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Frequency and features of cardiovascular diseases in spondyloarthritis

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ABSTRACT

BACKGROUND: Group of spondyloarthritis include not only damage of musculoskeletal system, oftenly it's combination with a variety of comorbid pathologies, primarily involving the cardiovascular system, is characteristic. Given the high importance of early detection, assessment and further prediction of the risks of cardiovascular diseases in this cohort of patients, a competent interpretation of the risks of aggravating cardiovascular diseases and their prevention is one of the priority tasks not only for rheumatologists, but also for specialists in related fields.

AIM: To study the structure of comorbid pathology and assess the frequency of cardiovascular diseases in patients with ankylosing spondylitis, psoriatic arthritis and psoriatic spondyloarthritis, to conduct a comparative analysis of the incidence of cardiovascular comorbidities in different groups of spondyloarthritis.

MATERIALS AND METHODS: The study included 153 patients with a verified diagnosis of spondyloarthritis. Patients were divided into 3 groups depending on the nature of the lesion of the musculoskeletal system: ankylosing spondylitis meeting the modified New York criteria for ankylosing spondylitis (1984) ($n = 53$), psoriatic arthritis meeting the CASPAR criteria (Classification criteria of Psoriatic Arthritis, 2006) ($n = 40$) and psoriatic spondylitis simultaneously meeting the modified New York criteria for ankylosing spondylitis and the CASPAR criteria for psoriatic arthritis ($n = 60$). All patients taken with monoclonal antibodies (inhibitors TNF-alpha).

RESULTS: When studying cardiovascular comorbidity in patients with spondyloarthritis in three groups, arterial hypertension was most common in the ankylosing spondylitis group — 37.7%, in psoriatic arthritis — 62.5%, in the psoriatic spondyloarthritis group — 51.7%, conduction disturbance in ankylosing spondylitis — 28, 3%, in psoriatic arthritis — 17.5%, in the psoriatic spondyloarthritis group — 18.3%, dyslipidemia is significantly more common in the psoriatic arthritis and psoriatic spondyloarthritis groups — 47.5% and 51.7%, respectively, compared with the ankylosing spondylitis group — 18.9%. Along with cardiovascular diseases, endocrine disorders were detected with a high frequency of occurrence: overweight was more common in patients of the psoriatic arthritis and psoriatic spondyloarthritis groups — 35.0 and 38.3%, respectively, significant differences in the incidence of type 2 diabetes mellitus in the three groups has not been identified.

CONCLUSIONS: It is necessary to carry out medical examination in order to identify comorbidities in patients with various forms of spondyloarthritis, in order to determine further tactics of management and correction, depending not only on the activity of the disease, but also taking into account comorbidities.

Keywords: spondyloarthritis; comorbidities; ankylosing spondylitis; psoriatic arthritis; psoriatic spondylitis; cardio-vascular risk.

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Частота и особенности течения сердечно-сосудистых заболеваний при спондилоартритах

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АННОТАЦИЯ

Актуальность. Известно, что для спондилоартритов характерно сочетание с разнообразными коморбидными состояниями, в первую очередь заболеваниями сердечно-сосудистой системы. Учитывая высокую значимость раннего выявления рисков сердечно-сосудистых заболеваний у данной категории пациентов, необходима дальнейшая разработка дополнительных высокоинформативных маркеров их диагностики для проведения своевременной профилактики, что является одной из приоритетных задач для врачей многих терапевтических специальностей.

Цель — изучить структуру коморбидной патологии и оценить частоту сердечно-сосудистых заболеваний у пациентов с анкилозирующим спондилитом, псориатическим артритом и псориатическим спондилоартритом, а также провести сравнительный анализ встречаемости кардиоваскулярной патологии при различных формах спондилоартритов.

Материалы и методы. В исследование были включены 153 пациента с достоверным диагнозом спондилоартрит. Пациенты были разделены на 3 группы в зависимости от характера поражения опорно-двигательного аппарата: анкилозирующий спондилит (n = 53), псориатический артрит (n = 40) и псориатический спондилоартрит (n = 60). Все пациенты получали терапию ингибиторами ФНО-альфа. Структура коморбидной патологии оценивалась при помощи индексов Charlson и CIRS-G по Miller. Модифицированная шкала SCORE (Systematic COronary Risk Evaluation), шкала Рейнольдса (Reynolds Risk Score), модифицированная шкала QRISK3 использовались для оценки сердечно-сосудистых событий.

Результаты. Различные сопутствующие заболевания встречались у большинства обследованных пациентов со спондилоартритом (72 %), у более чем половины отмечалась полиморбидная патология. Среди коморбидных состояний преобладали заболевания сердечно-сосудистой системы (63 %), желудочно-кишечного тракта (53 %) и эндокринной системы (46 %). Артериальная гипертензия чаще встречалась у пациентов с псориатическим артритом и псориатическим спондилоартритом, а нарушение проводимости у пациентов с анкилозирующим спондилитом. Большинство пациентов имели 2 и 3 степень согласно шкалам SCORE и Рейнольдса. Более половины пациентов с псориатическим артритом и псориатическим спондилоартритом имели 3 и 4 степень риска, тогда как менее трети пациентов с анкилозирующим спондилитом имели 3 и 4 степень риска. Средние значения QRISK были достоверно выше у пациентов с псориатическим артритом и псориатическим спондилоартритом, чем у пациентов с анкилозирующим спондилитом. Ожирение и дислипидемия чаще встречались у пациентов с псориатическим артритом и псориатическим спондилоартритом. 10-летняя выживаемость была достоверно выше у пациентов с анкилозирующим спондилитом и псориатическим артритом, чем в группе больных с псориатическим спондилоартритом.

Заключение. При обследовании пациентов с псориатическим артритом целесообразно проводить не только оценку активности псориатического артрита и структурного прогрессирования в суставах, но и сопутствующих заболеваний с целью выбора наиболее оптимального лечения.

Ключевые слова: спондилоартриты; коморбидность; анкилозирующий спондилит; псориатический артрит; псориатический спондилит; сердечно-сосудистый риск.

Как цитировать

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INTRODUCTION

Spondyloarthritis (SpA) is a group of chronic inflammatory diseases affecting the spine, joints, and entheses that share clinical, radiographic, and genetic characteristics. SpA refers to ankylosing spondylitis (AS), which includes nonradiographic axial SpA, psoriatic arthritis (PsA), reactive arthritis, SpA associated with inflammatory bowel disease and uveitis, and undifferentiated SpA. These diseases are typically associated with the MHC class I molecule HLA-B27. They show several common clinical symptoms, including inflammatory back pain, peripheral arthritis, enthesitis, dactylitis, and extraarticular manifestations, such as anterior uveitis, psoriasis (PSO), and inflammatory bowel disease (IBD) [1]. Inflammation of the joints and enthuses causes gradual structural damage to the musculoskeletal system, leading to a reduced quality of life and a rapid onset of disability.

Spondyloarthritis, like many other rheumatic diseases, is treated with a treat-to-target approach to achieve remission or low disease activity. Rheumatologists might use various drugs depending on the form and stage of SpA. These drugs include nonsteroidal anti-inflammatory drugs (NSAIDs), disease-modifying antirheumatic drugs (DMARDs), biological DMARDs (bDMARDs), and JAK inhibitors (small molecule inhibitors) [2].

Given that NSAIDs are the primary drugs used to treat axial SpA (axSpA) and must be used for a lengthy period of time, it is critical to closely monitor side effects related to gastrointestinal and cardiovascular damage [3, 4]. Furthermore, concomitant cardiovascular diseases (as signs of multimorbidity) are common in patients with SpA, affecting quality of life and life expectancy [5]. Long-term use of NSAIDs, even at low doses, may be contraindicated in patients with an increased risk of major adverse cardiovascular events (MACEs), upper gastrointestinal tract disorders, and IBD [6, 7]. Several studies have found a relationship between NSAID use and cardiovascular risk. However, recent studies examining the effect of long-term NSAID use on the risk of MACEs in AS patients (n = 22,929) during an 8-yr follow-up period found a modest correlation between cardiovascular events and NSAID use. Comorbidities such as hypertension, diabetes mellitus, dyslipidemia, and upper extremity atherosclerosis increase the risk of MACE [8].

According to recent studies, SpA patients have a 5– to 7-yr lower life expectancy, 1.6–1.9 times higher total mortality, and 20%–40% higher cardiovascular mortality than the general population [9].

The most important standardized criteria for assessing cardiovascular risk in SpA patients and the characteristics of cardiovascular disease progression are currently under debate.

This study aimed to investigate comorbidities, analyze the incidence of cardiovascular diseases in patients with AS, PsA, and psoriatic SpA, and conduct a comparative analysis of cardiovascular comorbidities in various SpA groups.

MATERIALS AND METHODS

The study included 153 patients with confirmed SpA. Patients were divided into three groups based on the type of musculoskeletal damage: AS meeting the modified New York criteria for AS (1984; n = 53), PsA meeting the Classification Criteria of Psoriatic Arthritis (CASPAR, 2006; n = 40), and PsSpA meeting both the modified New York criteria for AS and the CASPAR for PsA (n = 60).

In the study, patients with AS or PsSpA received a bDMARD from the tumor necrosis factor-α (TNF-α) inhibitor group, alone or in combination with an NSAID. PsA patients were given TNF-α inhibitors and DMARDs (methotrexate, sulfasalazine, or leflunomide). The groups were sex- and age-matched. Patients with IBD were excluded from the study.

All patients had their clinical laboratory parameters, SpA activities (BASDAI, ASDAS-CRP, DAPSA, and DAS28-CRP), and SpA functional status (BASFI) examined.

All patients were evaluated at baseline for comorbidities and the severity and risk of severe adverse cardiovascular events (Charlson Comorbidity Index [CCI] and CIRS-G by Miller). Three approaches were used to determine the 10-yr risk of MACEs: the modified Systematic Coronary Risk Evaluation (SCORE) system, the Reynolds Risk Score (RRS), and the modified QRISK3. The SCORE, RRS, and QRISK3 values were interpreted in accordance with the European Society of Cardiology guidelines. The risk levels are classified as low (< 1%), moderate (⩾ 1% to 5%), high (⩾ 5% to 10%), and very high (⩾ 10%).

R 3.4.1 (R: A Language and Environment for Statistical Computing, R Foundation for Statistical Computing, Vienna, Austria, R Core Team, 2017), with jamovi graphical user interface and jmv packages (Jmv: The "Jacobi" Analyses, version 0.9.5.0; Selker et al., 2018) was used to statistically analyze the study data.

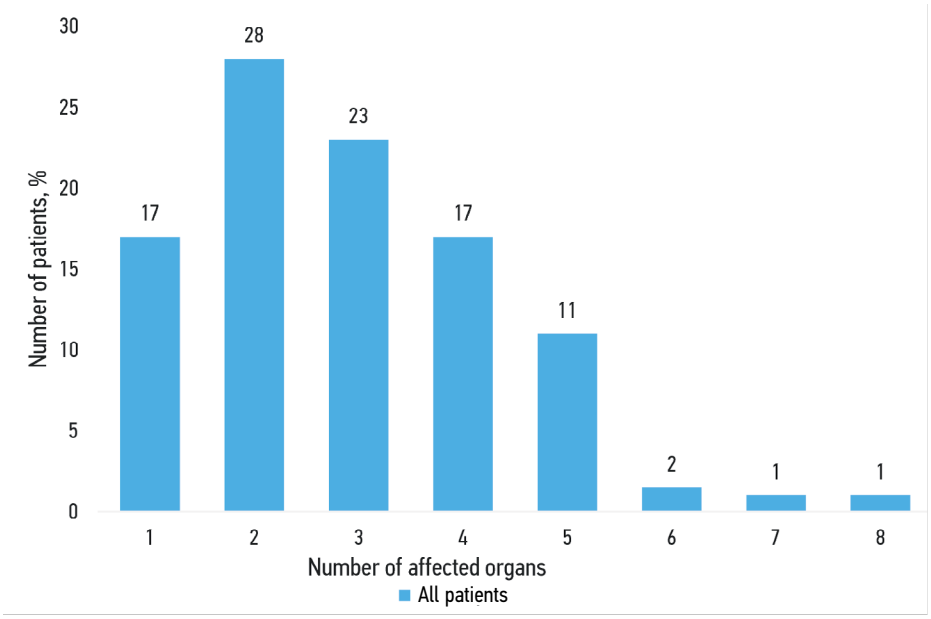
All patients signed an informed consent form. The patient data were anonymized. This study was approved by the Ethics Committee of the I.I. Mechnikov North-Western State Medical University.

RESULTS

The study had a low prevalence of men (55%) (Table 1). The mean age of patients was 46.7 ± 12.5 yr, and the disease

duration was 11.3 ± 8.1 yr. HLA-B27-associated disease was found in 73 patients (47.7%). Nonaxial SpA symptoms included enthesitis in 93 patients (60.8%), dactylitis in 57 patients (37.2%), and coxitis in 26 patients (17.0%). Extraskeletal symptoms (uveitis) were found in 20 patients (13.1%). BASDAI found that most patients (67%) had low-activity SpA at baseline. The study groups differed significantly in the presence of dactylitis, enthesitis, coxitis, and psoriatic onychodystrophy and the detection of HLA-B27 carriage ($p < 0.01$). When the results were compared between groups, it was observed that AS patients were more likely to have HLA-B27 carriage and sacroiliitis. PsSpA patients showed higher mean activity based on BASDAI than AS and PsA patients. According to ASDAS-CRP, baseline activity was very high (21.5%), increasing (29.6%), and moderate (28.5%), with 20.4% in clinical and laboratory remission. PsSpA patients had higher ASDAS scores. All patients received TNF inhibitors. Most AS patients had previously received one bDMARD, whereas one-third of PsA and PsSpA patients had previously received two or more bDMARDs.

Most patients (72%) had several comorbidities. The most common comorbidities were cardiovascular



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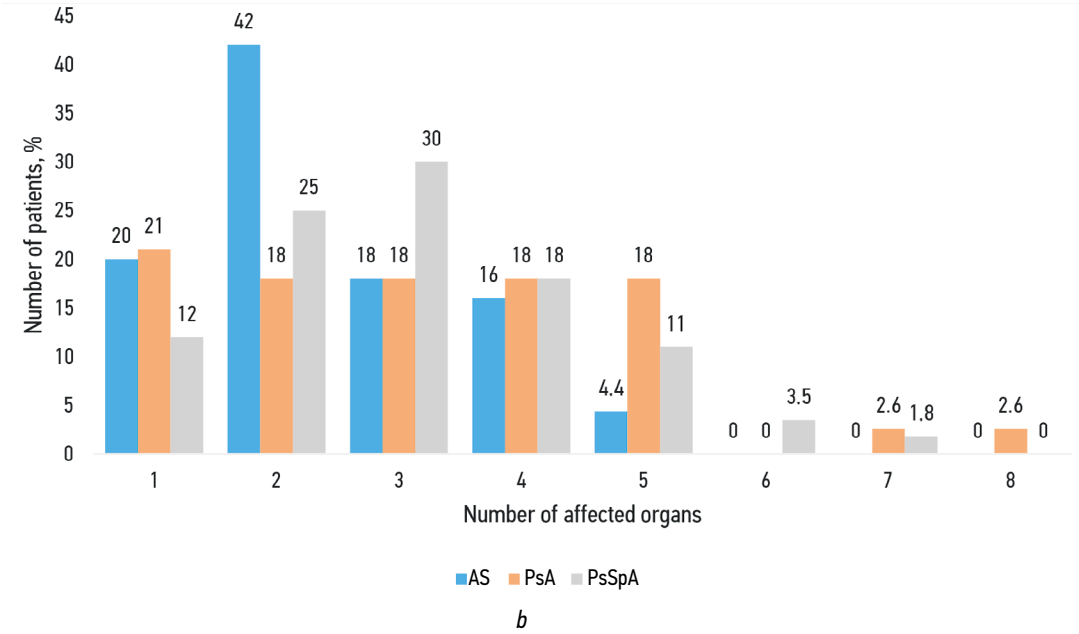

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Fig. 1. Affected organs and systems according to the CIRS-G by Miller in all patients (*a*) and by group (*b*). AS — ankylosing spondylitis; PsA — psoriatic arthritis; PSpA — psoriatic spondyloarthritis

Рис. 1. Количество пораженных органов и систем при оценке с помощью индекса CIRS-G по Miller у всех пациентов (*a*) и в зависимости от группы (*b*) АС — анкилозирующий спондилит; ПсА — псориатический артрит; ПсСпА — псориатический спондилоартрит

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(63%), gastrointestinal (53%), and endocrine (46%) disorders. Miller's CIRS-G revealed that most patients (56.5%) had several comorbidities. In total, 23.2% of PsA patients and 16.3% of PsSpA patients had five or more affected organs compared with only 4.6% of AS patients (Figure 1). The total CIRS-G score in AS patients was significantly lower than in PsA and PsSpA patients (4.22 vs. 5.5 vs. 5.67, $p = 0.013$).

Cardiovascular diseases were the primary focus of comorbidity analysis (Table 2). Hypertension was the most common cardiovascular disease, affecting 50% of the patients. Notably, hypertension was more prevalent in patients with PsA and PsSpA. Coronary artery disease (CAD) incidence was comparable in all groups. Eight patients experienced myocardial infarction. Only AS patients had a myocardial infarction while taking TNF inhibitors (1, 8, and

Table 1. Baseline clinical characteristics of patients ($n = 153$)
Таблица 1. Клиническая характеристика пациентов на момент включения в исследование, $n = 153$

Study parameters	AS ($n = 53$)	PsA ($n = 40$)	PsSpA ($n = 60$)
Male, *n* (%)	31(58.5)	21 (52.5)	32 (53.3)
Mean age at baseline, *M* ± *SD*	44.3 ± 11.9	48.8 ± 13.3	47.4 ± 12.4
Disease duration (yr), *M* ± *SD*	9.9 ± 8.3	13.2 ± 8.1	11.2 ± 7.9
Sacroiliitis, *n* (%)	52 (98)	26 (65)	50 (83)
Dactylitis, *n* (%)	5 (9.4)	21 (52.5)	31 (51.7)
Enthesitis, *n* (%)	20 (37.7)	25 (62.5)	48 (80.0)
Coxitis, *n* (%)	6 (11.3)	4 (10.0)	16 (26.7)
Uveitis, *n* (%)	11 (20.8)	4 (10.0)	5 (8.3)
HLA-B27 carriage, *n* (%)	42 (79.2)	10 (25.0)	21 (35.0)
BASDAI, points (*M* ± *SD*)	2.9 ± 1.9	3.0 ± 1.7	3.7 ± 2.0
ASDAS-CRP, points (*M* ± *SD*)	2.0 ± 0.9	2.0 ± 0.98	2.4 ± 1.1
Therapy duration and all bDMARDs	4.0 (1.0–6.0)	5.0 (2.0–8.2)	3.0 (2.0–5.0)
Therapy duration and the last bDMARD	3.0 (1.0–6.0)	2.8 (2.0–5.0)	2.0 (1.0–4.0)

Note: AS — ankylosing spondylitis; PsA — psoriatic arthritis; PSpA — psoriatic spondyloarthritis; GEBD — genetically engineered biological drugs; CRP — C-reactive protein; BASDAI — Bath Ankylosing Spondylitis Disease Activity Index; ASDAS — Ankylosing Spondylitis Disease Activity Score.

Примечание: АС — анкилозирующий спондилит; ПсА — псориатический артрит; ПсСпА — псориатический спондилоартрит; ГИБП — генно-инженерные биологические препараты; СРБ — С-реактивный белок; BASDAI — Bath Ankylosing Spondylitis Disease Activity Index; ASDAS — Ankylosing Spondylitis Disease Activity Score.

Table 2. Cardiovascular diseases in patients with AS, PsA, and PsSpA
Таблица 2. Структура сердечно-сосудистой патологии у пациентов исследуемых групп

Cardiovascular diseases	All patients ($n = 153$)	AS ($n = 53$)	PsA ($n = 40$)	PsSpA ($n = 60$)
Hypertension, *n* (%)	76 (49.7)	20 (37.7)	25 (62.5)	31 (51.7)
Grade 1	54 (35.2)	14 (26.4)	18 (45)	22 (36.7)
Grade 2	16 (10.5)	4 (7.6)	6 (15)	6 (10)
Grade 3	6 (3.9)	2 (3.8)	1 (0)	3 (5)
Coronary artery disease (CAD), *n* (%)	17 (11.1)	7 (13)	5 (12)	5 (8.3)
Stable angina, FC 1–2, *n* (%)	13 (8.5)	5 (9.4)	4 (10)	4 (6.8)
Acute myocardial infarction, *n* (%)	8 (5.2)	3 (2.0)	3 (7.5)	2 (3.3)
Atrial fibrillation, *n* (%)	4 (2.6)	2 (3.8)	1 (2.5)	1 (1.7)
Rhythm disorder, *n* (%)	16 (10.4)	6 (11)	5 (12.5)	5 (8.3)
Chronic heart failure (CHF), *n* (%)	14 (9.1)	3 (5.7)	6 (15)	5 (8.5)
CHF grade I, *n* (%)	3 (0.5)	1 (2)	2 (5)	0 (0)
CHF grade II, *n* (%)	11 (7.2)	2 (3.8)	5 (12.5)	4 (6.7)

Note: AS — ankylosing spondylitis; PsA — psoriatic arthritis; PSpA — psoriatic spondyloarthritis.

Примечание: АС — анкилозирующий спондилит; ПсА — псориатический артрит; ПсСпА — псориатический спондилоартрит.

10-yr after starting treatment), whereas other patients had a myocardial infarction before beginning treatment. Seven patients (4.6%) had coronary angiography and/or stenting, whereas one patient underwent coronary artery bypass surgery. Conduction disorders were 10% more prevalent in AS patients (28%) than in PsA patients (18%) and PsSpA patients (18%). The incidence of cardiac rhythm disorders was comparable in all groups. They were found in every 10th patient, with sinus tachycardia and extrasystole being the most common types. Chronic heart failure was more prevalent in patients with PsA. One PsA patient and three PsSpA patients had previously experienced an acute cerebrovascular accident.

Notably, 29% of the patients had dyslipidemia. Dyslipidemia was significantly more prevalent in PsA and PsSpA patients than in AS patients (Table 3). The lipid metabolism parameters of PsA and PsSpA patients were comparable. Mean cholesterol levels, low-density lipoprotein levels, and total cholesterol to high-density lipoprotein cholesterol ratio were significantly higher in PsA and PsSpA patients than in AS patients.

An intergroup comparative analysis was conducted based on obesity grades. The study found significant differences ($p < 0.001$) in obesity grades among AS, PsA, and PsSpA patients (Table 4). Obesity was more prevalent in patients with PsA and PsSpA with grade 1 or 2 in most cases.

The SCORE system, RRS, and modified QRISK3 were used to determine cardiovascular risk. The mean SCORE value was significantly higher in PsSpA patients (1.98 [0.75; 3.28] points) than in AS patients (1.59 [0.74; 3.61]) and PsA patients (1.73 [1.18; 4.36]). However, there were no significant differences after recalculating SCORE values for rheumatological diseases (× 1.5). Most patients had SCORE grades 2 and 3 (48% and 28%, respectively). There was no difference between the groups.

The mean RRS values were 2.0, 3.0, and 4.0 for AS, PsA, and PsSpA patients. Most patients had RRS grades 2 and 3.

QRISK found significant differences between the groups (Table 5). More than half of PsA and PsSpA patients had risk grades 3 and 4 compared with less than one-third of AS patients. The mean QRISK score was significantly higher in PsA and PsSpA patients than in AS patients (6.12 vs. 6.81 vs. 3.8, $p = 0.002$), indicating a higher cardiovascular risk.

The CCI was used to assess comorbidities and predict 10-yr survival rates (Figure 2). The CCI score was higher in PsA and PsSpA patients than in AS patients, affecting survival parameters. Thus, AS and PsA patients had significantly higher

Table 3. Lipid metabolism parameters in patients with AS, PsA, and PsSpA
Таблица 3. Показатели липидного обмена у пациентов исследуемых групп

Lipid metabolism parameters	AS (*n* = 53)	PsA (*n* = 40)	PsSpA (*n* = 60)	*p*
Dyslipidemia, *n* (%)	10 (19)	19 (48)	31 (52)	0,001
Cholesterol (mmol/L), *Me* (25%; 75%)	4.53 (4.13;5.23)	5.50 (5.00; 6.30)	5.80 (4.98; 6.33)	0.001
HDL (mmol/L), *Me* (25%; 75%)	1.70 (1.58; 1.85)	1.72 (1.52; 1.90)	1.70 (1.39; 1.90)	0.6
LDL (mmol/L), *Me* (25%; 75%)]	2.55 (2.00; 3.04)	2.89 (2.40; 3.62)	2.89 (2.10; 3.61)	0.023
Total cholesterol to HDL cholesterol ratio (mmol/L), *Me* (25%; 75%)	2.69 (2.47; 3.20)	3.33 (2.88; 3.71)	3.21 (2.87; 4.04)	0.001

Note: AS — ankylosing spondylitis; PsA — psoriatic arthritis; PSpA — psoriatic spondyloarthritis; LDL — low density lipoproteins; HDL — high density. lipoproteins.
Примечание: АС — анкилозирующий спондилит; ПсА — псориатический артрит; ПсСпА — псориатический спондилоартрит; ЛПНП — липопротеины низкой плотности; ЛПВП — липопротеины высокой плотности.

Table 4. Obesity grades in the study groups
Таблица 4. Распределение степени ожирения в исследуемых группах пациентов

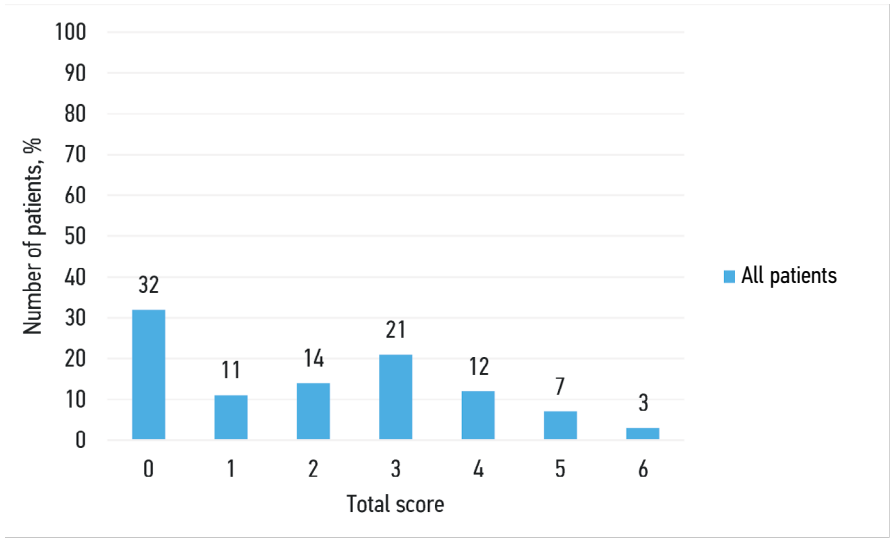
Obesity grade	AS, *n* (%)	PsA, *n* (%)	PsSpA, *n* (%)	*p*
0	34 (64)	8 (20)	14 (23)	< 0,001
1	13 (25)	15 (38)	23 (38)	
2	3 (5.7)	10 (25)	15 (25)	
3	2 (3.8)	5 (12)	5 (8.3)	
4	1 (1.9)	2 (5.0)	3 (5.0)	

Note: AS — ankylosing spondylitis; PsA — psoriatic arthritis; PSpA — psoriatic spondyloarthritis.
Примечание: АС — анкилозирующий спондилит; ПсА — псориатический артрит; ПсСпА — псориатический спондилоартрит.

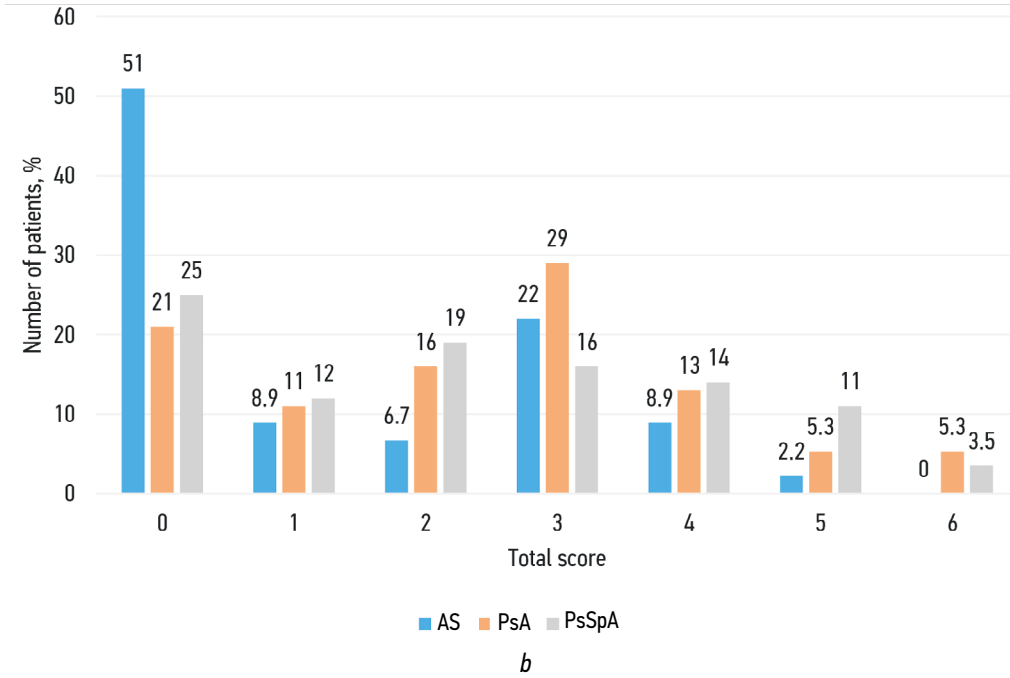
Table 5. QRISK scores in patients with ankylosing spondylitis, psoriatic arthritis, and psoriatic spondyloarthritis
Таблица 5. Показатели шкалы QRISK у пациентов исследуемых групп

Patient group	Risk level				*p*
	1	2	3	4	
AS, *n* (%)	19 (51)	9 (24)	4 (15)	5 (14)	0.002
PsA, *n* (%)	4 (15)	6 (23)	13 (49,8)	3 (12)	
PsSpA, *n* (%)	7 (16)	15 (34)	13 (30)	9 (20)	

Note: AS — ankylosing spondylitis; PsA — psoriatic arthritis; PSpA — psoriatic spondyloarthritis.
Примечание: АС — анкилозирующий спондилит; ПсА — псориатический артрит; ПсСпА — псориатический спондилоартрит.



a



b

Fig. 2. Distribution of AS patients depending on the incidence of comorbidities in all patients (*a*) and by group (*b*). AS — ankylosing spondylitis; PsA — psoriatic arthritis; PSpA — psoriatic spondyloarthritis
Рис. 2. Распределение пациентов с СпА в зависимости от распространенности сопутствующей патологии: *a* — для всех пациентов; *b* — по группам пациентов. АС — анкилозирующий спондилит; ПсА — псориатический артрит; ПсСпА — псориатический спондилоартрит

10-yr survival rates than PsSpA patients (78% vs. 78% vs. 54%, $p = 0.008$).

The findings indicate that PsSpA patients have more comorbidities than AS and PsA patients, affecting predicted 10-yr survival rates, which are significantly decreased in PsSpA patients.

DISCUSSION

A review of comorbidities in patients with various forms of SpA indicated that 72% of patients had at least one concomitant disease. Cardiovascular diseases were the most prevalent, affecting 63% of patients. Gastrointestinal diseases were the second most prevalent, affecting 53% of patients. The study cohort had a higher incidence of comorbidities than larger cohort studies.

In a study of 3,379 SpA patients, 51% reported at least one comorbidity, with 9% having three or more. The Rheumatic Disease Comorbidity Index was associated with higher BASFI scores, low quality of life (EuroQol), and lower employment rates. The most prevalent comorbidities were hypertension (33%), osteoporosis (13%), and gastrointestinal disorders (12%) [10].

In the British registry of axSpA patients ($n = 2,043$), 44% had at least one comorbidity. Comorbidities were more prevalent among older patients and those with lower levels of education. Smoking was more prevalent among patients with comorbidities (63% vs. 50%). Patients with comorbidities showed increased disease activity but no laboratory inflammatory markers. Each comorbidity increased the BASDAI score by 0.4 and the back pain score by 0.53. Depression, heart failure, and peptic ulcers were associated with increased disease activity [11].

The most common cardiovascular diseases in our cohort were hypertension (50%), CAD (11%), and conduction disorders (22%). The most common gastrointestinal diseases were *Helicobacter pylori*-associated chronic gastritis (37%), gastroesophageal reflux disease (21%), and peptic ulcer (10%).

When comparing the three groups, patients with PSO had more cardiovascular events and dyslipidemia, while patients with PsSpA had significantly higher incidences of hypertension, CAD, type 2 diabetes mellitus, dyslipidemia, and obesity.

Several studies have found that patients with PsA are more likely to develop hypertension, type 2 diabetes mellitus, obesity, dyslipidemia, and metabolic syndrome. Insulin resistance is associated with PsA.

Psoriasis is associated with lipid metabolism disorders and obesity; inhibiting TNF-α can promote adipogenesis, leading to weight gain [12].

According to Miller's CIRS-G, most patients had two to four affected organs and systems. The mean CCI score was 1.99 ± 1.77, and the mean 10-yr survival was 80.6% ± 24.0%.

Ballegaard et al. (2021) found that obesity, hypertension, and CCI ⩾ 1 were associated with low efficacy of PsA treatment [13].

This study focused on cardiovascular risk assessment. At present, no standardized techniques for assessing cardiovascular risk consider the presence of SpA.

Patients with PsSpA had the highest SCORE, QRISK3, and RRS values when assessing cardiovascular risk. QRISK3 was more helpful than SCORE and RRS.

Cardiovascular risk parameters in patients under the age of 40 yr were assessed using the only available instrument, QRISK3. Notably, 18% of patients had moderate to high risk of MACEs. PsA and PsSpA patients had significantly higher QRISK scores than AS patients (6.2 vs. 4.6 vs. 0.7, $p = 0.002$), indicating a higher cardiovascular risk.

The CCI score indicated that AS and PsA patients had the highest 10-yr survival rates (74%), whereas PsSpA patients had the lowest (54%).

Cardiovascular risks were assessed in a cohort study of 463 axSpA patients. During the 12 (7–19) yr of follow-up, 12 patients (2.6%) died, with five (1.1%) fatalities due to cardiovascular events. Nonfatal cardiovascular events occurred in 61 patients (13.2%), with CAD in 29.5%, myocardial infarction in 13.1%, transient ischemic attacks in 4.9%, stroke in 23%, and heart failure in 24.6%. Patients who experienced cardiovascular events were older, had more common risk factors, used statins, antihypertensive drugs, and acetylsalicylic acid more often, and had higher BASDAI scores, ESR, and CRP levels. FRS, SCORE, and QRISK3 identified 8.2%, 11.5%, and 1.8%, respectively, of 61 patients with cardiovascular events as being at high risk. High disease activity and BASDAI scores (⩾ 4) were associated with increased cardiovascular risk. No relationship was found between the study treatment and cardiovascular risk [14].

Within 10 yr of follow-up, 23 of 295 patients (7.8%) reported their first cardiovascular event, which was significantly associated with a high CRP level and high BASDAI scores (> 4) [15].

Cardiovascular events were associated with type 2 diabetes mellitus, hypertension, dyslipidemia, and atherosclerosis in a French cohort study of SpA patients; patients taking NSAIDs and TNF inhibitors had significantly lower cardiovascular risk than those taking IL-17 inhibitors [16].

Thus, previous studies have indicated a relationship between high disease activity and cardiovascular risk, underlining the importance of SpA treatment in a timely and appropriate manner.

In our study, three AS patients had myocardial infarction during treatment with TNF inhibitors. Although TNF inhibitors may be beneficial in reducing cardiovascular risk, an earlier study reported no TNF inhibitor-specific reduction in cardiovascular disease incidence in axSpA patients [17].

The study of Spanish colleagues, who developed a checklist for comorbidity assessment in axSpA patients for doctors and patients, is highly beneficial in practice. The checklist assesses comorbidities such as cardiovascular, gastrointestinal, renal, and pulmonary diseases, lifestyle, immunization status, and the risk of infectious diseases, affective disorders, osteoporosis, and fractures. "Practices to avoid" have been developed for physicians [18].

The ASAS-EULAR recommendations for axSpA management were released in 2022 [19], including two new and two revised recommendations since 2016 [20]. The two new recommendations consider comorbidities. To treat recurrent uveitis or IBD, anti-TNF-α monoclonal antibodies are recommended, whereas IL-17 inhibitors are preferred for psoriasis. If treatment does not yield results, comorbidities should be considered.

CONCLUSION

Screening patients with SpA for cardiovascular risk factors and diseases is recommended. Identifying risks and current diseases will aid in developing additional treatment and adjustment strategies depending on disease activity and comorbidities. A multidisciplinary approach to treating SpA patients will reduce the rheumatic disease burden while improving the prognosis and quality of life in chronic noncommunicable diseases.

ADDITIONAL INFORMATION

Author contribution. All authors made significant contributions to the preparation of the article and read and approved the final version before publication.

Contribution of each author. R.R. Samigullina — GC-MS, collection and preparation of samples, data analysis,writing the main part of the text, literature review, making final edits, V.I. Mazurov — experimental design, writing the main part of the text, making final edits, E.A. Vasilenko — collection and preparation of samples, data analysis, E.A. Trofimov — literature review, data analysis.

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