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BRIEF REPORT

Different ethnic background is associated with distinct clinical profiles in the spondyloarthritides in the North and South of Brazil

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Abstract

The objective of this study was to analyze the clinical profile of the spondyloarthritides (SpA) in distinct Brazilian regions. A common protocol of investigation was prospectively applied to 202 SpA patients, including 138 patients from the South and 64 patients from the North. All the patients were classified as axial or peripheral SpA. Clinical and demographic variables and disease indexes were analyzed. Bonferroni correction was used to adjust the level of significance of each test; results with p value < 0.003 were considered statistically relevant. White ethnicity was associated with positive HLA-B27, while non-Whites presented higher frequency of peripheral arthritis, although not statistically significant. When comparing non-White patients from the North with those from the South, the Southerners presented significantly higher scores of Ankylosing Spondylitis Disease Activity Score using C-reactive protein ($p = 0.001$) and Health Assessment Questionnaire ($p = 0.001$). Although not statistically significant, Northern non-White patients were more frequently males, while Southerners had higher frequency of anterior uveitis and higher Bath Ankylosing Spondylitis Disease Activity Index and Ankylosing Spondylitis Quality of Life. Brazilian SpA patients present distinct patterns of disease according to the geographic region, especially regarding the non-White populations.

Keywords Brazil · Epidemiology · Ethnicity · Joint involvement · Spondyloarthritis

Introduction

Recently, the Assessment of Spondyloarthritis International Society (ASAS) proposed classification criteria for axial [1] and peripheral spondyloarthritides (SpA) [2] in order to standardize the clinical protocols of investigation for these diseases [3]. Latin American countries, traditionally characterized by a high degree of miscegenation between Whites with Black (Brazil, Colombia) and Indian (Mexico, Guatemala, Peru) populations [4], commonly present a significantly higher frequency of peripheral involvement in SpA patients [5, 6].

In Brazil, there are distinct ethnic backgrounds according to the geographic region. While the South is characterized by a predominant White population with the lowest percentage of "Mulattos" (originated from the miscegenation of Whites and Blacks) among the different Brazilian geographic regions, the North has a predominant mixed population (including Whites, Mulattos, and Indians). Due to these distinct phenotypes [4], these populations are many times hard to characterize.

The present study was designed to compare the clinical profile of a group of SpA patients attended in centers from the North and the South of Brazil, with a special attention to the non-White patients.

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Material and methods

Patients This is an observational cross-sectional study conducted in three Brazilian public university hospitals. Two of them were located in the South (Porto Alegre and Curitiba) and the other was located in the North of Brazil (Manaus) (Fig. 1). This study enrolled 202 consecutive patients ≥ 18 years who were classified as axial [1] or peripheral [2] SpA according to the ASAS criteria. Psoriatic arthritis was considered when patients fulfilled the CASPAR criteria [7]. Ethnicity was divided into Whites and non-Whites; among the non-Whites, patients were divided in those from the North and those from the South. White patients were individuals who referred themselves as Whites and had at least two White previous generations.

Study design A common protocol of investigation was applied to the three centers. It included epidemiological data, clinical profile of axial and peripheral joint involvement, extra-articular manifestations, and the following indexes/questionnaires: (1) disease activity: Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) [8] and Ankylosing Spondylitis Disease Activity Score (ASDAS) using erythrocyte sedimentation rate (ASDAS-ESR) and C-reactive protein (ASDAS-CRP) [9]; (2) functional status: Bath Ankylosing Spondylitis Functional Index (BASFI) [10]; (3) enthesitis: Maastricht Ankylosing Spondylitis Enthesitis Score (MASES) [11], Spondyloarthritis Research Consortium of Canada (SPARCC) index [12], and Leeds Enthesitis Index (LEI) [13]; (4) quality of life: Ankylosing Spondylitis Quality of Life (ASQoL) [14] and Health Assessment Questionnaire (HAQ) [15]. Values of CRP and ESR were also recorded. All questionnaires have been validated and culturally adapted to the Brazilian Portuguese [16, 17]. Data regarding the working status and the regular practice of physical exercise (considered as at least 30 min per day for at least 3 days per week) were also questioned.

Patients were also questioned about past and current treatment: nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroids, conventional disease-modifying drugs (including methotrexate (MTX) and sulfasalazine (SSZ)), and biologic drugs (tumoral necrosis factor inhibitors (TNFi), including infliximab, etanercept, and adalimumab).

All the rheumatologists involved in the data collection attended a meeting where the protocol was discussed and the questionnaires and indexes applications were standardized before the study was started.

This research has been approved by the local Ethics in Research Committees of the three centers and all enrolled patients signed an informed consent.

Statistical analysis Categorical variables were compared by χ^2 and Fisher's exact test, and continuous variables were compared by ANOVA test. We used the Bonferroni

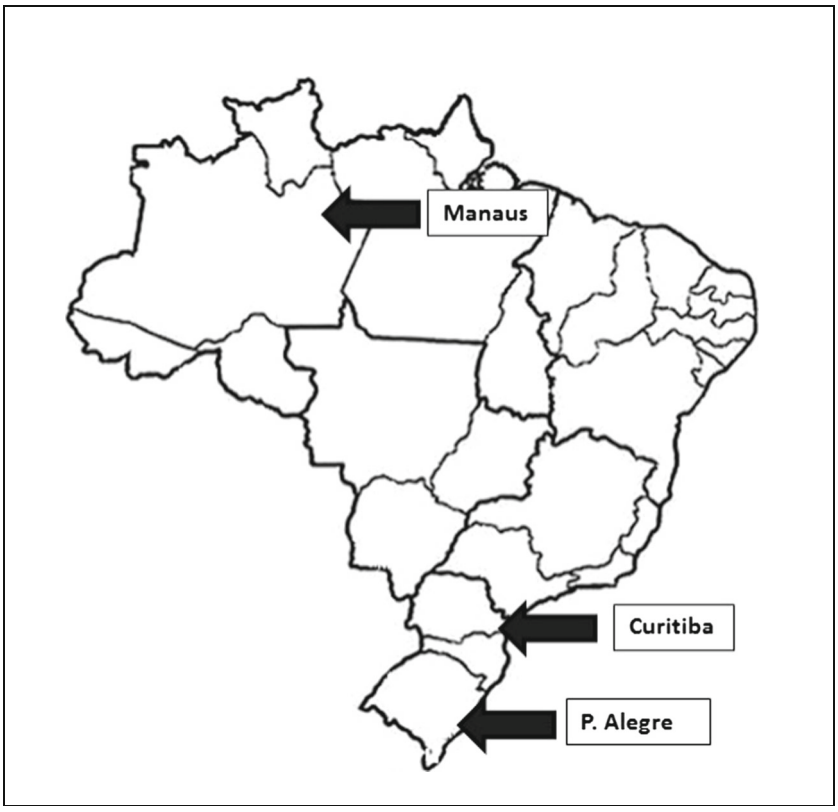

Fig. 1 Localization of the three rheumatological centers where SpA patients were enrolled

Table 1 Demographic, clinical and treatment data, and disease indexes, in SpA patients from three Brazilian rheumatological centers, according to the ethnic background (Whites vs. non-Whites)

	Whites ($n = 126$)		Non-Whites ($n = 76$)		P
	%	N	%	N	
Gender					
Male	63.5	80	67.1	51	0.712
Female	36.5	46	32.9	25	
Positive familial history	20.6	26	17.1	13	0.666
Positive HLA-B27	70.6	72/102	50.0	23/46	0.026
Lumbar pain	73.8	93	80.3	61	0.382
Buttock alternating pain	23.8	30	23.7	18	1.000
Cervical pain	38.1	48	42.1	32	0.677
Hip pain	30.2	38	27.0	21	0.824
Lower limb arthritis	49.2	62	64.5	49	0.049
Upper limb arthritis	32.5	41	46.1	35	0.077
Enthesitis	39.7	50	31.6	24	0.314
Dactylitis	17.5	22	11.8	9	0.383
Uveitis	30.0	33	27.4	20	0.831
Inflammatory bowel disease	3.6	4	6.8	5	0.525
Psoriasis	35.5	39	26.0	19	0.238
Nail involvement	48.7	19/39	20.0	4/20	0.063
Physical exercise	51.6	65	35.5	27	0.038
Work	34.9	44	40.5	30	0.568
Axial SpA	67.5	85	72.4	55	0.565
Peripheral SpA	32.5	41	27.6	21	
BASDAI (mean ± SD)	3.61 ± 2.30		3.69 ± 2.63		0.831
ASDAS-ESR (mean ± SD)	2.71 ± 1.06		2.69 ± 1.12		0.887
ASDAS-CRP (mean ± SD)	2.47 ± 1.09		2.29 ± 1.31		0.328
BASFI (mean ± SD)	4.46 ± 2.68		4.07 ± 3.04		0.362
MASES (0–13) (mean ± SD)	2.71 ± 3.74		3.01 ± 4.14		0.598
SPARCC (0–16) (mean ± SD)	2.32 ± 3.66		2.57 ± 4.23		0.672
LEI (0–6) (mean ± SD)	0.97 ± 1.67		0.96 ± 1.57		0.974
ASQoL (mean ± SD)	7.88 ± 4.83		6.46 ± 5.67		0.071
HAQ (mean ± SD)	0.81 ± 0.65		0.70 ± 4.23		0.295
ESR (mean ± SD)	10.90 ± 13.22		9.10 ± 15.54		0.282
CRP (mean ± SD)	3.61 ± 2.30		3.69 ± 2.63		0.386
NSAID					
Continuous	54.0	68	53.9	41	0.506
On demand	33.3	42	38.2	29	
Never	12.7	16	7.9	6	
Corticosteroids					
Current	7.9	10	11.8	9	0.509
Past	38.9	49	42.1	32	
Never	53.2	67	46.1	35	
Sulfasalazine					
Current	19.0	24	25.0	19	0.115
Past	23.8	30	32.9	25	
Never	57.2	72	42.1	32	
Methotrexate					
Current	39.7	50	44.7	34	0.007
Past	19.8	25	34.2	26	
Never	40.5	51	21.1	16	

Table 1 (continued)

	Whites ($n = 126$)		Non-Whites ($n = 76$)		P
	%	N	%	N	
Infliximab					
Current	12.0	15	11.8	9	1.000
Past	4.8	6	5.2	4	
Never	83.2	105	83.0	63	
Etanercept					
Current	18.2	23	25.0	19	0.781
Past	8.8	11	9.1	7	
Never	73.0	92	65.9	50	
Adalimumab					
Current	20.6	26	19.5	15	0.831
Past	7.1	9	7.8	6	
Never	72.3	101	72.7	55	

NSAID, non-steroidal anti-inflammatory drugs; *ASDAS*, Ankylosing Spondylitis Disease Activity Score; *ASQoL*, Ankylosing Spondylitis Quality of Life; *BASDAI*, Bath Ankylosing Spondylitis Disease Activity Index; *BASFI*, Bath Ankylosing Spondylitis Functional Index; *CRP*, C-reactive protein; *ESR*, erythrocyte sedimentation rate; *HAQ*, Health Assessment Questionnaire; *LEI*, Leeds Enthesitis Index; *MASES*, Maastricht Ankylosing Spondylitis Enthesitis Score; *SPARCC*, Spondyloarthritis Research Consortium of Canada

correction to adjust the level of significance of each test; considering a global $\alpha = 5\%$ and adjusting for multiple variables, the results with p value < 0.003 were considered statistically relevant.

Results

Two hundred and two patients were included in the study, with a male predominance (64.2%), mean age of 48.6 years, and mean disease duration of 17.2 years. There were 138 patients from the South (54 from Porto Alegre and 84 from Curitiba) and 64 patients from the North (Manaus). There were 144 patients (71.3%) classified as axial SpA (predominantly with AS) and 58 (28.7%) as peripheral SpA (predominantly with PsA).

Whites vs. non-Whites Demographic data showed that 126 patients (62.4%) were Whites and 76 (37.6%) were non-Whites. The prevalence of axial and peripheral SpA was similar in Whites and non-Whites. When comparing demographic and clinical data according to ethnicity, it was observed that non-Whites presented more frequent peripheral arthritis affecting lower limbs, while White patients presented higher frequency of positive HLA-B27, although it was not statistically significant (Table 1). Fifty-four patients were not tested for HLA-B27, especially in the North. Psoriasis was the most frequent extra-articular manifestation; although it was more common in White patients, there was no statistical significance. Anterior uveitis and inflammatory bowel disease presented similar frequencies in both ethnicities. No statistical significance was observed when the different indexes/questionnaires (BASDAI, ASDAS-ESR, ASDAS-CRP, BASFI, MASES, SPARCC, LEI, ASQoL, and HAQ) were performed in Whites and non-Whites. Regarding treatment, there were no statistical association related to the use of NSAIDs, corticosteroids, MTX, SSZ, and TNFi (Table 1).

North vs. South We also compared clinical and demographic data regarding ethnicity in patients from the North and those from the South, separately. In the North, there were 18 Whites (28.1%) and 46 non-Whites (71.9%), while in the South there were 108 Whites (78.3%) and 30 non-Whites (21.7%). There were no statistical associations with clinical variables, different indexes/questionnaires, and treatment (Table 2).

Non-Whites from the South vs. non-Whites from the North There were 46 non-Whites from the North and 30 from the South. The frequency of axial and peripheral SpA was similar in non-Whites from the North and from the South. The frequency of HLA-B27 was similar among the non-Whites, although it was missing in half the non-White patients from the North. The comparison among the non-Whites showed that while patients from the North had higher intake of NSAIDs ($p = 0.001$), patients from the South presented statistical association with higher values of ASDAS-CRP ($p = 0.001$) and HAQ ($p = 0.001$) and were more frequently prescribed adalimumab ($p = 0.001$) (Table 3). Although not

Table 2 Demographic, clinical and treatment data, and disease indexes, in SpA patients from three Brazilian rheumatological centers, according to the ethnic background (Whites vs. non-Whites from the North and from the South)

	Whites North	Non-Whites	*P*	Whites South	Non-Whites	*P*
	n = 46 %	*n* = 18 %		*n* = 108 %	*n* = 30 %	
Gender						
Male	66.7	78.3	0.521	63.0	50.0	0.284
Female	33.3	21.7		37.0	50.0	
Positive familial history	44.4	19.6	0.087	16.7	13.3	0.873
Positive HLA-B27	71.4	47.8	0.288	70.5	52.2	0.159
Lumbar pain	83.3	73.9	0.637	72.2	90.0	0.075
Buttock alternating pain	44.4	26.1	0.261	20.4	20.0	1.000
Cervical pain	50.0	41.3	0.726	36.1	43.3	0.611
Hip pain	22.2	23.9	1.000	31.5	33.3	1.000
Lower limb arthritis	50.0	73.9	0.125	49.1	50.0	1.000
Upper limb arthritis	38.9	52.2	0.498	31.5	36.7	0.752
Enthesitis	44.4	32.6	0.550	38.9	30.0	0.497
Dactylitis	22.2	8.7	0.293	16.7	16.7	1.000
Uveitis	16.7	17.4	1.000	32.6	44.4	0.367
Inflammatory bowel disease	5.6	6.5	1.000	3.3	7.4	0.690
Psoriasis	38.9	19.6	0.199	34.8	37.0	1.000
Physical exercise	55.6	41.3	0.453	50.9	26.7	0.031
Work	33.3	48.9	0.400	35.2	26.7	0.511
Axial SpA	77.8	73.9	1.000	65.7	70.0	0.827
Peripheral SpA	22.2	26.1		34.2	30.0	
BASDAI (mean ± SD)	2.87 ± 1.75	3.07 ± 2.45	0.715	3.74 ± 2.37	4.65 ± 2.67	0.099
ASDAS-ESR (mean ± SD)	2.65 ± 0.97	2.51 ± 1.04	0.615	2.73 ± 1.08	2.97 ± 1.22	0.328
ASDAS-CRP (mean ± SD)	1.65 ± 1.03	1.88 ± 1.35	0.482	2.61 ± 1.05	2.92 ± 1.14	0.196
MASES (0–13) (mean ± SD)	2.22 ± 4.08	2.39 ± 3.49	0.878	2.79 ± 3.69	3.97 ± 4.90	0.227
SPARCC (0–16) (mean ± SD)	2.33 ± 4.16	2.11 ± 3.99	0.845	2.31 ± 2.37	3.27 ± 4.58	0.299
LEI (0–6) (mean ± SD)	0.83 ± 1.54	0.67 ± 1.32	0.702	0.99 ± 1.70	1.40 ± 1.87	0.285
ASQoL (mean ± SD)	5.39 ± 4.45	5.07 ± 4.83	0.800	8.30 ± 4.80	8.60 ± 6.25	0.807
HAQ (mean ± SD)	0.51 ± 0.51	0.45 ± 0.40	0.629	0.87 ± 0.67	1.13 ± 0.90	0.169
ESR (mean ± SD)	27.0 ± 15.4	30.0 ± 23.7	0.550	25.7 ± 22.9	28.6 ± 22.3	0.542
CRP (mean ± SD)	3.8 ± 8.5	6.9 ± 17.4	0.340	12.2 ± 13.5	12.4 ± 11.7	0.932
NSAID						
Continuous	100.0	69.6	0.005	46.3	30.0	0.255
On demand	0.0	28.3		38.9	53.3	
Never	0.0	2.1		14.8	16.9	
Corticosteroids						
Current	11.1	13.0	0.581	7.4	10.0	0.883
Past	33.3	45.7		39.8	33.7	
Never	55.6	41.3		52.8	53.3	
Sulfasalazine						
Current	27.8	28.3	0.437	17.6	20.0	0.887
Past	22.2	37.0		24.1	26.7	
Never	50.0	34.7		58.3	53.3	
Methotrexate						
Current	83.3	56.5	0.065	32.4	26.7	0.076
Past	5.6	28.3		22.2	43.3	
Never	11.1	15.2		45.4	30.0	

Table 2 (continued)

	Whites North	Non-Whites	*P*	Whites South	Non-Whites	*P*
	n = 46 %	*n* = 18 %		*n* = 108 %	*n* = 30 %	
Infliximab						
Current	22.2	8.7	0.139	12.4	18.5	0.724
Past	16.7	6.5		3.4	3.7	
Never	61.1	84.8		84.2	77.8	
Etanercept						
Current	22.2	32.6	0.503	21.3	14.8	0.453
Past	11.1	4.3		10.3	18.5	
Never	66.7	63.1		68.4	66.7	
Adalimumab						
Current	22.2	15.2	0.052	24.7	29.6	0.093
Past	11.1	0.0		7.9	22.2	
Never	66.7	84.8		67.4	48.2	

NSAID, non-steroidal anti-inflammatory drugs; *ASDAS*, Ankylosing Spondylitis Disease Activity Score; *ASQoL*, Ankylosing Spondylitis Quality of Life; *BASDAI*, Bath Ankylosing Spondylitis Disease Activity Index; *BASFI*, Bath Ankylosing Spondylitis Functional Index; *CRP*, C-reactive protein; *ESR*, erythrocyte sedimentation rate; *HAQ*, Health Assessment Questionnaire; *LEI*, Leeds Enthesitis Index; *MASES*, Maastricht Ankylosing Spondylitis Enthesitis Score; *SPARCC*, Spondyloarthritis Research Consortium of Canada

statistically significant, male gender and higher intake of MTX was more frequent in the North, while anterior uveitis and higher values of BASDAI and ASQoL were more frequent in the South (Table 3).

Discussion

The present study contributes to a better understanding of the clinical characterization of the Brazilian SpA patients. It is important to emphasize that Brazil has a particular genetic pool due to the population miscegenation secondary to the colonization process, which brings one geographical region being different from the other according to the emigration flow. Caucasian colonization was established in the Southeast (predominantly of Portuguese, Italian, and Spanish origin) and in the South coast (with a high number of Germans and Italians). Slavery was responsible for the immigration of around 5 million Black people from Africa; these people were sent to the plantations of sugar cane in the Northeast and coffee in the Southeast. Nowadays, we have a strong African-Brazilian population in the North and Northeast and, in a minor degree, in the Southeast and mid-West. Descendants of the original Indians were mostly restricted to communities in the Amazon region (North), where there was miscegenation with Whites and Mulattos. The 2010 national census showed that the Brazilian population is constituted by 48.7% of Whites, 50.6% of African-Brazilians (43.6% Mulattos and 7.0% non-miscegenated Blacks), and 0.7% of Asian ancestry and Indians [18].

This study was designed to allow the comparison of SpA patients from two completely distinct geographic regions in the country, the South (predominantly White) and the North (encompassing the highly miscegenated Brazilian Amazon region). Due to the application of the Bonferroni correction, the results were not statistically significant among Whites and non-Whites. Nevertheless, it was possible to observe that the frequency of positive HLA-B27 was higher in the White patients and that peripheral arthritis was more frequent in the non-Whites. These findings suggest that larger cohorts, especially with non-White SpA patients, will be necessary to prove the hypothesis that the characteristic higher frequency of peripheral involvement observed in the non-White patients could be associated with the miscegenation among Whites and Blacks.

This is the first study comparing the non-White Brazilian SpA patients from the North with those from the South, characterizing distinct clinical presentations. The most striking difference among these populations was the frequency of non-Whites in the studied patients, 21.7% in the South vs. 71.9% in the North. The small non-White population from the South, predominantly originated from the miscegenation among Whites and Blacks who were sent as slaves in the seventeenth to nineteenth century, showed a more severe disease, associated with higher scores of ASDAS-CRP and HAQ. Differently, the SpA patients from the North showed only

Table 3 Demographic, clinical and treatment data, and disease indexes, in SpA patients from three Brazilian rheumatological centers, according to the ethnic background (non-Whites from the North vs. non-Whites from the South)

	Non-Whites North $n = 46$		Non-Whites South $n = 30$		*P*
	%	*N*	%	*N*	
Gender					
Male	78.3	36	50.0	15	0. 021
Female	21.7	10	50.0	15	
Positive familial history	19.6	9	13.3	4	0.694
Positive HLA-B27	47.8	11/23	52.2	12/23	1.000
Lumbar pain	73.9	34	90.0	27	0.153
Buttock alternating pain	26.1	12	20.0	6	0.738
Cervical pain	41.3	19	43.3	13	1.000
Hip pain	23.9	11	33.3	10	0.525
Lower limb arthritis	73.9	34	50.0	15	0.060
Upper limb arthritis	52.2	24	36.7	11	0.276
Enthesitis	32.6	15	30.0	9	1.000
Dactylitis	8.7	4	16.7	5	0.491
Uveitis	17.4	8	44.4	12	0.026
Inflammatory bowel disease	6.5	3	7.4	2	1.000
Psoriasis	19.6	9	37.0	10	0.172
Nail involvement	20.0	2/10	20.0	2/10	1.000
Physical exercise	41.3	19	26.7	8	0.290
Work	48.9	22	26.7	8	0.092
Axial SpA	73.9	34	70.0	21	0.912
Peripheral SpA	26.1	12	30.0	9	
BASDAI (mean ± SD)	3.07 ± 2.44		4.65 ± 2.67		0.012
ASDAS-ESR (mean ± SD)	2.51 ± 1.03		2.97 ± 1.22		0.096
ASDAS-CRP (mean ± SD)	1.87 ± 1.35		2.91 ± 1.13		0.001
MASES (0–13) (mean ± SD)	2.39 ± 3.48		3.97 ± 4.89		0.133
SPARCC (0–16) (mean ± SD)	2.11 ± 3.98		3.27 ± 4.57		0.262
LEI (0–6) (mean ± SD)	0.67 ± 1.31		1.40 ± 1.86		0.071
ASQoL (mean ± SD)	5.07 ± 4.83		8.60 ± 6.25		0.011
ESR (mean ± SD)	30.03 ± 23.71		28.55 ± 29.31		0.766
CRP (mean ± SD)	6.92 ± 17.44		12.39 ± 11.69		0.108
HAQ (mean ± SD)	0.45 ± 0.40		1.13 ± 0.90		0.001
NSAID					
Continuous	69.6	32	30.0	9	0.001
On demand	28.3	13	53.3	16	
Never	2.1	1	16.7	5	
Corticosteroids					
Current	13.0	6	10.0	3	0.588
Past	45.7	21	33.7	11	
Never	41.3	19	56.3	16	
Sulfasalazine					
Current	28.3	13	20.0	6	0.278
Past	37.0	17	26.7	8	
Never	34.7	16	53.3	16	

Table 3 (continued)

	Non-Whites North $n = 46$		Non-Whites South $n = 30$		*P*
	%	*N*	%	*N*	
Methotrexate					
Current	56.5	26	26.7	8	0.032
Past	28.3	13	43.3	13	
Never	15.2	7	30.0	9	
Infliximab					
Current	8.7	4	16.7	5	0.441
Past	6.5	3	3.3	1	
Never	84.8	39	80.0	24	
Etanercept					
Current	32.6	15	13.3	4	0.058
Past	4.3	2	16.7	5	
Never	63.1	29	70.0	21	
Adalimumab					
Current	15.2	7	26.7	8	0.001
Past	0.0	0	20.0	6	
Never	84.8	39	53.3	16	

NSAID, non-steroidal anti-inflammatory drugs; *ASDAS*, Ankylosing Spondylitis Disease Activity Score; *ASQoL*, Ankylosing Spondylitis Quality of Life; *BASDAI*, Bath Ankylosing Spondylitis Disease Activity Index; *BASFI*, Bath Ankylosing Spondylitis Functional Index; *CRP*, C-reactive protein; *ESR*, erythrocyte sedimentation rate; *HAQ*, Health Assessment Questionnaire; *LEI*, Leeds Enthesitis Index; *MASES*, Maastricht Ankylosing Spondylitis Enthesitis Score; *SPARCC*, Spondyloarthritis Research Consortium of Canada

a male predominance, although not statistically significant. As this region was colonized predominantly from the nineteenth century, without slave labor, it was constituted by a few Whites and a large group of Mulattos, who miscegenated with the Indian descendants; so, this mixed population is significantly more difficult to characterize. Further studies, especially analyzing the genetics of these populations, are necessary to elucidate the differences observed in these non-White patients.

Although not statistically significant after Bonferroni's correction, many results are worthy to be commented. In our study, the higher intake of MTX for the non-White patients can be associated with the higher peripheral involvement in this group, as previously observed in the Brazilian Registry of SpA [19]. And the lower QoL observed in non-White SpA Brazilian patients can be explained by the genetic background and the influence of socioeconomic factors, such as access to health services and to specific treatments [20]. We also showed that the working status was similar among the distinct populations, as 34.9% of the Whites and 40.5% of the non-Whites referred were working in a regular job. Interestingly, regular practice of physical exercise was more common in the White patients.

A common protocol of investigation and a previous meeting to standardize the data collection were important to avoid the problems related to the characterization of patients living in ethnic and socioeconomic distinct regions. But this study still had many limitations. First, the low number of patients, especially when they were subdivided for the statistical study, limits the power of the conclusions. In this setting, the application of the Bonferroni correction to the data was important to refine the statistical results. Second, the characterization of ethnicity in a highly miscegenated country is rather difficult and complex; we considered "White" those patients who considered themselves White and referred at least two previous White generations; that is probably the main reason we had a low number of "White" patients in the North. And finally, the fact that HLA-B27 was not tested in all the patients could have affected some results.

Summarizing, Brazilian SpA patients can present distinct patterns of disease according to the ethnic background, demonstrating that the clinical profile of SpA is also different among non-White patients from the North compared to the South.

Compliance with ethical standards

This research has been approved by the local Ethics in Research Committees of the three centers and all enrolled patients signed an informed consent.

Disclosures None.

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