THE RELATIONSHIP BETWEEN DISEASE SEVERITY AND QUALITY OF LIFE IN PATIENTS WITH MODERATE TO SEVERE PSORIASIS

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Introduction

- Psoriasis is prevalent in 2-4% of the population in Western countries¹
- Longitudinal data on psoriasis patients is continuously collected in the population-based quality registry in Sweden called PsOReg²
- Psoriasis often results in significant loss to quality of life¹
- This study aims to investigate the relationship between disease severity measured by the psoriasis area severity index (PASI) and quality of life measured by the five dimension European Quality of Life survey (EQ-SD) using the UK-based weighting³

Methods

- PsOReg includes patients with moderate to severe psoriasis receiving systemic treatment from a specialist with data available from 2005 to 2014
- Observed and measurable effects affecting quality of life (X) include PASI, PASI squared, age, body mass index, smoking status, and presence of psoriatic arthritis
- Quality of life is determined, in part, by unobservable effects (αi) like personality
- The model including unobserved effects in Equation 1 cannot be estimated directly since αi is not observed
- By de-meaning all variables in the model over the time index t (Equation 2), the individual fixed effects are removed, and Equation 3 can be estimated
- By the Frisch-Waugh-Lovell theorem⁴-⁶, the coefficient estimates (βs) are numerically equal in Equation 1 and 3. This means that even though αi is not actually estimated, the coefficients on observed parameters have been adjusted for the effects of αi

Equation 1:  𝑦𝑖𝑡 = 𝑋𝑖𝑡 β + α𝑖 + ε𝑖𝑡

Equation 2:  𝑦𝑖𝑡 = (𝑋𝑖𝑡 − 𝑋̅) β + (α𝑖 − 𝛼̅) + (ε𝑖𝑡 − 𝜀̅)

Equation 3:  ̄ 𝑦𝑖𝑡 = ̄ 𝑋𝑖𝑡 β + ̄ 𝜀𝑖𝑡

- The analysis was conducted using all complete observations for adult patients at each healthcare contact date.
- The estimation utilised 15,099 observations in 3,838 groups, resulting in an average of 3.9 observations per patient
- The model was tested for the appropriateness of random effects (Table 1) using a Hausman test⁷ which was rejected at an alpha level of 0.01. Therefore the final model used fixed effects
- The model was tested for the existence of group-wise homoscedasticity (Table 1) using a Wald test⁸, which was rejected at an alpha level of 0.01. Therefore the final model used robust standard errors.

Table 1: Hausman and Wald tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Degrees of freedom</th>
<th>Chi-square</th>
<th>P=Chi square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hausman (fixed effects)</td>
<td>6</td>
<td>123.06</td>
<td>0.0000</td>
</tr>
<tr>
<td>Wald (heteroskedasticity)</td>
<td>3838</td>
<td>8.1e+36</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Hausman H₀: The fixed effects and random effects estimators are both consistent
Wald H₁: Errors are homoskedastic within each group (patients)
- An assumption of the model is that the individual fixed effects do not change over time
- This is may not always be fulfilled when considering variables such as income

Results

- The results indicate that each unit increase in PASI is correlated with a reduction in EQ-SD, but at a decreasing rate
- The constant term, PASI, PASI squared, and age are statistically significant given an alpha level of 0.05
- Estimates of PASI and PASI squared were -0.0178 (p<0.001) and 0.0002 (p<0.001) respectively (Table 3)

Table 3: Regression results

| Variable | Coefficient estimate (β) | P>|t| | 95% Confidence interval |
|----------|--------------------------|------|-------------------------|
| Constant | 1.1512 | 0.000 | 0.9832 - 1.3191 |
| PASI     | -0.0178 | 0.000 | -0.0120 - 0.0158 |
| PASI squared | 0.0002 | 0.000 | 0.0001 - 0.0003 |
| Age     | -0.0050 | 0.001 | -0.0079 - 0.0021 |
| BMI     | -0.0013 | 0.373 | 0.0024 | 0.0016 |
| Smoker  | 0.0109 | 0.685 | -0.0417 | 0.0635 |
| Psoriatic arthritis | -0.0133 | 0.142 | -0.0311 | 0.0045 |

- An increase in PASI of 10 (20) units results in a decrease in EQ-SD of 0.1571 (0.2717) holding other variables constant at their respective means
- The (adjusted) R² was 0.5279 in the regression using a "brute force" method instead of fixed effects
- Figure 1 shows the non-linear relationship in EQ-SD decrement and PASI score, holding all other variables constant

Figure 1: Relationship between PASI and EQ-SD decrements

References


Conclusions

- QOL in psoriasis patients is decreasing as disease severity increases, but at a decreasing rate
- Fixed effects estimation is a useful methodology that allows for time-invariant effects to be accounted for, even if they are unobserved

Disclosure

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