The Relationship between Biological Therapy, Work Productivity, and Activity Impairment in Patients with Psoriatic Arthritis: Prospective Multicentre Observational Study

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Background

Psoriatic arthritis (PsA) is a chronic progressive disease bringing substantial socioeconomic burden (1). Gradual loss of productivity and compromised daily activities can be modified by effective therapy, e.g. biological treatment (BT) (2).

Aim

The aim of this study was to explore the differences in demographics and clinical outcomes between population treated and untreated by biologics in the real clinical practice in the Czech Republic. Secondly, we wanted to decipher the most relevant predictors of productivity costs borne by patients.

Methods

We described the methods of data collection in a mirror study of ankylosing spondylitis (3). 228 PsA patients diagnosed with CASPAR criteria (4,5) were followed over 873 appointments in 6-month intervals. Activity (AI) and work impairment (WI) were assessed using WPAI questionnaire (6). Additionally, we collected patients' demographics and several clinical outcomes (e.g. DAPsA, clinical DAPsA, HAQ, EQ-5D, IGA) (7–13) (Table 1). Predictors of productivity costs (measured by WI) were explored with linear mixed-effect regression model (ME) (14–16) and statistical differences between groups using Kruskal-Wallis test. Productivity costs was monetized via Human Capital Approach (HCA; costs until retirement at 62.7 years; discount rate 3% (17)) with the average gross wage of €1493 including all taxes paid (18)(19)).

Work productivity was proportionally decreased according to the stage of disability since in the Czech Republic disability pension is defined in stages: 1st stage is defined by Law as a decrease in working productivity by 35-49%, 2nd stage by 50-69%, and 3rd stage by 70-100%.

Results: Table 1 shows the description of the population in our study. 53.5% patients were working and 25.4% were disabled. Mean baseline AI and WI in working patients (± SD) were 0.28 (± 0.24) and 0.33 (± 0.32). Similarly to HAQ score (0.74 ± 0.70), WI and AI worsened with growing PsA activity measured either by DAPsA score or cDAPsA excluding serum C-reactive protein (CRP); all with p ≤ 0.0001. The mean time to retirement was 14.0 ± 9.9 years.

38.2% patients were treated with BT (anti-TNF) in the 12 months prior to enrolment to the study with the mean costs of €981 per patient-month. Compared to non-BT population, BT patients were younger (50.7 vs. 59.4) and more frequently disabled (17.1% vs. 8.3%). They had non-significantly lower DAPsA and cDAPsA at baseline (9.3 vs. 10.7, p = 0.058 and 8.6 vs. 10.0, p=0.077). In longitudinal population, however, DAPsA and cDAPsA differed significantly (8.1 vs. 9.4, p=0.051 and 8.60 vs. 10.1, p=0.016).

The average productivity costs (by HCA) at baseline and longitudinal population was equal to €56,506 and €58,422, respectively. Due to significantly longer time to retirement and advanced working impairment (see Table 1, mean age 51 vs. 59 years), we observed higher productivity costs in BT patients compared to non-BT patients at both baseline (€66,028 vs. €45,505; p= 0.245) and longitudinal population (€74,046 vs. €45,145; p=0.0002).

Out of 50 clinical parameters tested, HAQ, DAPsA and AI were the best predictors of WI (Table 2). ME models translated into productivity costs using HCA showed that increase in either HAQ or AI as sole predictors (Models 3 and 4) by 0.1 represent a growth of loss of productivity by €2387 or €5367 (Figure 1). In the best Model 5, increase of both HAQ and AI together by 0.1 correspond to the growth of productivity costs by €6212 (Figure 2). Considering the routinely collected clinical outcomes, combination of DAPsA and HAQ as predictors appears to be the most practical model. Hence, a disease progression represented by growth of DAPsA by 1 and HAQ by 0.1 corresponds to the growth of productivity costs by €2619 (Model 1).

Disease Activity Index for Psoriatic Arthritis was calculated as simple sum of plasma C-reactive protein (CRP; mg/dL) + swollen joints count + tender joints count + global health assessment by physician via visual analogue scale (VAS) + global health assessment by patient VAS.

Table 1. Population at baseline and (*longitudinal population in parentheses*) described in the context of the biological therapy (BT)

Parameter (mean)	BT	Non-BT	p	n
CRP	0.57 (0.54)	0.71 (0.61)	0.004 (≤ 0.001)	224 (858)
Swollen joints count (66 count)	1.09 (1.02)	1.23 (1.23)	0.088 (0.002)	228 (871)
Tender joints count (68 count)	2.86 (2.74)	3.60 (3.60)	0.049 (0.056)	228 (871)
GHA by physician via VAS	1.36 (1.08)	1.36 (1.07)	0.901 (0.775)	228 (869)
GHA by patient via VIA	3.31 (3.27)	3.78 (3.55)	0.048 (0.112)	228 (872)
cDAPsA	8.6 (8.1)	10.0 (9.4)	0.077 (0.051)	228 (860)
DAPsA	9.3 (8.6)	10.7 (10.1)	0.058 (0.019)	224 (855)
Age	50.7 (53.2)	59.4 (61.0)	≤ 0.001 (≤ 0.001)	228 (873)
Time from the diagnosis of PS	23.7	25.6	0.420	224
Time from the diagnosis of PsA	13.9	13.6	0.783	228
Erosive form	21.1%	27.6%	0.125	228
IGA of PS (10)	1.28 (1.28)	1.48 (1.20)	0.206 (0.225)	228 (871)
EQ-VAS (22)	71.3 (70.7)	65.5 (68.0)	0.036 (0.127)	227 (872)
EQ-5D (22)	0.71 (0.72)	0.66 (0.69)	0.177 (0.711)	228 (873)
HAQ	0.75 (0.79)	0.74 (0.77)	0.768 (0.458)	226 (868)
Activity impairment (measured using WPAI)	0.25 (0.27)	0.30 (0.27)	0.106 (0.844)	224
Work impairment (measured using WPAI)	0.38 (0.41)	0.27 (0.26)	0.129 (≤ 0.001)	135
Working or student	22.4%	29.8%	0.230	225
Productivity costs (€)	66,028 (74,046)	45,505 (45,145)	0.245 (≤ 0.001)	125 (431)
Disabled n (%)	39 (45%)	19 (13%)	≤ 0.001	228
n	87 (296)	141 (577)		228 (873)

n: number of observations; p: probability (p)-value; HAQ: Health Assessment Questionnaire; PS: psoriasis; PsA: psoriatic arthritis; WPAI: Work productivity and activity impairment questionnaire; CRP: c-reactive protein measured in mg/dl; GHA: global health assessment; VAS: visual analogue scale; DAPsA: Disease activity in PsA; cDAPsA: clinical DAPsA; IGA: 5-point investigator global assessment of psoriasis; EQ: EuroQol; EQ-5D; EuroQol 5-dimension questionnaire.

Table 2 Linear regression of longitudinal data (all 5 visits): predictors of work impairment (measured using WPAI)

Variable	Mixed Model 1	Mixed Model 2	Mixed Model 3	Mixed Model 4	Mixed Model 5
DAPsA	0.004 (0.001)***			0.006 (0.001)***	
Activity impairment			0.362 (0.350)***		0.319 (0.038)***
HAQ	0.134 (0.206)***	0.161 (0.020)***			0.100 (0.020)***
Constant term	0.187 (0.025)***	0.211 (0.025)***	0.221 (0.232)***	0.264 (0.026)***	0.166 (0.023)***
Groups	140	143	142	141	141
n	472	481	480	475	477
Snijders/Bosker R^2 Level 2	0.378	0.361	0.315	0.130	0.456
Bryk/Raudenbush R^2 Level 2	0.399	0.384	0.327	0.135	0.479
AIC	-371.2	-358.9	-408.7	-344.7	-422.2
MSE	0.067	0.067	0.075	0.088	0.060

Figure 1. Fitted values of productivity costs predicted by HAQ or Activity impairment (WPAI questionnaire) using the mixed regression model

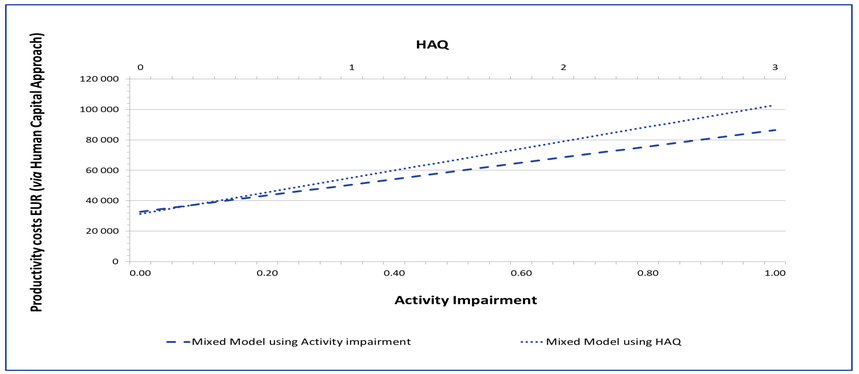
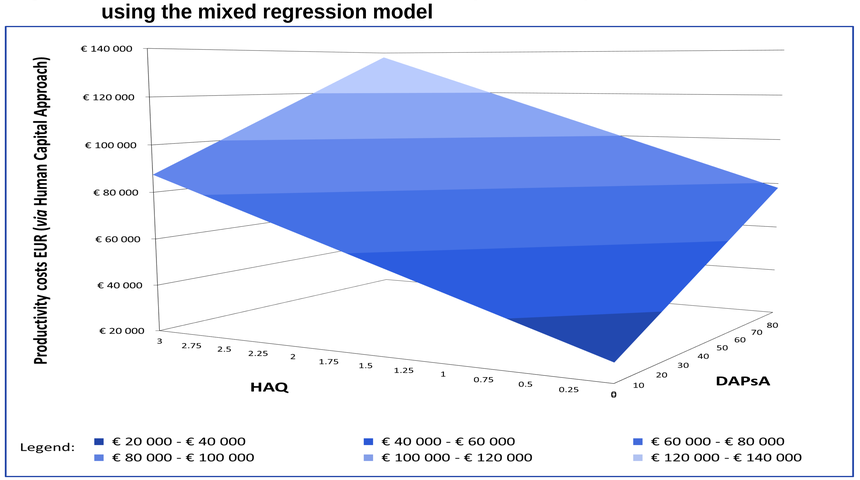


Figure 2. 3-D-fitted values of productivity costs predicted by both HAQ and DAPsA using the mixed regression model



Conclusions: In the view of the BT indication criteria (disease severity, failure of previous treatment), the clinical parameters of the BT population suggest that BT effectively slows PsA progression being in line with numerous clinical trials. Primary response is observed as attenuation of acute inflammation measured by CRP.

It should be noted that BT is indicated in younger patients whose working impairment have longer time to retirement. Hence, significantly higher productivity costs (a function of time to retirement and working impairment) in BT population must not be seen as a sign of low efficacy of BT.

HAQ and AI are the best predictors of WI in PsA. HAQ along with DAPsA are the most useful predictors in the clinical practice, yet, representing slightly worse model. We conclude that decreasing HAQ and DAPsA, e.g. via more effective BT, will undoubtedly increase working productivity, thus significantly decrease productivity losses/costs in patients with PsA and the whole society. We hope that our results could be employed in future cost-effectiveness analyses of new technologies and could provide clear answers on how better disease control and treatment response influence productivity costs.

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