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# Frequency of inflammatory back pain and sacroiliitis in Egyptian patients with rheumatoid arthritis

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## Abstract

**Background:** The aim of this study is to determine the frequency of inflammatory back pain and associated ankylosing spondylitis in rheumatoid arthritis patients.

**Results:** Sacroiliitis was found in 22% of rheumatoid arthritis patients. The frequency of rheumatoid arthritis patients who fulfilled classification criteria for spondyloarthritis or ankylosing spondylitis was 58%, in whom HLA-B27 was positive in 21 patients (35.2%) and was correlated with MRI sacroiliitis. Twenty percent of rheumatoid arthritis patients had ankylosing spondylitis (56%) and 27% had axial spondyloarthritis.

**Conclusion:** Frequencies of inflammatory back pain and sacroiliitis in Egyptian rheumatoid arthritis patients were high.

**Keywords:** Rheumatoid arthritis, Ankylosing spondylitis, Inflammatory back pain, Sacroiliitis

## Background

Rheumatoid arthritis (RA) is a chronic inflammatory disease characterized by synovial inflammation in the musculoskeletal joints resulting in cartilage degradation and bone destruction [1]. It is a multi-factorial disease sustained by environmental and genetic factors [2, 3]. Cytokine imbalance and oxidative stress have been reported to play a role in Egyptian RA patients [4–7].

Rheumatoid arthritis involves the peripheral and axial skeleton. Any synovial joint in the limbs may be affected. In the spine, there is a preference for the cervical area, especially the apophysial and atlantoaxial joints, whereas sacroiliac joint (SIJ) involvement is rare [8]. Cervical spine disorders are well-known manifestations of RA. However, RA patients often also present with back pain, but the frequency of symptoms of the thoracolumbar spine is rarely studied [9]. An increased prevalence of low back pain (LBP) was associated with human leukocyte antigen B27 (HLA-B27) in RA patients [10].

Coexistence of RA and ankylosing spondylitis (AS) in one patient is rare [11] and radiological changes were typical for both diseases. In doubtful cases, in order to confirm the coexistence of both diseases, magnetic resonance imaging (MRI), scintigraphy, and computed tomography may be useful in detecting early changes in the SIJs, not only in AS, but also in patients with RA [12, 13].

## Patients and methods

One hundred consecutive patients (83 female, 17 male) who fulfilled the 1987 ACR classification criteria for RA [14] in the period from July 2015 to August 2016 were included in the present study. All patients were attending the outpatient rheumatology clinic, Minia University Hospitals, Egypt.

The disease activity score in 28 joints (DAS28) [15] and Health Assessment Questionnaire—disability index (HAQ-DI) were assessed [16]. Inflammatory back pain (IBP) was defined according to both Calin [17] and experts' [18] criteria. RA patients were grouped according to the Calin criteria into those who fulfilled the criteria (Group 1; n = 52) and those who did not (Group 2; n = 48).

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**Table 1** Characteristics of the rheumatoid arthritis patients

Parameter Mean $\pm$ SD (range) or n (%)	RA patients (n = 100)
Age (years)	41.4 $\pm$ 11.9 (18–72)
Sex F:M	83/17 4.9:1
DD (years)	6 $\pm$ 5.3 (0.25–20)
Age at onset (years)	35.4 $\pm$ 11.2 (17–70)
DAS 28	4.4 $\pm$ 1.1 (1.1–6.3)
HAQ-DI	1.2 $\pm$ 0.6 (0–3)
ESR (mm/1st h)	44.1 $\pm$ 27.8 (5–120)
RF +ve	56 (56)
X-ray hand/wrist erosions	78 (78)

DD disease duration, DAS28 disease activity score 28, HAQ-DI health assessment questionnaire-disability index, ESR erythrocyte sedimentation rate, RF rheumatoid factor

Physical examination included searching for signs of axial involvement. A modified Schöber's test according to Moll and Wright was used [19] and assessment of the lateral trunk flexion was done. Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) and Bath Ankylosing Spondylitis Functional Index (BASFI) [20] were calculated for patients with IBP. Plain x-ray of the hands and wrists (antero-posterior view), SIJs (anteroposterior view), and lumbar spine (lateral view) were done for all patients. MRI (T2WI and STIR

sequences) on SIJs was done for RA patients who had IBP with normal pelvic x-ray or with pelvic x-ray suspicious of sacroiliitis (SI). MRI of the SIJ was evaluated by the radiologist who was blind to the clinical and x-ray findings.

Both the European Spondyloarthropathy Study Group (ESSG) criteria [21] and Amor criteria [22] were used to classify patients for spondyloarthritis (SpA), the Assessment of Spondyloarthritis International Society (ASAS) classification criteria [23] were used to diagnose axial SpA and the modified New York (mNY) criteria [24] was used to classify AS. Rheumatoid factor (RF) and erythrocyte sedimentation rate (ESR) were assessed in all patients. Human leukocyte antigen B27 (HLA B27) was investigated in patients who met one of the classification criteria for SpA (ESSG criteria and Amor criteria) or AS (mNY criteria).

#### Statistical analysis

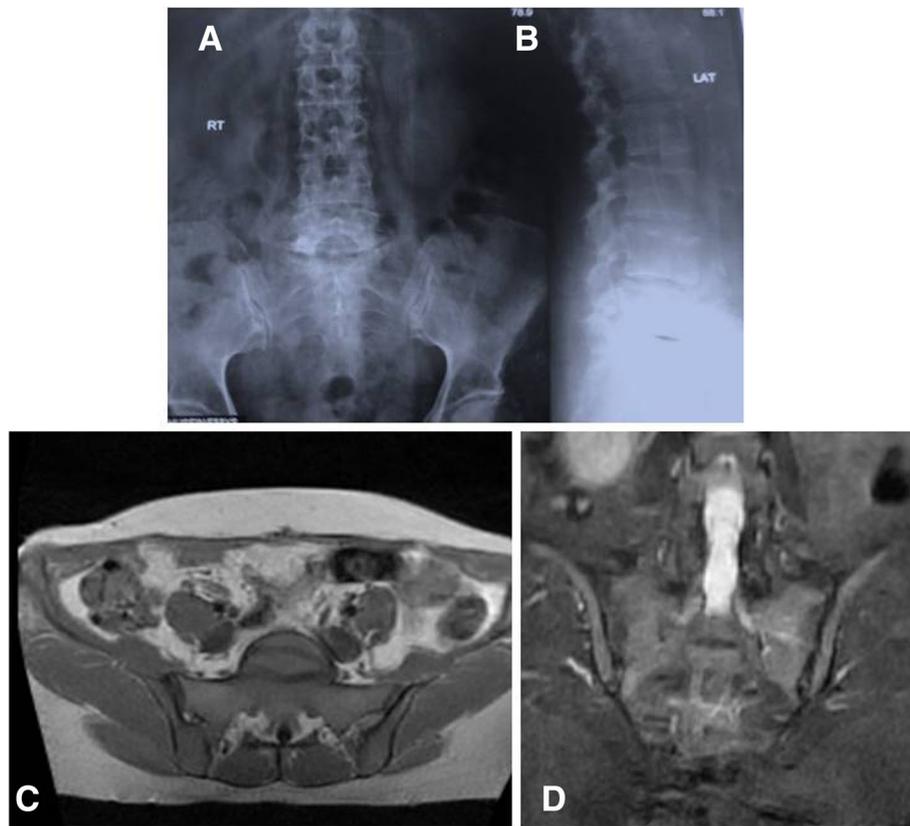
Analysis of data was done using SPSS (Statistical program for social science) version 16. Data were expressed as mean  $\pm$  SD for parametric and as number and percent for non-parametric variables. Comparison between groups for parametric data was done by independent samples t test (unpaired t test). Chi-square ( $X^2$ ) test was used to compare qualitative

**Table 2** Characteristics of rheumatoid arthritis patients with coexisting ankylosing spondylitis

Case	Age (years)	Sex	First symptom	Age O (years)	Back pain	Gluteal pain	Enth.	Sacroiliitis		RN/ ErosA	RF	HLA-B27	Axial SpA
								Clin.	X-ray				
1	40	F	PolyA	33	IBP	+	+	+	G1	-/+	-	+	+
2	29	F	PolyA	26	IBP	+	+	-	G2	-/+	-	-	+
3	23	F	PolyA	21	IBP	+	+	+	G2	-/-	+	+	+
4	45	F	PolyA	35	IBP	+	+	-	G2/3	+/+	-	-	-
5	50	F	PolyA	43	IBP	+	+	+	G2/3	-/+	-	-	-
6	37	F	PolyA	34	IBP	-	+	+	G2	-/+	+	-	+
7	32	F	PolyA	29	IBP	+	+	+	G2	-/+	+	+	+
8	44	F	PolyA	43	IBP	+	+	+	G2	-/-	-	-	+
9	44	F	PolyA	42	IBP	+	+	+	G2	-/-	-	-	+
10	41	F	PolyA	21	IBP	+	+	+	G3	-/+	-	+	+
11	50	F	PolyA	36	IBP	+	+	-	G2	-/+	+	-	-
12	45	F	PolyA	42	Non-I	+	+	+	G2	-/+	+	-	+
13	20	F	PolyA	18	IBP	+	+	+	G2	-/+	+	-	+
14	35	F	PolyA	34	IBP	-	+	+	G2	+/+	+	+	+
15	42	F	PolyA	39	IBP	+	+	-	G2	-/-	-	-	+
16	27	F	PolyA	26	IBP	+	+	-	G3*	-/+	+	+	-
17	32	F	PolyA	20	IBP	-	-	-	G2	-/+	+	-	+
18	27	F	LBP	26	IBP	+	+	+	G2	-/-	-	-	+
19	31	F	PolyA	21	Non-I	-	+	-	G1/4	+/+	-	+	+
20	25	F	PolyA	23	IBP	+	+	-	G2/3	-/-	-	-	+

F female, PolyA polyarthritis, AgeO age at onset, LBP low back pain, IBP inflammatory back pain, non-I non-inflammatory, Enth enthesitis, Clin clinical, G grade, RN rheumatoid nodule, ErosA erosive arthritis, RF rheumatoid factor, HLA-B27 human leukocyte antigen-B27, SpA spondyloarthritis

\*All had bilateral sacroiliitis except one patient was unilateral



**Fig. 1** Female patient 44 years with rheumatoid arthritis. **a** Plain X-ray lumbar sacral spine AP and lateral views showed lumbar spine syndesmosophytes of the facet joints with degenerative disc changes and narrowed sclerotic sacroiliac joints. **c** Axial MRI T1WI and **d** coronal T2WI of the sacroiliac joints showed early peri-articular edema

variables. Correlations were calculated using Pearson's or Spearman's rank correlation coefficient. The level of statistical significance was set at a  $p$  level  $< 0.05$ .

## Results

Characteristics of the RA patients are demonstrated in Table 1. The most utilized treatments received were antimalarials (85%) followed by methotrexate (79%), non-steroidal anti-inflammatory drugs (74%), leflunomide (20%), and sulfasalazine (6%). Tumor necrosis factor-alpha (TNF- $\alpha$ ) inhibitor (infliximab) was received by one patient.

Eighty-five percent of RA patients had chronic back pain lasting  $\geq 1$  month. Among 100 RA patients, the frequency of IBP was 52% according to Calin and 45% according to experts' criteria. According to the ASAS classification criteria, 27 patients had axial SpA, and according to mNY criteria, 20 patients had AS (all were females and had characteristic clinical, radiological, and laboratory findings of RA as shown in Table 2). Classification steps for axial SpA (ASAS) and AS (mNY) are shown in Fig. 1. Fifty-six percent and 26% of RA patients had SpA according to the ESSG

**Table 3** Characteristics of HLA-B27 positive patients with RA who met any of the classification criteria for SpA or AS

Parameter	RA patients ( $n = 21$ )
Mean $\pm$ SD (range) or $n$ (%)	
Age (years)	37.09 $\pm$ 11.78 (21–62)
Sex F:M	15/6 2.5:1
RF +ve	10 (47.61)
X-ray hand/wrist erosions	14 (66.7)
IBP	20 (95.2)
Clinical enthesitis	19 (90.5)
Clinical SI	13 (62.9)
Radiographic SI	18 (85.7)
X-ray lumbar changes*	19 (90.5)

RA rheumatoid arthritis, RF rheumatoid factor, IBP inflammatory back pain, SI sacroiliitis

\*Squaring and Roman's sign

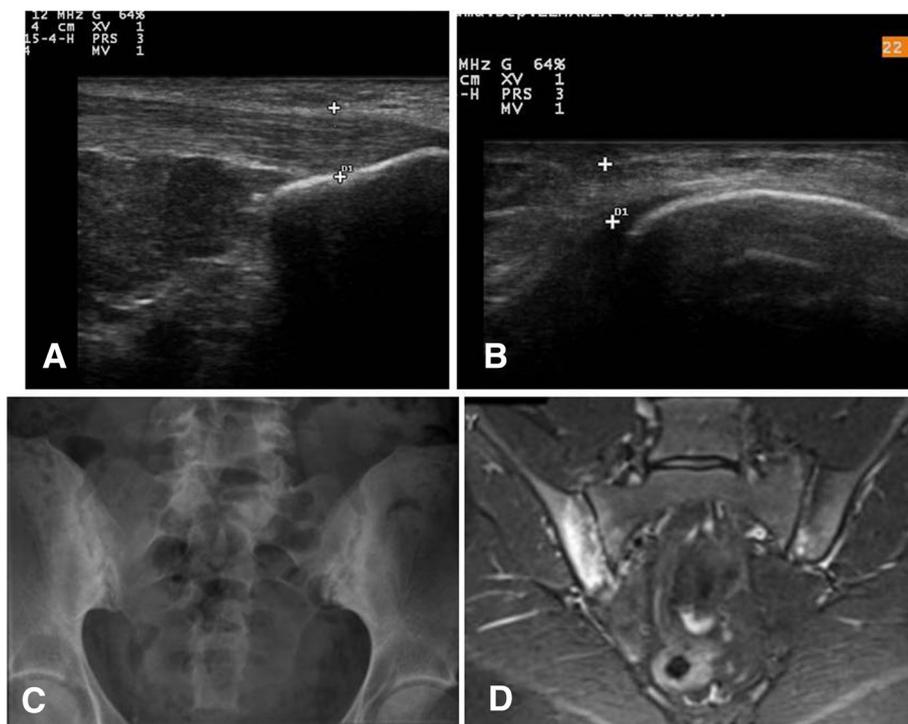
**Table 4** Differences in demographic data, clinical and radiological features between two groups of RA patients

Parameter Mean $\pm$ SD (range) or n (%)	IBP in RA patients according to Calin criteria		<i>p</i>
	With ( <i>n</i> = 52)	Without ( <i>n</i> = 48)	
Age (years)	37.1 $\pm$ 11.7 (18–62)	45.1 $\pm$ 11.2 (21–72)	<i>0.003</i>
Age at onset (years)	32.6 $\pm$ 11.2 (17–60.5)	38.4 $\pm$ 10.6 (20.5–70)	<i>0.01</i>
DD (years)	5.3 $\pm$ 5.1 (0.5–20)	6.7 $\pm$ 5.5 (0.25–20)	0.2
RF	26 (50)	30 (62.5)	0.2
Clinical SI: Unilateral	13 (25)	9 (18.8)	0.5
Bilateral	22 (42.3)	9 (18.8)	<i>0.01</i>
Modified Schöber's test (cm)	14.4 $\pm$ 0.9	14.8 $\pm$ 0.8	0.07
Lateral flexion (cm): Rt	4.9 $\pm$ 0.6	4.9 $\pm$ 0.6	0.8
Lt	4.8 $\pm$ 0.6	4.8 $\pm$ 0.7	0.7
Chest expansion (cm)	4.7 $\pm$ 0.6	4.8 $\pm$ 0.5	0.4
BASDAI	4.3 $\pm$ 2.1 (0.8–9.4)	NA	NA
BASFI	4.1 $\pm$ 2.1 (0–8.9)	NA	NA
X-ray hand/wrist erosion	38 (73.1)	40 (83.3)	0.2
Radiographic SI: Bilateral	29 (55.8)	10 (20.8)	<i>&lt; 0.001</i>
Unilateral	10 (19.2)	7 (14.6)	0.5
X-ray lumbar changes*	39 (75)	22 (45.8)	<i>0.003</i>
BME (MRI SIJ): Rt	11 (36.3)	1 (5.9)	<i>0.03</i>
Lt	10 (30.3)	1 (5.9)	<i>0.048</i>

IBP inflammatory back pain, RA rheumatoid arthritis, DD disease duration, RF rheumatoid factor, SI sacroiliitis, BASDAI Bath Ankylosing Spondylitis Disease Activity Index, BASFI Bath Ankylosing Spondylitis Functional Index, BME bone marrow edema, MRI magnetic resonance imaging, SIJ sacroiliac joint, NA not available

\*Squaring and Roman's sign

Italicized values are significant at *p* < 0.05



**Fig. 2** Female patient 40 years with rheumatoid arthritis. Enthesiitis (a) ultrasound of the ankle showed thickened Achilles tendon. b Musculoskeletal ultrasound of the knee showed quadriceps tendon. c Plain X-ray of the sacroiliac joint AP view showed ankylosis of the sacroiliac joint with sclerotic margin. d T2WI of the sacroiliac joint showed bone edema more evident at the right side



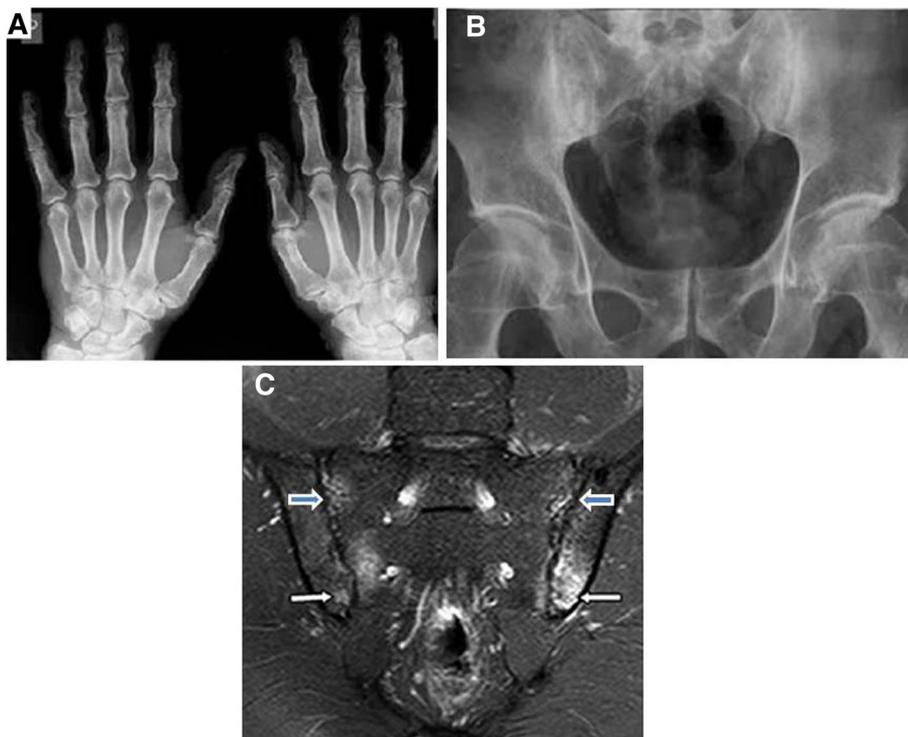
**Fig. 3** Female patient 45 years with rheumatoid arthritis. **a** Plain X-ray lumbar sacral spine AP, lateral views showed normal lumbar spine with mild sclerotic margin of the left sacroiliac joint. **b** MRI-STIR sequence showed edema of the left sacroiliac joint

and Amor's criteria. The total number of RA patients who fulfilled any of the classification criteria for SpA (ESSG and Amor criteria) or AS (mNY criteria) is 58 patients, HLA-B27 was positive in 36.2%.

Among patients with SpA (ESSG and Amor criteria), AS (mNY criteria), or axial SpA, the frequency of RF positivity was 48.2%, 42.3%, 45%, and 40.7%, respectively.

Characteristics of HLA-B27-positive patients with RA who met any of the classification criteria for SpA or AS are shown in Table 3.

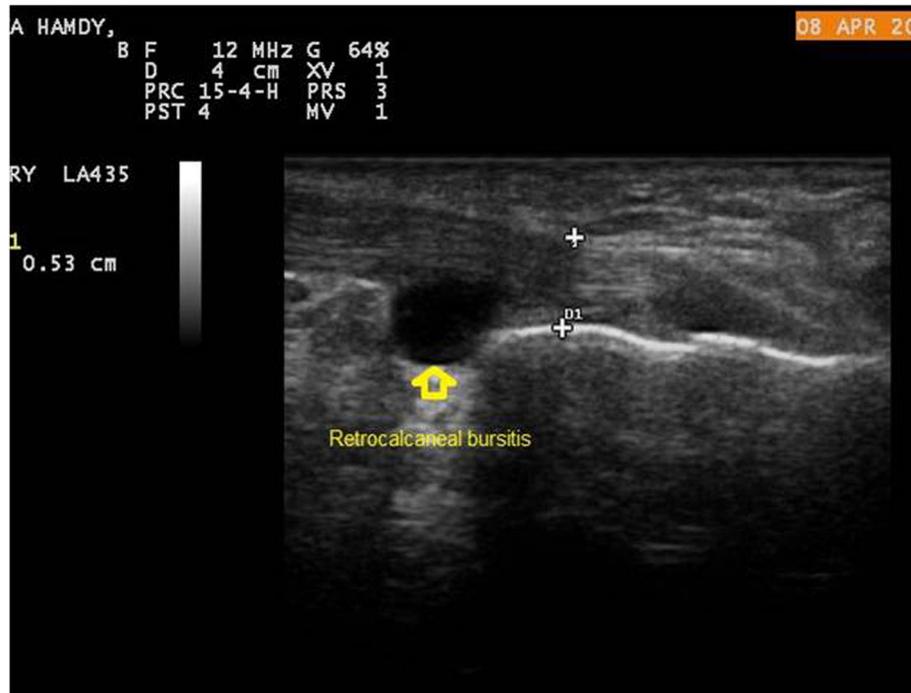
Differences in demographic data, clinical, and radiological features between RA patients with and without IBP according to Calin criteria are shown in Table 4. In those with IBP, right SIJ showed the following grades: G1 in 14 patients, G2 in 13, and G3 in 4, while left SIJ showed G1 in 19 patients, G2 in 14, and G3 in 4. Out of 52 patients, MRI on SIJ was done for 33 and bone marrow edema (Fig. 2)—suggestive of active sacroiliitis were detected in 13 patients (Fig. 1a, c, d; Fig. 2c, d; Fig. 3a, b; Fig. 4b, c; and Fig. 5).



**Fig. 4** Female patient 37 years with spondyloarthritis. **a** X-ray both hand AP view showed erosion of the DIP joints with periarticular osteopenia. **b** X-ray sacroiliac joint showed bilateral sacroiliitis (**b**). T2WI of both sacroiliac joints showed bone marrow edema (thick arrow), more in right sacroiliac joint, with right posterior subchondral erosion (small arrow)



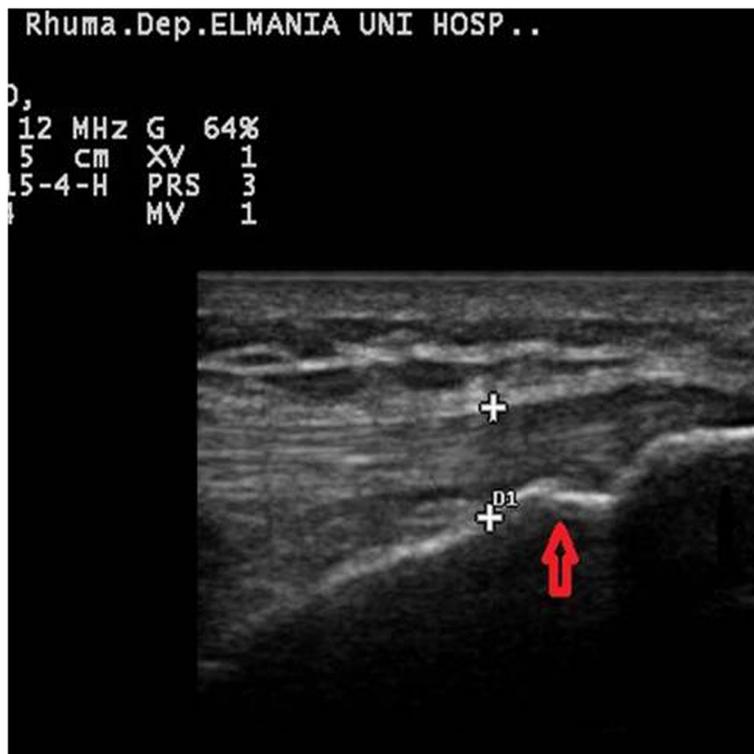
**Fig. 5** MRI sacroiliac joints (coronal t2WI in 45-year-old male RA patient showing focal bone marrow edema in left SII (blue arrow)



**Fig. 6** MSUS of left Achilles tendon of 29-year-old female RA patient showing retro calcaneal bursitis (yellow arrow), increased thickness of Achilles tendon (5.3 mm) and loss of fibrillary pattern



**Fig. 7** MSUS of right Achilles tendon of 26 years female RA patient showing calcification at insertion site and loss of fibrillary pattern



**Fig. 8** MSUS of right distal patellar tendon of 41 years male RA patient showing abnormal structure, increased thickness (5.7 mm), and erosion (red arrow)



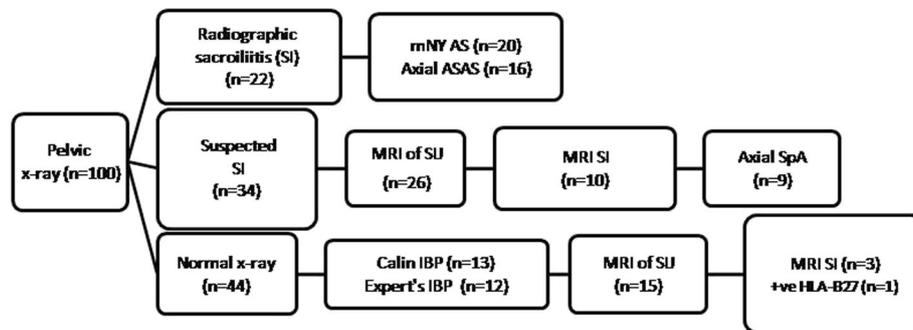
**Fig. 9** MSUS of right plantar aponeurosis insertion of 44 years female RA patient showing areas of calcification (blue arrow)

The IBP was not related to the disease duration, RF, DAS-28, and HAQ scores. HLA-B27 significantly correlated with the presence of SI detected by MRI ( $r_s = 0.82$ ,  $p < 0.001$ ). BASDAI significantly correlated with DAS28 ( $r = 0.31$ ,  $p = 0.02$ ), while BASFI

significantly correlated with DAS28 ( $r = 0.48$ ,  $p < 0.001$ ) and HAQ-DI ( $r = 0.56$ ,  $p < 0.001$ ). However, both BASDAI and BASFI were not related to the disease duration. Finally, there was no significant correlation between SI and erosive hand arthritis



**Fig. 10** MSUS of right triceps tendon of 35 years female RA patient showing abnormal structure and calcification (white arrow)



**Fig. 11 a, b** Flow chart showing the classification steps for ankylosing spondylitis and axial spondyloarthritis in the 100 rheumatoid arthritis patients. SI, sacroiliitis; mNY, modified New York; ASAS, Assessment in SpondyloArthritis international Society; MRI, magnetic resonance imaging; SIJ, sacroiliac joint; SpA, spondyloarthritis; IBP, inflammatory back pain; HLA-B27, human leucocyte antigen-B27

(Fig. 4a). The diagnosis of RA with AS detected in 20 patients; 19 (95%) of them had clinical enthesitis (Figs. 1 a, b; 6, 7, 8, 9 and 10). Flow chart showing the classification steps for ankylosing spondylitis and axial spondyloarthritis in the 100 rheumatoid arthritis patient was illustrated at Fig. 11a, b.

## Discussion

Rheumatoid arthritis is a chronic joint disease which if untreated leads to permanent structural damage and disability. The majority of evidence points to an immune-mediated etiology associated with stromal tissue dysregulation that together propagate chronic inflammation and articular destruction [25].

The present study revealed higher frequencies of IBP and radiographic (sacroiliitis) SI in RA patients. IBP was found in 52% of patients and definite radiographic SI was found in 22%. Thirty-four patients had suspected radiographic SI and was detected in 10 (29.4%) by MRI on SIJ. Moreover, MRI SI was detected in 3/15 (20%) patients with IBP and normal pelvic radiograph. Twenty percent of RA patients had AS, 56% and 26% had SpA according to the ESSG and Amor's criteria, and 27% had axial SpA. To our knowledge, this is the first study reporting the frequency of IBP and AS in Egyptian patients with RA. Can et al. [12] found the prevalence of IBP 16.8% according to Calin criteria and 11.4% according to experts' criteria among 167 RA patients and detected radiographic sacroiliitis (SI) in 4/164 (2.4%). However 14.02% of patients had suspected SI on radiographs and only 1 was detected by MRI. MRI SI was detected in 4/137 (2.9%) patients with IBP and normal pelvic radiograph.

Sacroiliitis is one of the important symptoms in patients attending infectious diseases and rheumatology clinics. Some patients with SI are asymptomatic, and some have unspecific symptoms [26]. In RA, SIJ inflammation is rare, however affection up to 20% of patients has been reported

[27]. Ankylosis of SIJ is rarely observed, the changes are located in distal sections and the degree of damage is low [11]. These are in agreement with the present results, as most of RA patients have grade 1 or 2 SI and few cases have grade 3.

In the present study, the activity and functional indices of AS significantly correlated with RA disease activity in patients with IBP. In patients with SpA or AS, HLA-B27 was positive in 35.2% and significantly correlated with MRI SI. All RA patients with positive HLA-B27 had LBP that was mostly inflammatory. In agreement, Mera-Varela et al. [28] reported an increased prevalence of LBP (27.5%) in RA patients with positive HLA-B27 being inflammatory in 12.5%.

Spondyloarthritis encompasses a group of inflammatory conditions with shared features. Both peripheral and axial joints can be affected. SpA is distinct from RA, and it is important to recognize and manage early in their presentation to improve health outcomes [29]. The coexistence of RA and AS in the same patient has rarely been reported [11, 27, 30–35].

In the present study, we report the diagnosis of RA and AS in 20 patients. Polyarthritides was the first symptom in 19 patients (95%), while IBP was the first symptom in only 1 patient. All patients have chronic LBP which was inflammatory in 18 (90%) patients. Twelve (60%) had clinical SI and all had radiographic SI. Nineteen (95%) had clinical enthesitis, 9 (45%) had positive RF, and 7 (35%) had positive HLA-B27. The explanation of this coexistence is that AS had developed by chance in patients already suffering from RA or conversely, RA had occurred by chance in patients already suffering from AS. To reach to the firm diagnosis, integration of radiographic, clinical, and laboratory data are required.

RA and AS are considered to be separate and unrelated diseases. Diagnostic confusion may occasionally arise when signs and symptoms of the one disease overlap those of the other or, rarely, when both entities coexist within

the same patient. The chance of this association in the same person is about 1 in 50,000 to 1 in 200,000 [34]. It seems reasonable to determine a group of patients with coexisting RA and AS, for which distinct therapeutic strategies should perhaps be developed [35].

Treatment of inflammatory diseases of the joints should be comprehensive. In RA, synthetic disease-modifying antirheumatic drugs (DMARDs) should be applied as soon as possible, while in the axial form of AS without peripheral joint inflammation, drugs from this group do not apply [36]. In both diseases, high efficacy of biological drugs as TNF inhibitors was confirmed [35]. In most patients with RA coexisting with AS described during the last decade, biological treatment with TNF inhibitors was administered [33, 37].

Our study had some limitations. First is the relatively small number of patients. Second is the absence of pathologic tissue confirmation of disease activity.

## Conclusion

The frequencies of inflammatory back pain and radiographic sacroiliitis in RA patients were high. MRI has an important role in evaluation of sacroiliac joints in RA patients. IBP and radiographic SI were not related to the disease duration of RA or to disease activity or disability.

## Limitation

Further longitudinal studies with larger numbers of RA patients are needed to detect the real frequency of IBP and the overlap between RA and AS.

## Abbreviations

AS: Ankylosing spondylitis; ASAS: Axial spondyloarthritis; IBP: Inflammatory back pain; LBP: Low back pain; MRI: Magnetic resonance imaging; RA: Rheumatoid arthritis; RF: Rheumatoid factor; SI: Sacroiliitis; SIJ: Sacroiliac joint; SpA: Spondyloarthritis; STIR: Short T1-inversion recovery.

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## Authors' contributions

NO contributed to the radiological data collection, imaging techniques, image interpretation, revision, and final editing. FM contributed to the clinical data collection and sharing in final editing. AH contributed to the sharing in clinical data collection and study design. SK contributed to the sharing in clinical data collection and lab. correlation. SA contributed to the patient selection and statistical analysis. All authors read and approved the final manuscript.

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## Availability of data and materials

All data and material were available for this study.

## Competing interest

The authors declare that they have no competing interests.

## Ethics approval and consent to participate

This study was approved by the Ethics Committee of the Faculty of Medicine of our university

## Consent for publication

Consent for publications was taken from authors.

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