Clinical and spinal radiographic outcome in axial spondyloarthritis
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Chapter 10

Obesity is common in axial spondyloarthritis and associated with poor clinical outcome

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Hendrika Bootsma
Elisabeth Brouwer
Anneke Spoorenberg

ABSTRACT

Objectives: To assess the prevalence of overweight and obesity in a large cohort of axial spondyloarthritis (SpA) patients in comparison with the general population. To explore the relationship of body mass index (BMI) with clinical outcome in axial SpA.

Methods: Patients from the Groningen Leeuwarden Axial SpA (GLAS) cohort who visited the outpatient clinic in 2011/2012 were included in this cross-sectional analysis. Body weight, height, disease activity, physical function, and quality of life (QoL) were assessed. Patients were divided into normal weight (BMI<25kg/m²), overweight (BMI≥25-<30kg/m²), and obesity (BMI≥30kg/m²). BMI data for the general population in the same demographic region, matched for age and gender, were obtained from the LifeLines Cohort Study.

Results: 461 axial SpA patients were included, 37% were overweight and 22% obese. In the LifeLines cohort (n=136,577), 43% were overweight and 15% obese. Overweight and obese patients were older, had longer symptom duration, and more comorbidity, especially hypertension. Furthermore, obese patients had significantly higher disease activity, worse physical function, and worse QoL than overweight and normal weight patients (mean BASDAI 4.5, 3.5, 3.8; mean ASDAS 2.8, 2.2, 2.3; median CRP 5, 3, 3 mg/L; median ESR 13, 8, 8 mm/hr; median BASFI 5.2, 2.9, 2.9; median ASQoL 8, 4, 5, respectively). After adjustment for potential confounders, obesity proved to be an independent predictor of worse clinical outcome.

Conclusions: In this large observational cohort study, obesity is more common in axial SpA than in the general population and it is associated with worse clinical outcome.
INTRODUCTION

Axial spondyloarthritis (SpA) is a chronic rheumatic inflammatory disease that predominantly affects the axial skeleton. Patients with axial SpA can be classified into ankylosing spondylitis (AS) and non-radiographic axial SpA (nr-axSpA) [1]. The disease usually starts between 15 and 45 years of age and is characterized by inflammatory low back pain, stiffness, and reduced spinal mobility. This leads to limitations in physical functioning and may result in physical inactivity [2].

Overweight and obesity are a worldwide growing problem. The World Health Organization (WHO) defines overweight and obesity as "abnormal or excessive fat accumulation that may impair health" [3]. It is associated with metabolic and cardiovascular diseases, some malignancies, and increased mortality and morbidity [4,5]. A valid population measure of overweight and obesity is the body mass index (BMI) [3]. Individuals with a BMI between 25 and 29.9 kg/m² are considered overweight and a BMI of 30 kg/m² or more represents obesity. Obesity is related to an increased risk for the development of rheumatic diseases such as rheumatoid arthritis (RA) and psoriatic arthritis (PsA) with varying odds ratios between 1.2 and 6.5 [6].

In axial SpA, a few studies have investigated the influence of BMI on clinical outcome. A small cross-sectional study in 46 AS patients demonstrated that 68% of the patients were overweight or obese. These patients had more functional limitations, higher subjective disease activity, and less benefits of exercise [7]. Two retrospective studies in 155 AS patients and 170 axial SpA patients showed significantly less response to tumor necrosis factor-alpha (TNF-α) blocking therapy in obese patients [8,9].

The first objective of the present study was to assess the prevalence of overweight and obesity in a large cohort of axial SpA patients in comparison with an age- and gender-matched cohort of the general population in the same demographic region. The second objective was to explore the relationship of BMI with disease activity, physical function, and quality of life in axial SpA.
METHODS

Axial SpA patients
All consecutive patients from the Groningen Leeuwarden Axial SpA (GLAS) cohort who
visited the outpatient clinic in 2011 or 2012 were included in this cross-sectional analysis.
The GLAS cohort is a prospective, longitudinal, observational cohort study in the North of
the Netherlands with a standardized assessment and management protocol according to
the Assessment of SpondyloArthritis international Society (ASAS) and the European League
against Rheumatism (EULAR) recommendations [10]. All patients were over 18 years of age
and fulfilled the 1984 modified New York criteria for AS (>90% of the population) [11] or the
2009 ASAS criteria for nr-axSpA [12].

Body weight and height were measured by physical examination and BMI was calculated
(weight in kilograms divided by the square of height in meters). Patients were divided
into three BMI categories according to the WHO criteria: normal weight (BMI <25 kg/m²),
overweight (BMI ≥25-<30 kg/m²), and obesity (BMI ≥30 kg/m²) [3]. Because of the small
number of patients with underweight (n=8), these patients were included in the normal
weight group.

Patient characteristics included age, gender, symptom duration, time since diagnosis,
HLA-B27 status, history of inflammatory bowel disease (IBD), uveitis, or psoriasis, presence of
peripheral arthritis (defined as ≥1 swollen joint), enthesal involvement (defined as ≥1 tender
entheses based on the Maastricht AS enthesitis score (MASES, 0-13)), use of nonsteroidal
anti-inflammatory drugs (NSAIDs), disease-modifying anti-rheumatic drugs (DMARDs),
TNF-α blockers, and comorbidity. Patients were questioned about possible comorbidities
by the physician based on the items of the self-administered comorbidity questionnaire, a
validated instrument to determine comorbidity in AS [13].

Disease activity was assessed by the Bath AS Disease Activity Index (BASDAI), AS Disease
Activity Score (ASDAS), C-reactive protein (CRP), and erythrocyte sedimentation rate (ESR).
Physical function and quality of life were assessed using the Bath AS Functional Index (BASFI)
and AS quality of life questionnaire (ASQoL), respectively.

The GLAS cohort study was conducted according to the principles of the Declaration of
Helsinki, approved by the local ethics committees of the Medical Center Leeuwarden (MCL)
and the University Medical Center Groningen (UMCG), and all patients provided written informed consent to participate in this study.

**General LifeLines population**

BMI data for the general population were obtained from the LifeLines Cohort Study, a large three-generation, population-based, longitudinal cohort study in the North of the Netherlands with a comparable age distribution as in the GLAS cohort [14]. Between 2006 and 2013, inhabitants of the northern part of the Netherlands were invited to participate and weight and height were measured by physical examination. The present analysis was limited to participants who were 18 years or older (n=136,577). Because there were more females than males in the LifeLines Cohort Study, data were adjusted for the gender distribution in the GLAS cohort (males>females) by stratifying the data for gender and multiplying the prevalence rates of normal weight, overweight, and obesity with the proportion of males or females in the GLAS cohort.

The LifeLines Cohort Study was conducted according to the principles of the Declaration of Helsinki, approved by the local ethics committee of the UMCG, and all participants provided written informed consent to participate in this study.

**Statistical analysis**

Results were expressed as number of patients (%), mean ± standard deviation (SD), or median (range) for categorical, normally distributed and non-normally distributed data, respectively. Descriptive statistics were used to compare the prevalence of overweight and obesity in axial SpA patients with the LifeLines population. Chi-square test, one-way ANOVA (with post-hoc LSD), and Kruskal Wallis test (with post-hoc Mann-Whitney U test) were used as appropriate to analyze the relationship of BMI categories with patient characteristics and clinical outcome in axial SpA patients. Additionally, univariable and multivariable linear regression analysis were used to investigate the association between BMI or obesity and clinical outcome corrected for potential confounders (age, gender, symptom duration, HLA-B27 status, and presence of any comorbidity (y/n) or presence of a specific comorbidity related to obesity: cardiovascular disease, hypertension, or diabetes (y/n)). If residuals were non-normally distributed, outcome variables were log transformed. Statistical analysis was performed with IBM SPSS Statistics 22 (SPSS, Chicago, IL, USA). P-values ≤0.05 were considered statistically significant.
RESULTS

In total, 461 axial SpA patients were included. The mean age was 45 years (SD ± 13), 66% were male, median symptom duration was 17 (range 0-61) years, and 80% were HLA-B27 positive. Patients had a mean BASDAI of 3.8 ± 2.3 and a mean ASDAS 2.4 ± 1.0. History of IBD was reported in 62 (14%) patients, uveitis in 146 (33%), and psoriasis in 52 (11%). Comorbidity was present in 198 (43%) patients. Hypertension was the most frequently reported comorbidity (Table 1).

Overweight and obesity in axial SpA versus the general population

The mean BMI of the axial SpA patients was 26.5 kg/m² (SD ± 4.6). The prevalence of overweight and obesity was 37% and 22%, respectively. Of the 100 obese patients, 19% had severe obesity (BMI ≥35<-40 kg/m²) and 3% had morbid obesity (BMI ≥40 kg/m²).

In comparison, the mean BMI of the age- and gender-matched LifeLines population was 26.1 kg/m² (SD ± 4.3) and the prevalence of overweight and obesity was 43% and 15%, respectively.

Relationship between BMI and clinical outcome in axial SpA

Axial SpA patients with overweight and obesity were significantly older, had longer symptom duration, and had more often comorbidity, especially hypertension, than patients with normal weight. Furthermore, patients with obesity were less frequent HLA-B27 positive (Table 1).

Obese patients had significantly higher disease activity than overweight or normal weight patients regarding to BASDAI (mean 4.5, 3.5, 3.8, resp.), ASDAS (mean 2.8, 2.2, 2.3, resp.), CRP (median 5, 3, 3 mg/L, resp.), and ESR (median 13, 8, 8 mm/hr, resp.). Obese patients also had significantly higher BASFI (median 5.2, 2.9, 2.9, resp.) and ASQoL (median 8, 4, 5, resp.) than overweight and normal weight patients, reflecting worse physical function and quality of life (Table 1).

Univariable linear regression analysis showed that BMI and obesity were significantly associated with BASDAI, ASDAS, CRP, ESR, BASFI, and ASQoL (Table 2). After adjustment for potential confounders in multivariable linear regression analysis, obesity proved to be an independent predictor of higher disease activity, worse physical function, and worse quality of life (Table 2).
Table 1. Patient characteristics and clinical outcome of axial SpA patients; stratified for BMI categories.

<table>
<thead>
<tr>
<th></th>
<th>All patients (n=461)</th>
<th>Normal weight (&lt;25.0 kg/m²) (n=188)</th>
<th>Overweight (25.0-30.0 kg/m²) (n=173)</th>
<th>Obesity (≥30.0 kg/m²) (n=100)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (yrs)</strong></td>
<td>45.3 ± 12.8</td>
<td>40.3 ± 12.1</td>
<td>48.2 ± 12.4*</td>
<td>49.6 ± 11.6*</td>
</tr>
<tr>
<td><strong>Gender (male)</strong></td>
<td>303 (66)</td>
<td>117 (63)</td>
<td>124 (72)</td>
<td>62 (62)</td>
</tr>
<tr>
<td><strong>Symptom duration (yrs)</strong></td>
<td>17 (0-61)</td>
<td>13 (0-53)</td>
<td>20 (1-61)*</td>
<td>19 (0-54)*</td>
</tr>
<tr>
<td><strong>Time since diagnosis (yrs)</strong></td>
<td>8 (0-54)</td>
<td>7 (0-41)</td>
<td>10 (0-48)</td>
<td>8 (0-54)</td>
</tr>
<tr>
<td><strong>HLA B27+</strong></td>
<td>361 (80)</td>
<td>155 (84)</td>
<td>138 (82)</td>
<td>68 (69)*†</td>
</tr>
<tr>
<td><strong>BMI (kg/m²)</strong></td>
<td>26.5 ± 4.6</td>
<td>22.3 ± 1.9</td>
<td>27.2 ± 1.4</td>
<td>33.2 ± 3.1</td>
</tr>
<tr>
<td><strong>History of IBD</strong></td>
<td>62 (14)</td>
<td>26 (14)</td>
<td>19 (11)</td>
<td>17 (17)</td>
</tr>
<tr>
<td><strong>History of uveitis</strong></td>
<td>146 (33)</td>
<td>63 (34)</td>
<td>55 (32)</td>
<td>28 (28)</td>
</tr>
<tr>
<td><strong>BMI (kg/m²)</strong></td>
<td>26.5 ± 4.6</td>
<td>22.3 ± 1.9</td>
<td>27.2 ± 1.4</td>
<td>33.2 ± 3.1</td>
</tr>
<tr>
<td><strong>History of psoriasis</strong></td>
<td>52 (11)</td>
<td>16 (9)</td>
<td>23 (13)</td>
<td>13 (13)</td>
</tr>
<tr>
<td><strong>Presence of peripheral arthritis</strong></td>
<td>16 (4)</td>
<td>9 (5)</td>
<td>4 (2)</td>
<td>3 (3)</td>
</tr>
<tr>
<td><strong>Presence of enthesal involvement</strong></td>
<td>160 (36)</td>
<td>63 (35)</td>
<td>57 (34)</td>
<td>40 (42)</td>
</tr>
<tr>
<td><strong>NSAID use</strong></td>
<td>228 (50)</td>
<td>94 (50)</td>
<td>80 (46)</td>
<td>54 (54)</td>
</tr>
<tr>
<td><strong>DMARD use</strong></td>
<td>32 (7)</td>
<td>16 (9)</td>
<td>10 (6)</td>
<td>6 (6)</td>
</tr>
<tr>
<td><strong>TNF-α inhibitor use</strong></td>
<td>204 (44)</td>
<td>79 (42)</td>
<td>84 (49)</td>
<td>41 (41)</td>
</tr>
<tr>
<td><strong>Comorbidity</strong></td>
<td>198 (43)</td>
<td>55 (30)</td>
<td>82 (48)*</td>
<td>61 (62)*†</td>
</tr>
<tr>
<td><strong>Cardiovascular disease</strong></td>
<td>35 (8)</td>
<td>10 (5)</td>
<td>14 (8)</td>
<td>11 (11)</td>
</tr>
<tr>
<td><strong>Hypertension</strong></td>
<td>105 (23)</td>
<td>15 (8)</td>
<td>45 (26)*</td>
<td>45 (45)*†</td>
</tr>
<tr>
<td><strong>Diabetes</strong></td>
<td>16 (4)</td>
<td>3 (2)</td>
<td>6 (4)</td>
<td>7 (7)</td>
</tr>
<tr>
<td><strong>Lung disease</strong></td>
<td>28 (6)</td>
<td>8 (4)</td>
<td>11 (6)</td>
<td>9 (9)</td>
</tr>
<tr>
<td><strong>Ulcer/stomach disease</strong></td>
<td>5 (1)</td>
<td>1 (1)</td>
<td>3 (2)</td>
<td>1 (1)</td>
</tr>
<tr>
<td><strong>Kidney disease</strong></td>
<td>5 (1)</td>
<td>2 (1)</td>
<td>2 (1)</td>
<td>1 (1)</td>
</tr>
<tr>
<td><strong>Liver disease</strong></td>
<td>3 (1)</td>
<td>1 (1)</td>
<td>1 (1)</td>
<td>1 (1)</td>
</tr>
<tr>
<td><strong>Anemia/blood disease</strong></td>
<td>6 (1)</td>
<td>3 (2)</td>
<td>2 (1)</td>
<td>1 (1)</td>
</tr>
<tr>
<td><strong>Cancer</strong></td>
<td>6 (1)</td>
<td>4 (2)</td>
<td>1 (1)</td>
<td>1 (1)</td>
</tr>
<tr>
<td><strong>Depression</strong></td>
<td>12 (3)</td>
<td>7 (4)</td>
<td>3 (3)</td>
<td>3 (3)</td>
</tr>
<tr>
<td><strong>Osteoarthritis or FMS</strong></td>
<td>20 (4)</td>
<td>7 (4)</td>
<td>7 (4)</td>
<td>6 (6)</td>
</tr>
<tr>
<td><strong>Non-inflammatory back pain</strong></td>
<td>6 (1)</td>
<td>2 (1)</td>
<td>4 (2)</td>
<td>0 (0)</td>
</tr>
<tr>
<td><strong>Other chronic rheumatic disease</strong></td>
<td>10 (2)</td>
<td>3 (2)</td>
<td>5 (3)</td>
<td>2 (2)</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>62 (13)</td>
<td>14 (7)</td>
<td>30 (17)*</td>
<td>18 (18)*†</td>
</tr>
<tr>
<td><strong>BASDAI (0-10)</strong></td>
<td>3.8 ± 2.3</td>
<td>3.8 ± 2.3</td>
<td>3.5 ± 2.1</td>
<td>4.5 ± 2.3*†</td>
</tr>
<tr>
<td><strong>ASDAS</strong></td>
<td>2.4 ± 1.0</td>
<td>2.3 ± 1.0</td>
<td>2.2 ± 0.8</td>
<td>2.8 ± 1.1*†</td>
</tr>
<tr>
<td><strong>CRP (mg/L)</strong></td>
<td>3 (0-94)</td>
<td>3 (0-73)</td>
<td>3 (1-94)</td>
<td>5 (1-82)*‡</td>
</tr>
<tr>
<td><strong>ESR (mm/hr)</strong></td>
<td>9 (1-79)</td>
<td>8 (1-71)</td>
<td>8 (2-79)</td>
<td>13 (2-66)*‡</td>
</tr>
<tr>
<td><strong>BASFI (0-10)</strong></td>
<td>3.3 (0-9.9)</td>
<td>2.9 (0-9.1)</td>
<td>2.9 (0-9.9)</td>
<td>5.2 (0-19.7)*†</td>
</tr>
<tr>
<td><strong>ASQoL (0-18)</strong></td>
<td>6 (0-18)</td>
<td>5 (0-17)</td>
<td>4 (0-17)</td>
<td>8 (0-18)*†</td>
</tr>
</tbody>
</table>

Values are presented as number of patients (%), mean ± SD or median (range).

* Irritable bowel syndrome, other eye/skin problems, headache, thyroid problems, allergy, osteoporosis.

* P-values ≤0.05 compared to patients with normal weight.

† P-values ≤0.05 compared to patients with overweight.

Abbreviations: HLA: Human leukocyte antigen; BMI: Body mass index; IBD: Inflammatory bowel disease; NSAID: Nonsteroidal anti-inflammatory drug; DMARD: Disease-modifying anti-rheumatic drugs; TNF: Tumor necrosis factor; FMS: Fibromyalgia syndrome; BASDAI: Bath ankylosing spondylitis disease activity index; ASDAS: Ankylosing spondylitis disease activity score; CRP: C-reactive protein; ESR: Erythrocyte sedimentation rate; BASFI: Bath ankylosing spondylitis functional index; ASQoL: Ankylosing spondylitis quality of life questionnaire.
In total, 31 obese patients had very high disease activity (BASDAI ≥6 and/or ASDAS >3.5). Of these patients, 6 were treated with TNF-α blockers, 6 fulfilled the ASAS criteria and were going to start with TNF-α blocking therapy, 7 had discontinued the treatment because of inefficacy or adverse events, 5 had contra-indications to start with TNF-α blockers, and 7 did not start because of their own choice (n=2) or expert opinion (n=5).

Table 2. Univariable and multivariable linear regression analysis of the association between BMI and obesity with clinical outcome.

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>Predicting variables</th>
<th>Univariable analysis</th>
<th>Multivariable analysis*</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASDAI</td>
<td>BMI</td>
<td>0.056 (0.011-0.101)</td>
<td>0.047 (-0.004-0.099)</td>
</tr>
<tr>
<td></td>
<td>Obesity</td>
<td>0.841 (0.341-1.341)</td>
<td>0.629 (0.080-1.179)</td>
</tr>
<tr>
<td>ASDAS</td>
<td>BMI</td>
<td>0.036 (0.016-0.057)</td>
<td>0.033 (0.010-0.057)</td>
</tr>
<tr>
<td></td>
<td>Obesity</td>
<td>0.526 (0.299-0.752)</td>
<td>0.497 (0.248-0.746)</td>
</tr>
<tr>
<td>CRP (log)</td>
<td>BMI</td>
<td>0.015 (0.006-0.023)</td>
<td>0.017 (0.007-0.026)</td>
</tr>
<tr>
<td></td>
<td>Obesity</td>
<td>0.186 (0.092-0.279)</td>
<td>0.231 (0.130-0.333)</td>
</tr>
<tr>
<td>ESR (log)</td>
<td>BMI</td>
<td>0.013 (0.005-0.021)</td>
<td>0.013 (0.003-0.022)</td>
</tr>
<tr>
<td></td>
<td>Obesity</td>
<td>0.116 (0.020-0.211)</td>
<td>0.118 (0.015-0.220)</td>
</tr>
<tr>
<td>BASFI</td>
<td>BMI</td>
<td>0.133 (0.083-0.183)</td>
<td>0.073 (0.019-0.128)</td>
</tr>
<tr>
<td></td>
<td>Obesity</td>
<td>1.609 (1.056-2.163)</td>
<td>1.040 (0.460-1.619)</td>
</tr>
<tr>
<td>ASQoL</td>
<td>BMI</td>
<td>0.147 (0.042-0.252)</td>
<td>0.086 (-0.031-0.204)</td>
</tr>
<tr>
<td></td>
<td>Obesity</td>
<td>2.891 (1.744-4.038)</td>
<td>2.157 (0.878-3.435)</td>
</tr>
</tbody>
</table>

* Adjusted for age, gender, symptom duration, HLA-B27 status, and comorbidity. See Table 1 for abbreviations.

DISCUSSION

This cross-sectional analysis in a large cohort of axial SpA patients showed that more than half of the patients were overweight or obese. Obesity was present in 22% and these patients had significantly higher disease activity, worse physical function, and worse quality of life.

The high prevalence of overweight and obesity in the GLAS cohort is in accordance with smaller studies in AS with comparable age and disease duration. A retrospective study in 155 patients and a cross-sectional study in 46 patients found overweight in 35% and 37%, and obesity in 25% and 31% of the patients, respectively [7,8].
The percentage of axial SpA patients with overweight and obesity was comparable to the Lifelines population (59% vs. 58%), but obesity alone was more common in axial SpA patients (22% vs. 15%). Obesity was also more common in our axial SpA cohort than in the general Dutch and world-wide adult population where the prevalence of obesity has been estimated to be 11-13% [15,3]. In line with our data, higher prevalence rates of obesity in comparison to the general population were also found in patients with RA, psoriasis, or PsA [16,17]. These data underlines that especially obesity seems to be more common in rheumatic diseases including axial SpA than in the general population.

In our study, obese patients were older, had more often comorbidities, especially hypertension, and were less frequent HLA-B27 positive. A significantly lower presence of HLA-B27 positivity in obese patients was also found in a previous retrospective study in 155 AS patients [8]. It has been suggested that obesity contributes to the pathogenesis and inflammatory processes of several inflammatory diseases such as RA and PsA [6]. Our findings also suggest an association between obesity and suffering from axial SpA without presence of HLA-B27. Since we performed a cross-sectional analysis, no statements can be made about causality.

Obese axial SpA patients had higher disease activity according to both subjective and objective disease activity assessments (BASDAI, ASDAS, CRP, ESR) and experienced worse physical function and quality of life assessed with questionnaires (BASFI and ASQoL) than overweight and normal weight patients. Higher subjective measures of disease activity (BASDAI, VAS patient global score) and worse physical function (BASFI) were also found in obese AS patients of a small cross-sectional study [7]. Obesity is found to be associated with an abnormal accumulation of adipose tissue and it is suggested that white adipose tissue is an active endocrine organ that secretes adipocytokines or adipokines (e.g. TNF-α) which may be responsible for a pro-inflammatory state in obese subjects [6,18].

Despite a higher disease activity, obese patients in our study did not use TNF-α blockers more often. Our exploratory analyses in relatively small subgroups suggest that discontinuation of TNF-α blocking therapy due to inefficacy or adverse events and contra-indications to start with this treatment were relatively common in obese patients with very high disease activity. These results imply that it is difficult to treat obese patients adequately.
In addition, previous studies have shown that obesity is a negative predictor of treatment response [8,9]. A retrospective study in 155 AS patients showed that obese patients had a significantly lower treatment response, defined as 50% improvement in BASDAI, VAS, and CRP after 6 months of infliximab therapy compared to baseline, than normal weight patients (27% vs. 78%, 17% vs. 73%, and 39% vs. 88%, respectively) [8]. Another study of 170 axial SpA patients demonstrated a significantly lower proportion of patients reaching BASDAI50 response after 12 months of TNF-α blocking therapy (infliximab, etanercept, adalimumab) in obese than in normal weight patients (30% vs. 73%) [9]. These associations between obesity, disease activity, and treatment response were also found in RA and PsA and suggest that obesity plays an important role in the response to TNF-α blocking therapy [6]. It has been found that the response to TNF-α blockers is related to the volume of distribution of these agents, which could be influenced by overweight and obesity [19]. In a previous study in PsA patients, weight loss was associated with an improved response to TNF-α blocking therapy [20]. However, the exact interactions between obesity and disease pathways in axial SpA and other rheumatic diseases still remain unclear [21].

On the other hand, physical and functional limitations related to obesity itself or due to high disease activity can result in physical inactivity which successively may lead to weight gain. Physical exercise is important in the management of axial SpA to maintain physical function and to reduce symptoms but it is also recommended to prevent obesity [22]. Besides medication to reduce symptoms related to disease activity, such as NSAIDs and/or TNF-α blocking therapy, physical exercise seems important to break the vicious circle between disease activity, physical inactivity, and obesity. Unfortunately, data about physical activity were not available in our cohort.

This was the first study that investigates the prevalence of overweight and obesity in a large cohort of axial SpA patients in comparison with a large age- and gender-matched cohort of the general population in the same demographic region. In this study, BMI categories were used. BMI does not consider the abdominal fat distribution, while anthropometric measures such as waist circumference does better reflect the amount of abdominal adipose tissue [23]. However, BMI is a valid and easily evaluable assessment in clinical practice and it is the most useful population-level measure to assess absolute fat mass adjusted for body height [3].
CONCLUSIONS

Obesity seems to be more common in patients with axial SpA than in the general population. Obesity in axial SpA was an independent predictor of both higher subjective and objective assessments of disease activity and worse physical function and quality of life. Clinicians and patients should be aware of the negative consequences of being obese in axial SpA and, if possible, adjustments in treatment options and regimens should be made. Our results underline the need for studies investigating the pathophysiological mechanisms of body fat in relation to inflammation in axial SpA. Furthermore, prospective data may clarify the relationship between obesity, disease activity, and physical function and the influence of weight loss and physical activity on clinical outcome in axial SpA.
REFERENCES


