

ORIGINAL ARTICLE

Correlation between Physical Activity Level and Disease Activity in Axial Spondyloarthritis

Nadia Rahman^{1*}, Imamur Rashid², Nadim Kamal³, Abul Kalam Azad⁴, Mohammad Golam Nobi⁵

Received: 24 August 2026
Accepted: 1 September 2026
Published Online: 3 September 2026

Published by:
Gopalganj Medical College, Gopalganj,
Bangladesh

*Corresponding Author

DOI: 10.5281/zenodo.22740907

Copyright © 2026 The Insight



This article is licensed under a Creative Commons Attribution 4.0 International License.



ABSTRACT

Background: Axial spondyloarthritis is a chronic inflammatory rheumatic disease associated with pain, stiffness, functional impairment, and reduced quality of life. Although physical activity is a key component of non-pharmacological management and has beneficial effects on disease outcomes, patients with axSpA are generally less physically active, and higher disease activity may be associated with lower physical activity participation. **Objective:** The aim of the study was to assess the correlation between physical activity level and disease activity among patients with axial spondyloarthritis. **Methods & Materials:** This cross-sectional observational study was conducted at the Department of Physical Medicine and Rehabilitation, Bangladesh Medical University (BMU), Dhaka, Bangladesh, from January 2025 to December 2025. Eighty patients with axial spondyloarthritis were enrolled. Disease activity, functional status, and physical activity level were assessed using BASDAI, BASFI, and IPAQ-SF, respectively. Data were analyzed using SPSS version 26.0, with $p < 0.05$ considered statistically significant. **Results:** Among 80 patients with axial spondyloarthritis, moderate physical activity was the most common level (46.3%), while 60.0% had active disease. Mean BASDAI scores decreased significantly with increasing physical activity, from 5.6 ± 1.4 in the low-activity group to 3.6 ± 1.2 in the high-activity group ($p < 0.001$). Physical activity showed significant negative correlations with BASDAI ($r = -0.52$) and BASFI ($r = -0.44$), both $p < 0.001$. The mean BASDAI, BASFI, BASMI, and pain scores were 4.8 ± 1.6 , 4.3 ± 1.5 , 4.2 ± 1.4 , and 5.3 ± 1.7 , respectively, while the mean CRP and ESR levels were 11.8 ± 8.6 mg/L and 28.4 ± 17.2 mm/hr, respectively. **Conclusion:** Higher physical activity levels were significantly associated with lower disease activity and better functional status among patients with axial spondyloarthritis.

Keywords: Axial Spondyloarthritis, Physical Activity, Disease Activity.

(The Insight 2026; 9(3): 767-772)

1. Associate Professor, Department of Physical Medicine and Rehabilitation, Bangladesh Medical University (BMU), Dhaka, Bangladesh (ORCID: 0009-0007-5305-0895)
2. Associate Professor, Department of Physical Medicine and Rehabilitation, Bangladesh Medical University (BMU), Dhaka, Bangladesh (ORCID: 0009-0008-6452-4619)
3. Associate Professor, Department of Physical Medicine and Rehabilitation, Bangladesh Medical University (BMU), Dhaka, Bangladesh (ORCID: 0009-0008-4959-1776)
4. Associate Professor, Department of Physical Medicine and Rehabilitation, Bangladesh Medical University (BMU), Dhaka, Bangladesh (ORCID: 0000-0003-4570-6202)
5. Associate Professor, Department of Physical Medicine and Rehabilitation, Bangladesh Medical University (BMU), Dhaka, Bangladesh (ORCID: 0009-0006-8282-6819)

INTRODUCTION

Axial spondyloarthritis (axSpA) is a chronic inflammatory rheumatic condition characterized by inflammatory pain and stiffness in the sacroiliac joints, with symptom onset commonly occurring in the third decade of life. It is a chronic inflammatory rheumatic disease that predominantly affects young individuals, with an estimated prevalence ranging between 0.3% and 1.4%. In axSpA, patients primarily present with inflammatory back pain, with frequent involvement of the axial skeleton and sacroiliac joints [1]. The main clinical manifestations include inflammatory back pain, reduced joint mobility, and functional disability. These pathological changes contribute to decreased spinal mobility and impaired physical function, which may subsequently lead to reduced overall physical functioning and diminished quality of life (QOL) [2,3]. In addition, axSpA has been associated with an increased risk of cardiovascular disease (CVD) compared with the general population [4]. Over the past decade, accumulating evidence has

further demonstrated that inflammatory rheumatic diseases are linked with a higher risk of cardiovascular (CV) disease. Despite the well-established benefits of regular physical activity in improving health outcomes [5,6], individuals with inflammatory arthritis, including those with spondyloarthritis (SpA), tend to have lower levels of physical activity compared to people without the disease [7,8]. Moreover, the pattern and extent of disease involvement and resulting functional limitations differ between axial SpA and peripheral SpA, indicating that physical activity interventions should be individualized based on disease phenotype.

Physical activity (PA) and exercise have been shown to enhance overall well-being and reduce the risk of cardiovascular disease in the general population [9]. PA is defined as any bodily movement produced by skeletal muscles that results in energy expenditure. A clear dose-response relationship between physical activity levels and health benefits has been demonstrated [10]. In the general population, strong evidence

supports the beneficial effects of PA, including a 20–30% reduction in the risk of premature mortality and a lower risk of multiple chronic diseases. Exercise is a specific form of physical activity that is planned, structured, and repetitive, with the aim of improving or maintaining physical fitness [11]. The World Health Organization (WHO) has issued recommendations for physical activity and muscle-strengthening exercises for adults, including older adults and individuals with chronic conditions. The WHO further recommends that individuals engage in regular exercise according to their capacity, including both aerobic and muscle-strengthening activities performed at least at moderate intensity levels [12].

The beneficial effects of physical activity in axSpA have also been well documented [13], and the European League Against Rheumatism (EULAR) recommends physical activity as a key component of non-pharmacological management in axSpA. Physical activity has been shown to improve multiple health outcomes, including reduction of symptoms such as pain, improvement in spinal mobility, and enhancement of physical function in axSpA [14]. The 2021 European Alliance of Associations for Rheumatology (EULAR) recommendations on lifestyle behaviors emphasize that WHO physical activity guidelines are also applicable to individuals with rheumatic and musculoskeletal diseases (RMDs), and that patients with axSpA should be strongly encouraged to engage in exercise due to its beneficial effects on disease-related outcomes [15]. Exercise plays a central role in the management of inflammatory rheumatic diseases [16], and low-dose exercise prescriptions (frequency, intensity, time, and type) are commonly used to reduce pain and improve joint mobility [17]. Physical activity is therefore considered a fundamental component in the management of SpA. Given the increased cardiovascular risk in axSpA, it is essential to implement strategies aimed at reducing this risk, including promotion of physical activity [18]. In particular, considering the elevated cardiovascular risk in patients with axSpA, both cardiorespiratory and strength training exercises, which also provide cardiovascular protective effects, should be considered as therapeutic options in this population. Regular physical activity has also been shown to positively influence disease activity, physical function, and pain levels.

Despite these recommendations, several studies have reported reduced levels of physical activity among patients with axSpA in countries such as Canada and Sweden [19]. Previous research has also demonstrated that individuals with axSpA have lower physical activity levels and engage less in vigorous-intensity activities compared with age- and sex-matched healthy controls. Similarly, patients with SpA are generally less physically active than healthy individuals, particularly in relation to high-intensity physical activities. In addition, there is evidence suggesting that higher disease activity may be associated with reduced participation in physical activity. High-intensity exercise has often been approached cautiously by clinicians due to concerns that it may potentially exacerbate disease activity or trigger flare-ups. Furthermore, higher disease activity has been linked with reduced engagement in physical activity. Therefore, the present study was designed to investigate the correlation between physical activity level and disease activity in patients with axial spondyloarthritis.

OBJECTIVE

To assess the correlation between physical activity level and disease activity among patients with axial spondyloarthritis.

METHOD & MATERIALS

This cross-sectional observational study was conducted at the Department of Physical Medicine and Rehabilitation, Bangladesh Medical University (BMU), Dhaka, Bangladesh, from January 2025 to December 2025. A total of 80 patients diagnosed with axial spondyloarthritis (AxSpA) according to the Assessment of SpondyloArthritis International Society (ASAS) classification criteria were included in the study based on predefined inclusion and exclusion criteria. Ethical approval was obtained from the Institutional Review Board of Bangladesh Medical University, and informed written consent was obtained from all participants prior to enrollment. Sociodemographic and clinical data were collected using a predesigned data collection form to evaluate the relationship between physical activity level and disease activity among patients with AxSpA.

Inclusion Criteria

- Patients aged 18 years and above.
- Patients diagnosed with axial spondyloarthritis according to the ASAS classification criteria.
- Patients attending the Department of Physical Medicine and Rehabilitation, Bangladesh Medical University (BMU), Dhaka.
- Patients willing to participate and providing informed written consent.

Exclusion Criteria

- Patients with severe comorbid illnesses.
- Patients with acute infections.
- Patients with neurological disorders affecting physical activity.
- Patients with cognitive impairment precluding reliable questionnaire responses.
- Patients with malignancy.
- Pregnant women.
- Patients with musculoskeletal conditions limiting physical activity independent of AxSpA.
- Patients unwilling to participate in the study.

Data Collection Procedure

After obtaining informed written consent, sociodemographic and clinical data, including age, sex, disease duration, pain score, BASMI score, CRP, and ESR, were collected using a predesigned data collection form. All participants underwent clinical assessment during their outpatient visits to the Department of Physical Medicine and Rehabilitation, Bangladesh Medical University (BMU), Dhaka.

Assessment of Disease Activity and Functional Status

Disease activity was assessed using the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), while functional status was evaluated using the Bath Ankylosing Spondylitis Functional Index (BASFI). Spinal mobility was assessed using the Bath Ankylosing Spondylitis Metrology Index (BASMI). Pain severity was assessed using a Numeric Rating Scale (NRS) or Visual Analog Scale (VAS). Inflammatory status was evaluated using serum C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR). All assessments were performed according to standard procedures.

Assessment of Physical Activity

Physical activity level was measured using the International Physical Activity Questionnaire-Short Form (IPAQ-SF). Based on the standard IPAQ scoring protocol, participants were categorized into low, moderate, and high physical activity groups.

Statistical Analysis

Data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean $\pm$ standard

deviation (SD), whereas categorical variables were presented as frequencies and percentages. Differences in mean BASDAI scores among physical activity groups were analyzed using one-way analysis of variance (ANOVA). Pearson's correlation coefficient was used to assess the relationship between physical activity level and disease activity (BASDAI) as well as functional status (BASFI). A p-value <0.05 was considered statistically significant.

RESULTS

Table I: Baseline Demographic and Clinical Characteristics of the Study Population (n = 80)

Variable	Value
Age (years), mean $\pm$ SD	42.6 $\pm$ 10.8
Male, n (%)	45 (56.3)
Female, n (%)	35 (43.7)
Disease duration (years), mean $\pm$ SD	7.4 $\pm$ 4.9
BASDAI score, mean $\pm$ SD	4.8 $\pm$ 1.6
BASFI score, mean $\pm$ SD	4.3 $\pm$ 1.5
BASMI score, mean $\pm$ SD	4.2 $\pm$ 1.4
Pain score (NRS/VAS), mean $\pm$ SD	5.3 $\pm$ 1.7
CRP (mg/L), mean $\pm$ SD	11.8 $\pm$ 8.6
ESR (mm/hr), mean $\pm$ SD	28.4 $\pm$ 17.2

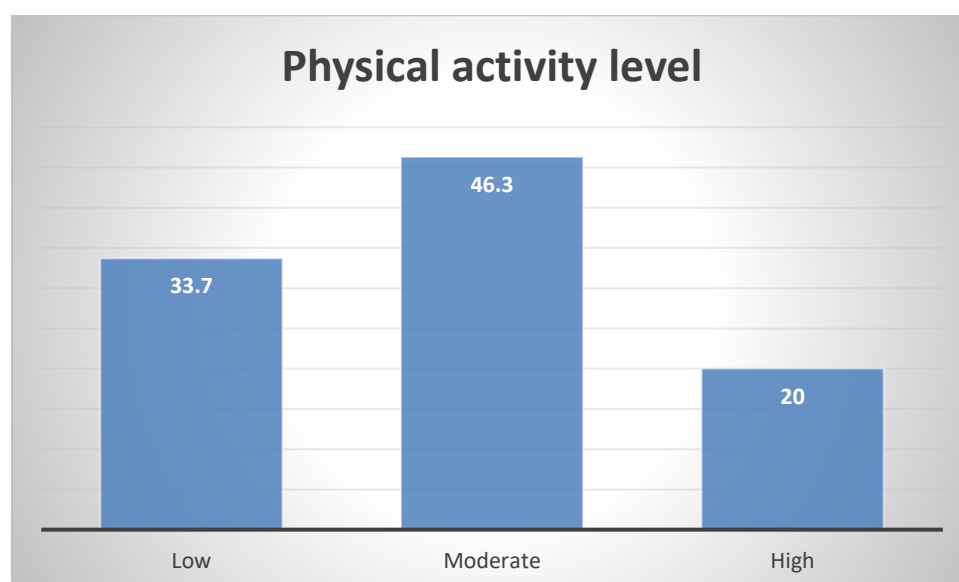


Figure 1: Distribution of Physical Activity Levels Among Patients with Axial Spondyloarthritis According to IPAQ Classification (n = 80)

Figure 1 illustrates the distribution of physical activity levels among the study participants according to the International Physical Activity Questionnaire (IPAQ). Moderate physical activity was the most common category, observed in 37 (46.3%) patients, followed by low physical activity in 27 (33.7%) and high physical activity in 16 (20.0%) patients.

Table II shows the distribution of patients according to disease activity based on BASDAI score. Active disease (BASDAI $\geq$ 4) was observed in 48 (60.0%) patients, whereas 32 (40.0%) patients had mild or low disease activity (BASDAI <4).

Table II: Distribution of Patients According to Disease Activity Based on BASDAI Score (n = 80)

Disease activity	BASDAI score	n	%
Mild/Low activity	<4	32	40.0
Active disease	$\geq$ 4	48	60.0
Total		80	100.0

Table III presents the comparison of mean BASDAI scores according to physical activity level among the study participants. Patients with low physical activity had the highest mean BASDAI score (5.6 ± 1.4), whereas those with high physical activity had the lowest mean BASDAI score (3.6 ± 1.2).

Table III: Comparison of Mean BASDAI Scores According to Physical Activity Level Among Patients with Axial Spondyloarthritis (n = 80)

Physical activity level	n	BASDAI (Mean $\pm$ SD)	p-value
Low	27	5.6 ± 1.4	<0.001
Moderate	37	4.7 ± 1.3	
High	16	3.6 ± 1.2	

Table IV demonstrates the correlation between physical activity level and disease parameters among patients with axial spondyloarthritis. Physical activity level showed a statistically

The differences in mean BASDAI scores among the three physical activity groups were statistically significant ($p < 0.001$).

significant moderate negative correlation with disease activity measured by BASDAI ($r = -0.52$, $p < 0.001$) and functional impairment measured by BASFI ($r = -0.44$, $p < 0.001$).

Table IV: Correlation Between Physical Activity Level and Disease Parameters Among Patients with Axial Spondyloarthritis (n = 80)

Variable pair	Correlation coefficient (r)	p-value
Physical activity vs BASDAI	-0.52	<0.001
Physical activity vs BASFI	-0.44	<0.001

DISCUSSION

This cross-sectional observational study was conducted in the Department of Physical Medicine and Rehabilitation, Bangladesh Medical University (BMU), Dhaka, Bangladesh. A total of 80 patients with axial spondyloarthritis were enrolled to assess the correlation between physical activity level and disease activity. Physical activity was evaluated using the International Physical Activity Questionnaire-Short Form (IPAQ-SF), while disease activity and functional status were assessed using the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) and Bath Ankylosing Spondylitis Functional Index (BASFI), respectively.

The mean BASMI score was 4.2 ± 1.4 , with a mean pain score of 5.3 ± 1.7 , while the mean CRP and ESR were 11.8 ± 8.6 mg/L and 28.4 ± 17.2 mm/hr, respectively. The elevated mean CRP and ESR levels suggest a measurable degree of systemic inflammation among the study participants, which is relevant given the underlying inflammatory nature of axial spondyloarthritis. CRP and ESR are commonly used laboratory markers to assess inflammatory activity and may provide objective information alongside patient-reported measures such as BASDAI and pain scores. The observed inflammatory marker levels, together with the elevated mean BASDAI, support the presence of ongoing inflammatory disease activity in this cohort, although CRP and ESR may vary among individual patients and do not always directly reflect clinical disease activity. These findings are comparable to those reported by Coulter et al., who observed a mean age of 49.0 ± 11.7 years, with 51% male participants and mean BASDAI and BASFI scores of 4.5 ± 2.3 and 4.4 ± 2.6 , respectively [20]. Similarly, Schiestl et al. reported a mean age of 39.3 years in their German axial spondyloarthritis cohort, with males accounting for 46% of the study population and mean BASDAI and BASFI scores of 4.6 ± 2.0 and 3.1 ± 2.4 , respectively [21]. The broadly comparable demographic characteristics and disease activity and functional indices across these studies suggest that the present cohort represents a clinically relevant population of patients with axial spondyloarthritis encountered in routine practice. The inclusion of mobility, pain, and inflammatory parameters in the present study further

provides a broader description of the clinical profile of the participants.

With regard to physical activity, moderate physical activity was the most prevalent category, observed in 46.3% of patients, followed by low physical activity in 33.7% and high physical activity in 20.0%. These findings are in accordance with those reported by Fabre et al., who evaluated physical activity among 203 patients with axial spondyloarthritis using the International Physical Activity Questionnaire (IPAQ) and found considerable variability in activity levels, with approximately half of the patients achieving recommended physical activity targets and a substantial proportion demonstrating moderate-to-high levels of activity [6]. Likewise, Hilberdink et al. reported that only a subset of patients with axial spondyloarthritis achieved adequate aerobic physical activity, emphasizing that physical inactivity remains common despite well-established exercise recommendations [22]. The predominance of moderate physical activity observed in the present study, together with the relatively high proportion of patients with low physical activity, supports previous evidence that while many patients maintain some degree of physical activity, a substantial proportion continue to experience insufficient activity levels. These findings underscore the need for targeted interventions and patient education strategies aimed at promoting regular physical activity in this population.

Assessment of disease activity revealed that 48 (60.0%) patients had active disease (BASDAI ≥ 4), whereas 32 (40.0%) exhibited mild or low disease activity (BASDAI < 4). These findings are consistent with previous studies demonstrating a considerable burden of disease activity among patients with axial spondyloarthritis. Garrido-Cumbrera et al., in the International Map of Axial Spondyloarthritis (IMAS) study involving 5,295 patients, reported that 75% of patients had active disease, with a mean BASDAI score of 5.4 ± 2.1 [23]. Although the prevalence of active disease was somewhat higher than that observed in the present study, both studies indicate that the majority of patients experience clinically significant disease activity. Similarly, de Winter et al. reported that between 58% and 75% of patients had BASDAI scores ≥ 4 , depending on the presence of peripheral manifestations [24]. The prevalence of active disease observed in the present cohort

closely parallels the lower range reported by de Winter et al., further supporting the notion that active disease remains common among patients with axial spondyloarthritis despite advances in therapeutic strategies.

A noteworthy finding of the present study was the clear graded relationship between physical activity level and disease activity, with BASDAI scores progressively declining across increasing physical activity categories. Patients with low physical activity exhibited the highest mean BASDAI score (5.6 ± 1.4), followed by those with moderate physical activity (4.7 ± 1.3), whereas the lowest scores were observed among patients with high physical activity (3.6 ± 1.2), and the differences were statistically significant ($p < 0.001$). These findings are consistent with those reported by Kim et al., who demonstrated a dose-response relationship between physical activity and disease outcomes in axial spondyloarthritis. Their study showed that higher levels of physical activity were independently associated with lower BASFI scores and reduced disease burden, while moderate levels of activity were associated with better overall function. Moreover, BASDAI scores decreased progressively with increasing physical activity, suggesting a gradient effect similar to that observed in the present study [25]. Taken together, these findings support the concept that greater engagement in physical activity contributes to improved disease control and better patient-reported outcomes in individuals with axial spondyloarthritis. Furthermore, physical activity level demonstrated significant moderate negative correlations with both disease activity and functional impairment, as evidenced by correlations with BASDAI ($r = -0.52$, $p < 0.001$) and BASFI ($r = -0.44$, $p < 0.001$). These findings indicate that higher levels of physical activity are associated with lower disease activity and better functional status. Similar observations were reported by Coulter et al., who, using objective accelerometer measurements, found significant inverse associations between physical activity indices and BASFI, showing that greater walking time, higher daily step counts, and increased moderate-to-vigorous physical activity were associated with reduced functional limitation [20]. Although Coulter et al. did not observe a statistically significant association between physical activity and BASDAI, patients with active disease tended to be less physically active and more sedentary, lending support to the inverse relationship observed in the present study. Likewise, Kim et al. demonstrated a significant negative association between total physical activity and BASFI, with patients engaging in higher levels of physical activity exhibiting better global function and lower disease burden. They also reported a progressive decline in BASDAI with increasing physical activity, suggesting a dose-response relationship between activity level and disease burden [25]. Collectively, these findings reinforce the beneficial role of physical activity in reducing disease activity and improving functional outcomes among patients with axial spondyloarthritis, highlighting the importance of incorporating regular physical activity into the comprehensive management of this chronic inflammatory disease.

LIMITATIONS

The study had several limitations:

- The study was conducted at a single center, which may limit the generalizability of the findings to the broader population of patients with axial spondyloarthritis.
- The relatively small sample size may limit the applicability of the findings to larger populations.

CONCLUSION

Axial spondyloarthritis is a chronic inflammatory disease in which disease activity and functional impairment can substantially affect patients' quality of life. In conclusion, physical activity level was significantly and inversely associated with disease activity among patients with axial spondyloarthritis. Higher levels of physical activity were associated with lower disease activity and better functional status, suggesting that regular physical activity may play an important role in reducing disease burden and improving overall outcomes in this patient population.

ACKNOWLEDGMENT

I would like to express my sincere gratitude for the invaluable support and cooperation provided by the staff, participants and my co-authors/colleagues who contributed to this study.

CONFLICTS OF INTEREST

There are no conflicts of interest.

REFERENCES

1. Braun J, Sieper J. Ankylosing spondylitis. *The Lancet*. 2007 Apr 21;369(9570):1379-90.
2. Salaffi F, Carotti M, Gasparini S, Intorcia M, Grassi W. The health-related quality of life in rheumatoid arthritis, ankylosing spondylitis, and psoriatic arthritis: a comparison with a selected sample of healthy people. *Health and quality of life outcomes*. 2009 Mar 18;7(1):25.
3. Carrette S, Graham D, Little H, Rubenstein J, Rosen P. The natural disease course of ankylosing spondylitis. *Arthritis & Rheumatism: Official Journal of the American College of Rheumatology*. 1983 Feb;26(2):186-90.
4. Mathieu S, Gossec L, Dougados M, Soubrier M. Cardiovascular profile in ankylosing spondylitis: a systematic review and meta-analysis. *Arthritis care & research*. 2011 Apr;63(4):557-63.
5. Brophy S, Cooksey R, Davies H, Dennis MS, Zhou SM, Siebert S. The effect of physical activity and motivation on function in ankylosing spondylitis: a cohort study. In *Seminars in arthritis and rheumatism* 2013 Jun 1 (Vol. 42, No. 6, pp. 619-626). WB Saunders.
6. Fabre S, Molto A, Dadoun S, Rein C, Hudry C, Kreis S, Fautrel B, Pertuiset E, Gossec L. Physical activity in patients with axial spondyloarthritis: a cross-sectional study of 203 patients. *Rheumatology international*. 2016 Dec;36(12):1711-8.
7. Hernandez-Hernandez V, Ferraz-Amaro I, Díaz-González F. Influence of disease activity on the physical activity of rheumatoid arthritis patients. *Rheumatology*. 2014 Apr 1;53(4):722-31.
8. Swinnen TW, Scheers T, Lefevre J, Dankaerts W, Westhovens R, de Vlam K. Physical activity assessment in patients with axial spondyloarthritis compared to healthy controls: a technology-based approach. *PloS one*. 2014 Feb 28;9(2):e85309.
9. Bassuk SS, Manson JE. Physical activity and the prevention of cardiovascular disease. *Current atherosclerosis reports*. 2003 Jul;5(4):299-307.
10. Garber CE, Blissmer B, Deschenes MR, Franklin BA, Lamonte MJ, Lee IM, Nieman DC, Swain DP. Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: guidance for prescribing exercise.
11. Caspersen CJ, Powell KE, Christenson GM. Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public health reports*. 1985 Mar;100(2):126.
12. Okely AD, Kontsevaya A, Ng J, Abdeta C. 2020 WHO guidelines on physical activity and sedentary behavior. *Sports Medicine and Health Science*. 2021 Jun 1;3(2):115-8.
13. Sveaas SH, Berg IJ, Provan SA, Semb AG, Hagen KB, Vøllestad N, Fongen C, Olsen IC, Michelsen A, Ueland T, Aukrust P. Efficacy of high intensity exercise on disease activity and cardiovascular risk in active axial spondyloarthritis: a randomized controlled pilot study. *PloS one*. 2014 Sep 30;9(9):e108688.

14. Regel A, Sepriano A, Baraliakos X, van der Heijde D, Braun J, Landewé R, Van den Bosch F, Falzon L, Ramiro S. Efficacy and safety of non-pharmacological and non-biological pharmacological treatment: a systematic literature review informing the 2016 update of the ASAS/EULAR recommendations for the management of axial spondyloarthritis. *RMD open*. 2017 Jan 27;3(1).
15. Gwinnutt JM, Wieczorek M, Balanescu A, Bischoff-Ferrari HA, Boonen A, Cavalli G, De Souza S, De Thurah A, Dorner TE, Moe RH, Putrik P. 2021 EULAR recommendations regarding lifestyle behaviours and work participation to prevent progression of rheumatic and musculoskeletal diseases. *Annals of the rheumatic diseases*. 2023 Jan 1;82(1):48-56.
16. Osthoff AK, Niedermann K, Braun J, Adams J, Brodin N, Dagfinrud H, Duruoz T, Esbensen BA, Günther KP, Hurkmans E, Juhl CB. 2018 EULAR recommendations for physical activity in people with inflammatory arthritis and osteoarthritis. *Annals of the rheumatic diseases*. 2018 Sep 1;77(9):1251-60.
17. Dagfinrud H, Halvorsen S, Vøllestad NK, Niedermann K, Kvien TK, Hagen KB. Exercise programs in trials for patients with ankylosing spondylitis: do they really have the potential for effectiveness?. *Arthritis care & research*. 2011 Apr;63(4):597-603.
18. Drosos GC, Vedder D, Houben E, Boekel L, Atzeni F, Badreh S, Boumpas DT, Brodin N, Bruce IN, Gonzalez-Gay MA, Jacobsen S. EULAR recommendations for cardiovascular risk management in rheumatic and musculoskeletal diseases, including systemic lupus erythematosus and antiphospholipid syndrome. *Annals of the rheumatic diseases*. 2022 Jun 1;81(6):768-79.
19. Passalent LA, Soever LJ, O'SHEA FD, Inman RD. Exercise in ankylosing spondylitis: discrepancies between recommendations and reality. *The Journal of rheumatology*. 2010 Apr 1;37(4):835-41.
20. Coulter EH, McDonald MT, Cameron S, Siebert S, Paul L. Physical activity and sedentary behaviour and their associations with clinical measures in axial spondyloarthritis. *Rheumatol Int*. 2020 Mar;40(3):375-381.
21. Schiestl LJ, Wendt E, Proft F, Hoepfer K, Witte T, Assmann G, Schwarting A, Dreher M. Interrelations of disease activity, health-related quality of life, and mental health in axial spondyloarthritis: the Rheuma-VOR cohort. *Frontiers in Medicine*. 2026 May 13;13:1823684.
22. Hilberdink B, Vlieland TV, van der Giesen F, van Gaalen F, Goekoop R, Peeters A, Fiocco M, van Weely S. Adequately dosed aerobic physical activity in people with axial spondyloarthritis: associations with physical therapy. *Rheumatol Int*. 2020 Sep;40(9):1519-1528.
23. Garrido-Cumbrera M, Poddubnyy D, Sommerfleck F, Bundy C, Makri S, Correa-Fernández J, Akerkar S, Lowe J, Karam E, Navarro-Compán V. Do patients with axial spondyloarthritis with active disease suffer from greater disease burden and work impairment? Results from the International Map of Axial Spondyloarthritis (IMAS). *Reumatología Clínica (English Edition)*. 2024 Dec 1;20(10):547-54.
24. de Winter JJ, Paramarta JE, de Jong HM, van de Sande MG, Baeten DL. Peripheral disease contributes significantly to the level of disease activity in axial spondyloarthritis. *RMD Open*. 2019 Jan 11;5(1):e000802.
25. Kim MY, Hong YS, Park SH, Kang KY. Physical activity is associated with physical and global function in patients with axial spondyloarthritis, independent of disease activity. *In Seminars in arthritis and rheumatism* 2022 Oct 1 (Vol. 56, p. 152067). WB Saunders.