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Impact of psoriasis severity on family income and quality of life

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Abstract
Background Psoriasis is a common disease and the costs of its therapy, medical care and loss of productivity are a major financial burden for patients and society. The financial status of psoriasis patients and its relationship with disease severity and quality of life (QoL) remains ill characterized.

Objective The aim of this study was to assess the economic status of psoriasis patients and to investigate its correlation with disease severity and its impact on QoL.

Methods A total of 83 (45 male) psoriasis patients, treated at a Polish specialty clinic, were assessed for their financial and employment status. QoL was measured with a generic (WHOQOL-BREF) and a skin disease-related QoL instrument (dermatology life quality index – DLQI). The effects of demographic and clinical variables, including disease severity measured by Psoriasis Area and Severity Index (PASI), on the family income of patients were analyzed by multiple logistic regression. The mediating effect of family income between PASI and QoL was assessed by using the Baron and Kenny’s procedure.

Results Patients’ family income correlate negatively with psoriasis severity (Spearman’s rho = −0.356; P < 0.01). Disease severity in patients with a family income below the social minimum was significantly higher (PASI: 20.5±12.2) than in patients with a higher family income (PASI: 11.7±7.7, P < 0.001). We found that education, disease severity and age predict 50% of the variability in family income (P < 0.001). Disease severity showed the second strongest impact on income after education (P < 0.01). Family income was found to link disease severity to global QoL impairment (P < 0.05).

Conclusion Disease severity negatively affects the financial status of psoriasis patients, which in turn, is a mediator of global QoL impairment. Our findings are alarming and call for long-term solutions that equalize employment opportunities for patients with psoriasis.

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Conflicts of interest
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Introduction
Psoriasis is a chronic disease, that primarily affects the skin and has a prevalence in developed countries of 2%. The disease results in high total costs for the society, including expenses for therapy, medical examination, laboratory tests, but also the loss of productivity.1–3 Also, the financial burden for patients is considerable and includes expenses for therapy and a loss in career opportunities.4–7 According to results of two US studies, family income is correlated negatively with psoriasis severity, and the risk of low income was significantly higher in patients with more severe psoriasis.4,8 As of now, however, there are no published data on the correlation between disease severity and income in psoriasis patients in Europe.

Psoriasis is known to diminish the life potential of affected patients, which phenomenon was lately defined within the Cumulative Life Course Impairment construct.7,9 Stigmatization, psychological co-morbidities, social withdrawal and exclusion, may exert profound long-term effect on education, professional career, life course and in result on the incomes achieved by patients. Lower incomes may in turn further decrease life perspectives, diminish quality of life (QoL) and be responsible for a limitation of therapy options. Thus, a better
understanding of this sequence may, in consequence, enable to better counteract this negative long-term mechanisms.

**Study objective and hypotheses**

The aim was to assess the economic and employment status of psoriasis patients, investigate whether disease severity is linked to family income and education level, analyse relationships between income, disease severity and QoL.

To this end, we tested the following hypotheses: (i) QoL correlates with family income and disease severity. Family income and education levels correlate with disease severity; (ii) Disease severity, duration of psoriasis, intensity of itch, age, sex, education level and place of residence are predictors of achieved family income; and (iii) The influence of disease severity on QoL is mediated at least in part by its effects on family income.

**Materials and methods**

**Patients** Consecutive adult inpatients with psoriasis vulgaris \((n = 83)\) hospitalized at the Department of Dermatology, Pediatric Dermatology and Dermatological Oncology of the Medical University of Lodz, in central Poland, who gave written consent were enrolled in this cross-sectional study. The data were collected between January and August 2010. Patients with psoriatic arthritis were not included. Patients always were examined on the day of admission to the hospital or on the following day. The research was approved by the Ethic Committee of the Medical University of Lodz.

**Clinical assessment, QoL impairment and demographic features** Disease severity and medical history were documented by the dermatologists. Itch intensity was assessed by patients on the visual analogue scale (VAS) 0–10. Questions to the demographic data and family income, defined as a household income per capita per month, as well as QoL assessment were included in the self-administered questionnaire. Instructions on how to fill the questionnaire were given by the dermatologist.

The Psoriasis Area and Severity Index (PASI) evaluates the clinical severity of psoriasis skin involvement. The scale measures three components: erythema, induration and desquamation and percentage of the involved body surface area. PASI values range from 0 to 72, with increment step of 0.1 and higher values reflecting more severe psoriasis.

WHOQOL-BREF is a generic self assessment questionnaire of QoL.\(^{10}\) The tool’s conception originated from the World Health Organization (WHO) definition of QoL.\(^{11}\) The validated Polish version of the tool was used.\(^{12}\) The questionnaire consists of 26 items which cover four domains: physical health, psychological domain, social relationship and environment. In addition the questionnaire contains two questions on the general perception of individual’s QoL and health, which are analysed together as patient’s global QoL assessment. All items are answered using five score Likert scale. The scores for each of the four domains are between 4 and 20 with higher scores reflecting higher QoL.

The Dermatology Life Quality Index (DLQI) is a self-administered questionnaire to measure skin disease-specific QoL. It consists of 10 items scored on a 4-point Likert scale from 0 to 3.\(^{13}\) The total score is the sum of all 10 items and ranges from 0 to 30. The higher the score the lower the QoL. We used the Polish validated version of the tool.\(^{14}\)

**Statistical analysis** Results were analysed with IBM SPSS, Version 20.0 (IBM Corp., Armonk, NY, USA). To assess the normality of distribution of variables, Kolmogorov–Smirnov test was administered. Pearson’s correlation was used to assess the linear relationships between variables and Spearman’s correlation was employed for ordinal variables. To test the significance of differences between two groups of parametric variables we used the Student’s \(t\)-test for independent variables. Effect size was expressed as \(d\) Cohen value. To test the predictive value of independent variables, the multiple logistic regression model was employed, and the mediating effect of family income was investigated with a procedure proposed previously by Baron and Kenny.\(^{15}\) Results for which the probability of the type I error was lower than 0.05 were assumed as significant.

**Results**

**Characteristics of the studied patient group, including clinical, demographic, employment, financial status and QoL assessment**

Patients’ age ranged between 18 and 74 years, with a mean of 45.4 years \(\pm\) standard deviation (SD) of 14 years. The mean disease duration was 20.2 years \(\pm\) 13.8 years, and average disease severity was moderate as assessed by PASI (14.5 \(\pm\) 10.2). Demographic and clinical characteristics of the patients are presented in Table 1, and QoL impairment is described in Table 2 (WHOQOL-BREF and DLQI). The unemployment rate (i.e. the proportion of unemployed labour forces to the total labour force available) was 14.3%.

**QoL correlates with family income and disease severity**

To better understand which patient characteristics are associated with QoL impairment in psoriasis, we assessed its correlation with demographic factors and disease parameters. Family income per capita correlated significantly with all domains of QoL, and lower incomes were associated with increased QoL impairment (Table 3).

Disease severity was also found to correlate with QoL, both general QoL as well as skin disease-specific QoL (Table 3).
High disease severity is correlated with family income

Next, we asked whether disease severity and family income are linked in psoriasis, and we found that income per capita in the household is, indeed, negatively correlated with psoriasis severity (Spearman’s $r = -0.356$; $P < 0.01$). Notably, mean disease severity (PASI) in patients with a household income per capita below 600 Polish zloty (148 Euro, 24 from 83 patients) was significantly ($P < 0.001$, Cohen’s $d = 0.893$) higher ($20.5 \pm 12.2$ SD) than in the patients with higher family income ($11.7 \pm 7.7$) – Fig. 1. Education levels did not correlate with PASI, although they showed trend towards statistical significance (Spearman’s $r = 0.204$; $P = 0.080$).

Low income is caused in part by high psoriasis severity

These findings led us to hypothesize that low income in psoriasis patients is caused, at least in part, by their skin disease. To test this hypothesis, we assessed the cumulative influence of different clinical variables (disease severity – PASI, disease duration, intensity of itch – VAS) and socio-demographic factors (age, sex, education level, place of residence) on the household income per capita (risk of income below social minimum level) by multiple logistic regression.

Variables were selected using stepwise forward selection, and a complex model with three variables (education, disease severity and age) allowed for the best prediction of the household income per capita ($\chi^2 = 31.952, P < 0.001$). In fact, this model predicted 50% of the variance of family income.
(Nagelkerke $R^2 = 0.498$). We found the level of education to have the highest impact on income: the lower the education level, the higher the chance to have lower income (Beta coefficient = 1.467; $P = 0.001$). The second most important driver of low family income was psoriasis severity (Beta coefficient = −0.115; $P < 0.01$): the higher the severity, the higher the chance to have lower income. The only other significant driver of low income was age: the younger the patients, the higher the chance to have a lower income (Beta coefficient = 0.058; $P < 0.05$).

**Low income in psoriasis patients links severe disease to low QoL**

To test if family income was a mediating factor between psoriasis severity and QoL we used the Baron and Kenny’s procedure (Fig. 2).¹⁵ In the first step we found, using an univariate regression model, that PASI predicted low income i.e. household income per capita below the social minimum level (Fig. 2). In the next step we tested if the effect of PASI on QoL observed in an univariate regression model disappeared after inclusion of family income as an independent variable to a bivariate regression model. This was confirmed for the global and environmental domains of QoL (Table 4). Finally, the effect of mediation was tested with the Sobel test, which confirmed a mediating effect of family income per capita on global QoL in patients with psoriasis ($z = 2.104; P < 0.05$) and failed to confirm a mediating effect of family income per capita on environmental domain of QoL, although we observed a trend towards statistical significance ($z = 1.853; P = 0.064$). There was no mediating effect of income on the physical, psychological and social relationships domains of WHOQOL instrument and DLQI – Table 4.

**Discussion**

Our results show, for the first time, that psoriasis is, in part, responsible for the low income and, because of this, responsible for the reduced global QoL in severely affected patients. We found disease severity to be only moderately correlated with skin disease-related QoL and some domains of general QoL, which is consistent with the previous findings.¹⁶,¹⁷ This lack of a strong correlation between perceived QoL and clinical severity in psoriasis is held to be due to moderating or mediating effects of psychological variables.¹⁸,¹⁹ Here, we tested the hypothesis that the influence of psoriasis severity on QoL impairment is in part mediated by achieved income.

**Table 4** Effect of disease severity (PASI) on quality of life became insignificant for the environmental domain and global quality of life of WHOQOL-BREF questionnaire after inclusion of family income to the regression model

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>WHOQOL-BREF</th>
<th>Unstandardized coefficients $\beta \pm$ standard errors</th>
<th>Bivariate regression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Univariate regression</td>
<td>Bivariate regression</td>
<td></td>
</tr>
<tr>
<td>Physical domain</td>
<td>PASI: −0.30 ± 0.008***</td>
<td>Income: 0.345 ± 0.176</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PASI: −0.023 ± 0.008**</td>
<td>PASI: −0.007 ± 0.008</td>
<td></td>
</tr>
<tr>
<td>Psychological domain</td>
<td>PASI: −0.013 ± 0.007</td>
<td>Income: 0.338 ± 0.174</td>
<td></td>
</tr>
<tr>
<td>Social relationships</td>
<td>PASI: −0.017 ± 0.010</td>
<td>Income: 0.397 ± 0.243</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PASI: −0.010 ± 0.011</td>
<td>PASI: −0.006 ± 0.007</td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td>PASI: −0.013 ± 0.006*</td>
<td>Income: 0.332 ± 0.142*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PASI: −0.006 ± 0.007</td>
<td>PASI: −0.018 ± 0.010</td>
<td></td>
</tr>
<tr>
<td>Global quality of life</td>
<td>PASI: −0.029 ± 0.009**</td>
<td>Income: 0.615 ± 0.211**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PASI: −0.018 ± 0.010</td>
<td>PASI: −0.027 ± 0.008***</td>
<td></td>
</tr>
<tr>
<td>DLQI</td>
<td>PASI: 0.353 ± 0.076***</td>
<td>Income: −4.328 ± 1.751*</td>
<td></td>
</tr>
</tbody>
</table>

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

PASI was included as an independent variable in univariate regression, whereas PASI and income were included as independent variables in bivariate regression model.
Income and well being in the general population are strongly linked only at the lowest income levels. In the wealthy, there is little or no correlation at all. Income to a certain degree helps individuals to secure their substantial needs. A low income may lead to life limitations and stress, reflected in a lower QoL. When these substantial needs are met, i.e. at higher income levels, many other social, psychological and demographic factors seem to play a more important role for the subjective well being. Studies in the United States showed that up to 42% of patients with severe psoriasis with a yearly income below 30 thousands US dollars experienced stress related to their financial status. In our patients, the correlation of income with each domain of QoL was even stronger than the correlation of life quality with disease severity, with exception of the skin disease-specific QoL. It must be noted that the economic and the employment situation of the patients we studied were difficult. Twenty-nine percent had an income below the social minimum. The social minimum for the year 2010, when the study was performed, according to the Institute of Labour and Social Affairs in Warsaw, was 908 Polish zloty (223 Euro) per month for singles and 735 Polish zloty (180 Euro) per capita for families of four. The unemployment rate of 14.3% in our patient population was higher than for the general population, i.e. 11.9% in 2010 in Lodz, where the data were collected, and almost as many psoriasis patients were pensioners due to work disability. Lower employment among patients with psoriasis may result partially from their social withdrawal, but may also be caused by patient’s discrimination at the workplace due to their disease. It was previously shown that up to 18% of psoriasis patients experience difficulties at work because of their disease and have problems in finding a job because of having psoriasis. Along the same line, 23% of patients report that their psoriasis has negatively influenced their choice of professional career, and unemployed psoriasis patients attribute their unemployment to the disease.

Our results confirm, for the first time in Europe and for the first time with the use of an objective dermatologist-administered severity measure, findings of two previous US studies, which showed that psoriasis severity correlates with family income. The causality of this relationship remains to be determined. One possible scenario is that a difficult financial situation of patients results in decreased life standards, which, in turn, influence the severity of psoriasis. A low income, especially one below the social or even subsistence minimum and unemployment may contribute to negative changes in many factors capable of exacerbating the course of psoriasis, like stress, diet, alcoholism rate, decreased therapy standards and microbial infections.

A second scenario is that it is the severity of psoriasis that influences the family’s income. Patients with more severe disease carry higher therapy costs and spend more time on therapy, which has a negative impact on their work efficacy and, in consequence, on their incomes. It was postulated that psoriasis exerts a cumulative impact on patient’s life course. Psoriasis results in stigmatization with social rejection and psychological distress with subsequent long-term behavioural changes that lead to decreased life chances, a lower economic status and a negative impact on patients’ QoL.

The relationship between psoriasis severity and income may also be bidirectional, resulting in a self-enhancing vicious circle. Fleischer and co-workers postulated that the influence of psoriasis on professional career may lead to lower incomes and decreased socioeconomic standards, which further limits optimal therapy.

To further test the hypothesis that psoriasis can directly influence patients’ income, potential drivers of income were tested in a multiple regression model. Interestingly, disease severity proved to be the second strongest predictor of family income (after education) and more important than patients’ age. In the US study described earlier, psoriasis severity and sex were identified as the only predictors of patients’ family income, which suggests that, the impact of psoriasis severity on income is a cross-cultural phenomenon. To address the question if achieved income plays a role of mediator between psoriasis severity and QoL impairment, analysis of mediation was performed, revealing that family income below social minimum was responsible for the decrease in the global QoL caused by PASI. Interestingly, whereas the skin disease-related QoL impairment is driven by both the variables: disease severity and family income independently, the global QoL impairment in psoriasis caused by disease severity is driven through the reduced family income.

It must be underlined that our study has several limitations. Due to its cross-sectional character only the point in time momentary severity of psoriasis was recorded, but the severity of psoriasis may fluctuate. Ideally, repeated measurements of disease severity over many years should be performed and compared with the patients’ financial status. On the other hand, 92% of the patients included in our study presented with chronic plaque psoriasis, which in most cases has a relatively stable course. Secondly, we only studied hospitalized patients, which may have led to a selection bias, favouring patients with higher disease activity, recalcitrant to standard therapy. Thus, caution must be applied in extrapolating the results of our study to the entire population of psoriasis patients. As no comparative groups were included, e.g. patients with other skin disorders, the results may not be extrapolated to other skin diseases. Also, our findings may not necessarily apply to other European and non-European countries with higher income and more protective and/or efficient social security systems. Further studies in these countries are needed.

In summary, QoL impairment in psoriasis patients is not only and directly caused by disease severity, but is a more complex process, which involves economic variables. The chronic course and high disease severity exert cumulative effects on patients’ life with lower incomes and decreased life chances. Our findings on

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the employment and economic status of psoriasis patients are alarming and indicate the need for further research in this field and the search for long-term solutions that equalize professional opportunities and prevent social exclusion of psoriasis patients. Our results also underline the importance of optimal long-term therapy that controls the symptoms of psoriasis, as this could protect patients from its negative cumulative effects on their economic situation and thereby, QoL.

References


