy than what was possible without them. In the last few decades, the spectrum of cross-sectional imaging indications has increased and a lot of researches have been done in various fields regarding its applications, particularly in spine imaging. The benefits of CT/MRI are not without their own banes. The surprisingly low cost and prompt availability in developing countries like India have led to CT/MRI being projected as almost the first line of diagnostic modality. In spite of the limited theoretical indications, advocating restrained use of CT/MRI, still the patient demand for visual evidence, tendency to milk the insurance policies, and financial incentives to health-care providers have led to the development of a cultural misconception that evaluation and management of back pain is incomplete without CT/MRI scan of the affected region and even whole spine in many cases.

In a substantial number of patients with complaints of nonspecific backache, the MRI/CT evaluation leads to findings which add to the problem instead of helping. The relationship between FJA on imaging and clinically significant spinal pain is one of such controversies, with patients insisting on management with invasive/noninvasive modalities of such findings at single or multiple levels.

Limitations of the study

One of the limitations of our study is that as we have studied the FJs of the whole spine including cervical, thoracic, and lumbar spine, some patients may have not been able to clearly localize their back pain specifically in dorsal or lumbar region. Besides this, the radiating/diffuse pain may have led to an erroneous response.

Although CT scan is best for the evaluation of osseous details, still, we cannot see other early or associated findings such

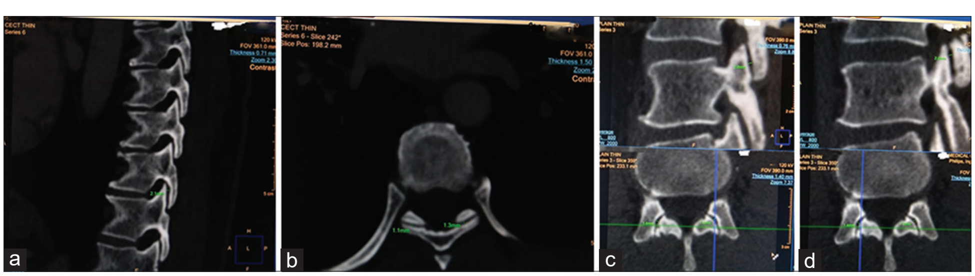

Figure 6: Facet joint space as measured in sagittal section can be more than on axial section at the same level (a) sagittal (patient 1) and (b) axial (patient 1), (c) left facet joint sagittal and axial (patient 2) and (d) right facet joint sagittal and axial (patient 2)

Figure 7: Decrease in joint space is not uniform, more decreased on margins, especially inferiorly in sagittal section

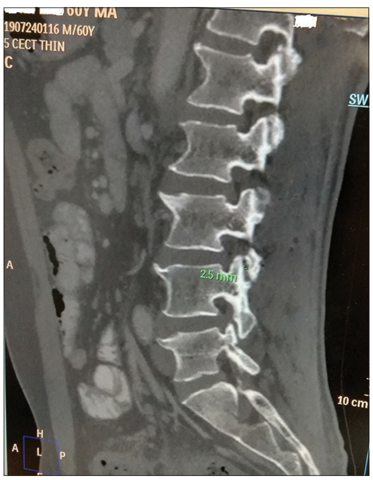

Figure 8: In this 60-year-old male patient, severe degeneration and osteophytes were present, but the facet joint space was normal

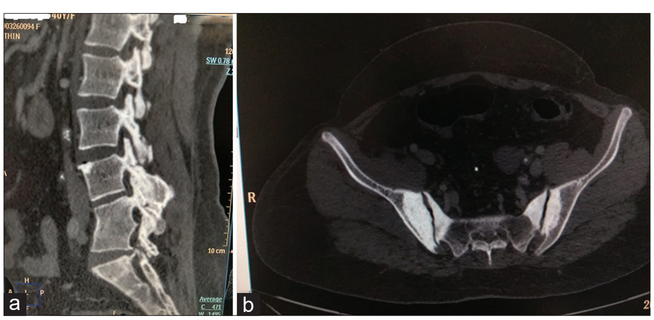

Figure 9: A 40-year-old female had complete block vertebras with severe facet joint arthritis (a), had degenerative sacroiliitis and was obese, (b) but surprisingly, she had no spine pain at all

as subarticular edema and effusions of FJs and surrounding tissues on CT as precisely as what is possible on MRI. However, dedicated MRI spine study of patients is usually done in patients who have spine-related complaints, and this will definitely lead to bias and error in results. Performing special MRI spine of patients who present to hospital with complaints other than backache is not feasible, which may create great financial burden and has ethical issues.

The cross-sectional design of our study renders it vulnerable to flaws, which can be avoided in longitudinal studies, the results of which may be statistically even more significant.

The number of cervical spine cases in our study is less. The probable cause is that CT cervical spine was mostly done for trauma cases, and majority of them were not in position to complete the questionnaire either because of spine injury itself or accompanying head injury and hence had to be excluded.

Another shortcoming of our study is some recall bias, particularly of patients in older age group.

CONCLUSION

We conclude that people residing and actually ambulating in the mountain regions and exposed to the terrain have higher prevalence of FJA as compared to the general population, and this may be an independent risk factor for the development of FJA.

The high prevalence of FJA is not clearly associated with the corresponding spinal pain in the lumbar region. Whereas, in the cervical and dorsal spine regions, statistically significant correlation between FJA and spinal pain does exists.

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Conflicts of interest

There are no conflicts of interest.

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