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SHORT REPORT

Impact of the COVID-19 pandemic on work productivity in patients with spondyloarthritis: results from the Dutch SpA-Net registry

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ABSTRACT

Objective To investigate whether work productivity in patients with spondyloarthritis (SpA) changed following the onset of the COVID-19 pandemic.

Methods Data from the Dutch SpA-Net registry were used. Work productivity was assessed with the Work Productivity and Activity Impairment General Health questionnaire. Proportions of patients employed and their overall work impairment (0%–100%) were compared during a 1-year period before ('pre-pandemic') and a 1-year period after the onset ('post-onset') of the pandemic (March 2020). Generalised estimating equation analysis of all assessments since 2016 explored whether overall work impairment (absenteeism and presenteeism) in employed patients changed with pandemic onset, adjusting for confounders. Similar analyses with disease activity as outcome were used to facilitate interpretation of work productivity results.

Results Data were available during pre-pandemic and post-onset years for 204 patients. Pre-pandemic, 128 (62%) patients were employed. Post-onset, 7 (3.4%) had lost employment, while another 7 (3.4%) originally unemployed gained employment. Overall work impairment was worse following pandemic onset (37.0%) compared with pre-pandemic (27.0%) (p<0.01). Post-onset increase in overall work impairment was mainly observed in patients with lower education (B=9.57, 95% CI 5.63 to 13.51) and largely attributable to absenteeism (B=11.15, 95% CI 7.44 to 14.86). In patients with high education, no such increase was seen. Disease activity did not change with pandemic onset.

Conclusions Work productivity worsened in patients with SpA after pandemic onset, especially in patients with lower education, while employment losses were limited and disease activity remained stable. Work support should be considered during the COVID-19 pandemic and thereafter for those vulnerable to adverse work outcome.

Key messages

⇒ The effect of the COVID-19 pandemic on work productivity in spondyloarthritis is unknown.
⇒ Work productivity significantly worsened with pandemic onset in employed patients with low education, mainly due to increased sickness absence and not due to decreased at-work productivity.
⇒ Work support should be considered for those vulnerable to adverse work outcome during the pandemic and thereafter.

INTRODUCTION

The COVID-19 pandemic has immensely impacted society. Since early 2020, governments have initiated regional and nationwide measures to contain the spread of the disease.[1] In the Netherlands, people were urged to work from home in March 2020, and several work sectors were shut down. In addition, schools were closed and hospitals had to reduce regular care. Since then, some of these measures were phased out, only to be reintroduced when new waves of the pandemic struck. These changes, together with (the risk of) contracting symptomatic COVID-19, affected persons' employment perspectives and work productivity.[2] Patients with rheumatic and musculoskeletal disorders (RMDs) might face additional health-related risks affecting work productivity, not only due to factors that put them at increased risk of infection[3] but also due to anxiety and concerns about their health and safety at work.[4]

Several studies investigated the impact of the pandemic on work-related outcomes in patients with RMDs. A large international survey-based study in patients with various RMDs conducted in the first half of 2020 observed a change in employment status in 27%, with a 14% reduction in full-time employment.[5] A Canadian study among young adults with RMDs found odds of employment to be reduced by 72% following pandemic onset, compared with pre-pandemic.[6] However, not

only employment (status) but also work productivity in employed persons might be affected by the pandemic and local containment regulations. Workers could incur more sick leave (absenteeism) and be less productive while at work (presenteeism) due to their mental or physical health. The aim of this study is to investigate whether employment and work productivity in patients with spondyloarthritis (SpA) changed following the onset of the pandemic.

METHODS

Population

Data from a Dutch disease-specific integrated eHealth system for SpA (SpA-Net) were used for this study.[7] Since 2016, patients with SpA attending the outpatient clinic in two Dutch hospitals (one academic and one general) are consecutively included in SpA-Net. Patients are prospectively followed up in daily practice as part of regular care. Visits are planned at the discretion of the treating rheumatologist. For the current analysis, patients aged 66 (legal age of retirement in the Netherlands) or younger were included.

Outcome

Employment and work productivity were assessed with the Work Productivity and Activity Impairment (WPAI) questionnaire.[8] Work productivity loss due to absenteeism (missed work hours due to health) and presenteeism (health-related impairments while at work) was calculated, and both were combined to calculate overall work impairment (range 0%–100% (best–worst) for all three work productivity outcomes). The WPAI is completed with a minimum interval of 6 months in SpA-Net.

Other variables of interest

Potential confounders included age, gender, education (high vs low), measures of disease activity (Ankylosing Spondylitis Disease Activity Score (ASDAS),[9] Bath Ankylosing Spondylitis Disease Activity Index (BASDAI)[10] and Patient global assessment) and current medication (non-steroidal anti-inflammatory drug, conventional synthetic disease-modifying antirheumatic drug, biological disease-modifying antirheumatic drug, targeted synthetic disease-modifying antirheumatic drug). Disease activity measures and medication use are completed/updated at every outpatient visit.

Statistical analysis

For employment rates and overall work impairment, two periods were compared: the 'pre-pandemic year' (March 12, 2019 - March 11, 2020) and the "post-onset year" (March 12, 2020 - March 11, 2021). On 12 March 2020, the Dutch government strongly urged people to remain at home if symptomatic and to work from home if possible. Loss/gain of employment and work impairment in the pre-pandemic and post-onset years were presented using descriptive statistics and compared using Wilcoxon signed-rank test (work impairment only). If a patient had multiple assessments during either year, the assessments closest to 12 March 2020 were chosen in the main analysis and any later assessment in the post-onset period in a secondary analysis.

Using all observations since initiation of SpA-Net (2016), a longitudinal analysis was conducted using generalised estimating equation (GEE), with overall work impairment as outcome. The independent variable of interest was 'time of assessment', a time-varying dichotomous variable indicating whether an assessment took place before pandemic onset (before 12 March 2020) or thereafter (on/after 12 March 2020). As patients could have both pre-pandemic and post-onset assessments, this analysis took into account within-patient correlations. Other variables (education/disease activity/medication) were included in multivariable GEE models, depending on results from univariable analysis (age/

Table 1 Characteristics of patients with a work assessment in the pre-pandemic year

Variable	Total (n=204)
Age, years	50.8 (10.7)
Male, n (%)	97 (47.6)
High education, n (%)	97 (47.6)
Employed, n (%)	126 (61.8)
Current/former smoker, n (%)	87 (42.9)
Diagnosis, n (%)	
axSpA	109 (54.5)
pSpA	23 (11.5)
PsA	62 (31.0)
IBD-associated SpA	3 (1.5)
uSpA	3 (1.5)
Uveitis (ever), n (%)	33 (16.5)
IBD (ever), n (%)	25 (12.5)
Psoriasis (ever), n (%)	84 (42.0)
ASDAS	2.2 (1.0)
BASDAI (0–10)	4.2 (2.4)
Patient global assessment	4.0 (2.8)
Current medication use, n (%)	
NSAID	115 (56.4)
csDMARD	69 (33.8)
bDMARD	120 (58.8)
tsDMARD	2 (1.0)

Values are mean (SD), unless stated otherwise.
ASDAS, Ankylosing Spondylitis Disease Activity Score; axSpA, axial spondyloarthritis; BASDAI, Bath Ankylosing Spondylitis Disease Activity Index; bDMARD, biological disease-modifying antirheumatic drug; csDMARD, conventional synthetic disease-modifying antirheumatic drug; IBD, inflammatory bowel disease; NSAID, non-steroidal anti-inflammatory drug; PsA, psoriatic arthritis; pSpA, peripheral spondyloarthritis; SpA, spondyloarthritis; tsDMARD, targeted synthetic disease-modifying antirheumatic drug.

Table 2 Work impairment at pre-pandemic and postonset assessments

	Pre-pandemic*	Post-onset*	p†	Change (post versus pre)*
Employed patients with pre-assessment and post-assessment (n=108)				
Overall work impairment (0%–100%)	27.0 (29.9), 15 (0–42.9)	37.0 (35.8), 20 (0–70)	<0.01	+9.9 (28.5), 0(–10 to 20)
Absenteeism (0%–100%)	7.1 (21.2), 0 (0–0)	16.2 (33.5), 0 (0–3.8)	0.02	+9.1 (33.4), 0 (0–0)
Presenteeism (0%–100%)	23.2 (25.4), 10 (0–0)	25.8 (27.4), 20 (0–0)	0.08	+3.2 (18.4), 0(–10 to 10)
All employed patients (n=123 (pre), 120 (post))‡				
Overall work impairment (0%–100%)	27.6 (30.9), 20 (0–42.9)	35.5 (35.6), 20 (0–66.3)	N/A§	N/A§
Absenteeism (0%–100%)	9.1 (25.0), 0 (0–0)	15.4 (33.1), 0 (0; 0)	N/A§	N/A§§
Presenteeism (0%–100%)	22.1 (24.7), 10 (0–30)	24.8 (27.0), 20 (0–50)	N/A§	N/A§

*Values expressed as mean (SD) and median (IQR).
†For comparison of post-onset versus pre-pandemic value.
‡This includes patients who completed only one assessment (either pre-pandemic or post-onset).
§No comparison between pre-pandemic and post-onset values, as some patients only completed one of both assessments.
N/A, not applicable.

gender were always included). Additional GEE analyses were conducted separately for absenteeism and presenteeism. Also, similar GEE analyses but with disease activity as outcome were used to understand whether changes in work productivity coincide with changes in disease activity. If relevant interactions were present between the variable of interest and confounders (p<0.10), analyses were stratified. P values of <0.05 were considered statistically significant. Analyses were conducted in Stata V.14.0.

RESULTS

Since 2016, 495 patients with age ≤66 years completed at least one WPAI assessment, of which 341 reported being employed at some time during follow-up. Of these, 204 completed a WPAI during both the pre-pandemic and post-onset years. Patient characteristics at the time of the pre-pandemic assessment are presented in table 1.

Employment rates

In both pre-pandemic and post-onset years, 126 (61.8%) were employed. From pre-pandemic to post-onset, 119 (58.3%) patients remained employed; 71 (34.8%) remained unemployed; 7 (3.4%) lost employment; and 7 (3.4%) gained employment. If post-onset employment rates were not based on first post-onset assessment but on a later one, 34 (54.8%) remained employed; 23 (37.1%) remained unemployed; 4 (6.5%) lost employment; and 1 (1.6%) gained work.

Work impairment

At the time of pre-pandemic assessment, 38 (30.9%) patients had no work impairment, while 6 (4.9%) had maximum work impairment. Mean (SD, median (IQR)) overall work impairment (range 0%–100% (best–worst)) changed from 27.0% (29.9, median 15 (IQR 0–42.9)) pre-pandemic to 37.0% (35.8; mean 20 (IQR 0–70)) post-onset (n=108; mean (SD) change=+9.9 (28.5), p<0.01) (table 2 and online supplemental figure 1). Work impairment increased (worsened) in 52 (48.2%) patients and decreased in 30 (27.8%).

Of the 341 patients that were employed at some point since 2016, 335 had sufficient data to be included in the GEE analyses, which took into account all observations since 2016. Multivariable GEE analyses were stratified by education level due to an interaction between time of assessment and education (p=0.04). In those with low education, work impairment was almost 10% (absolute) higher post-onset compared with pre-pandemic after adjusting for confounders (B=9.57, 95% CI 5.63 to 13.51) (table 3). In those with high education, no association between onset of the pandemic and work impairment was observed. If BASDAI/Patient global assessment was used as measure of disease activity, results were similar (online supplemental table 1 and 2). Of note, in GEEs with disease activity as outcome, ASDAS before and after pandemic onset did not differ in the overall population or in the education subgroups (B_{period}=–0.05, 95% CI –0.15 to 0.06), and this was similar for BASDAI/Patient global assessment (online supplemental table 3). The increase in overall work impairment could be mainly attributed to absenteeism (B=11.15, 95% CI 7.44 to 14.86 in patients with low education), while presenteeism before and after pandemic onset did not differ (online supplemental table 4 and 5).

Table 3 Univariable and multivariable generalised estimating equation analysis (ASDAS model)

	Univariable (n=335)			Multivariable Low education (n=153)			Multivariable High education (n=123)		
Variable	B	95% CI	p	B	95% CI	p	B	95% CI	p
Age (years)	0.26	−0.04 to 0.55	0.09	0.02	−0.40 to 0.45	0.92	0.17	−0.26 to 0.60	0.43
Male gender	−6.78	−13.58 to 0.02	0.05	−0.93	−10.39 to 8.53	0.85	−2.68	−12.41 to 7.06	0.59
High education	−7.91	−14.70 to −1.12	0.02	N/A†			N/A†		
ASDAS	12.46	10.45 to 14.48	<0.01	13.08	11.05 to 15.11	<0.01	10.51	7.10 to 13.91	<0.01
BASDAI (0–10)	7.73	6.87 to 8.58	<0.01	‡			‡		
Patient global assessment (0–10)	5.55	4.89 to 6.21	<0.01	‡			‡		
NSAID, current	−0.30	−5.11 to 4.52	0.90	§			§		
csDMARD, current	4.76	−1.20 to 10.72	0.12	§			§		
bDMARD/ tsDMARD, current	−2.47	−7.19 to 2.24	0.30	§			§		
Time, post-onset versus pre-pandemic*	5.32	1.82 to 8.82	<0.01	9.57	5.63 to 13.51	<0.01	1.49	−5.39 to 8.36	0.67

Variables that were possibly associated with the outcome in univariable analysis (p<0.10) were considered for multivariable analysis. Next, these were retained in multivariable models if they were significantly associated with the outcome (p<0.05). Age, gender and the primary variable of interest (time, post-onset vs pre-pandemic) were always included.
*Binary time-varying variable, indicating whether an assessment took place after onset of pandemic versus pre-pandemic (primary variable of interest). As patients were followed up over time, they could have both pre-pandemic assessments (before March 2020, coded 0) and post-onset assessments (after March 2020, coded 1).
†Used for stratification.
‡Due to collinearity, ASDAS, BASDAI and Patient global assessment were not included in the same model.
§Not associated with outcome in univariable analysis.
ASDAS, Ankylosing Spondylitis Disease Activity Score; BASDAI, Bath Ankylosing Spondylitis Disease Activity Index; bDMARD, biological disease-modifying antirheumatic drug; csDMARD, conventional synthetic disease-modifying antirheumatic drug; N/A, not applicable; NSAID, non-steroidal anti-inflammatory drug; tsDMARD, targeted synthetic disease-modifying antirheumatic drug.

DISCUSSION

In this Dutch cohort, changes in employment after onset of the COVID-19 pandemic were limited, while work productivity decreased significantly. Among those employed, absence from work increased substantially after pandemic onset. On the other hand, those performing work were not less productive, and disease activity in the same period did not change.

During the COVID-19 pandemic, absenteeism in the Dutch general population increased by 0.3% (percentage of work days missed: from 4.4% in 2019 to 4.7% in 2020; does not include work sector lockdown nor self-isolation due to positive testing without illness).[11] The change in absenteeism observed in the current study was substantially larger (+11% in those with low education). The finding that reduced productivity occurred mainly in those with lower education deserves attention, as it could indicate that those with lower education are at increased risk of long-term adverse work outcome (ie, prolonged sick leave or work disability) in an era of pandemics. Previously, the role of education as a potential determinant or effect modifier for work-related outcome in SpA has been demonstrated.[12 13] In our study, it can only be speculated whether the effect of education is due to less adequate coping with stressors that arose during the pandemic, an association between educational level and job type (blue-collar workers being more at risk of COVID-19 or not being able to work from home), or a combination of factors. Partly, this could also be a generic (non-disease-specific) effect. Dutch governmental support for work sectors during the pandemic might also have affected results.[14]

An important limitation of the current study is we that did not have data to explore the reason for absence, which could, for example, be COVID-19 infection, self-isolation (due to positive testing without being ill) or anxiety of contracting COVID-19 at work. The apparent gap in absenteeism with the general population could be an overestimation. In addition, as active participation in SpA-Net is voluntary, productivity data were not available in all patients, and selection bias cannot be excluded. Together with between-country differences in containment measures (affecting absenteeism/presenteeism) and governmental support (affecting work status), this

could affect generalisability of our results. Finally, no (population) control group was included, only allowing for indirect comparisons with the Dutch general population.

Strengths of the current study include the setting (daily practice) and unselected study population. In addition, both absenteeism and presenteeism were assessed, which allowed us to investigate the full spectrum of work productivity in employed patients.

In conclusion, we observed a notable decrease in work productivity in patients with SpA since the onset of the COVID-19 pandemic, especially in those with lower education. This change could be mainly attributed to sickness absence from work and not to a reduced at-work productivity. Care should be taken to support patients in their work role during the pandemic and thereafter.

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Contributors CW and AB conceived the study. CW conducted the analyses. All authors interpreted the results, revised the manuscript critically for important intellectual content and approved the final manuscript.

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Patient consent for publication Not applicable.

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