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**Quality of Life and its associated factors for psoriasis patients
in China: a cross-sectional study from hospital-based data**

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I hereby certify that me and my co-supervisor formulated the research question together, and I performed the literature review used in this report, developed and implemented the study design, analysed the data, and interpreted the results. I also confirm that the project presented reflects my own work, that the report was written using my own ideas and words, and that I am the only person held responsible for its contents. All sources of information, printed or electronic, reported by others are indicated in the list of references in accordance with international guideline

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ABSTRACT

Background: Negative influences from psoriasis is evident. In China, quality of life in psoriasis patients seeking care in hospitals has not been yet fully studied before. Finding out associated factors for health-related quality of life would facilitate the health intervention and resource allocations.

Aims: To estimate health-related quality of life for psoriasis patients in China and to explore the effect of demographic, life style, clinical factors on quality of life.

Materials and methods: This cross-sectional study involved 1258 psoriasis patients from 9 medical centers in China. Demographic factors, life style factors, and clinical factors were reported by patients themselves or doctors along with Dermatology Quality of Life Index questionnaire to assess the quality of life in psoriasis. Scores of quality of life measure were dichotomized as ≤ 10 to represent less affected quality of life and > 10 to represent largely affected quality of life. Descriptive analysis was used to summarize the data. Logistic regression models were used to explore the association between quality of life and risk factors.

Results: In serious (OR 3.50; 95% CI [1.11-10.98]; $P=0.035$) and severe severity (OR 7.25; 95% CI [1.29-40.69]; $P=0.029$) by physician global assessment were associated with largely affected quality of life. Having exercise habit was associated with lower risk of having largely affected quality of life (OR 0.74; 95% CI [0.56-0.97]; $P=0.035$). These results were adjusted by having or not a medical insurance.

Conclusion: Severity is the most significant risk factor for largely affected quality of life, along with having medical insurance and no exercise habit. Policy makers should focus on critical conditioned patients and be cautious about the possible negative effect from medical insurance and physical inactivity.

Key words: Psoriasis, Health-related quality of life (HRQOL), China, hospital patients, determinants, cross-sectional study

ABBREVIATION

HLA: Human leukocyte antigen

TCM: Traditional Chinese Medicine

PASI: Psoriasis Area and Severity Index

BSA: Body Surface Area

PGA: Physician Global Assessment

WHO: World Health Organization

QOL: Quality of Life

HRQOL: Health-Related Quality of Life

DLQI: Dermatology Quality of Life Index

PDI: Psoriasis Disability Index

PQOL-12: Psoriasis Quality of Life 12 items

SF-36: Short-Form Health Survey Questionnaire

WHOQOL-BREF: World Health Organization Quality of Life-BREF questionnaire

RMB: Renminbi, Chinese yuan (Chinese official currency: ¥)

BMI: Body Mass Index

INTRODUCTION

Overview of psoriasis

Psoriasis is manifested with erythematous papules or thickened plaques covered with silver-white scales. It causes daily life inconvenience like pruritus, burning sensation, dryness in the inflicted area. Negative influence on appearance like exfoliating epidermal residues, crumbled and pigmented fingernails are the biggest complaints. Based on the morphology and distribution of the symptoms, psoriasis can be categorized as several subtypes: plaque psoriasis, inverse psoriasis, guttate psoriasis, erythrodermic psoriasis, generalized pustular psoriasis, and palmoplantar psoriasis (1). The most common one is plaque type, which highlighted with red patches and silver scales; inverse psoriasis happens on any area where two patches meet together, such as groin and abdominal folds; guttate psoriasis is more common in youngsters and children, with eruption of round oval shaped papules no bigger than 1 cm; erythrodermic psoriasis refers to symptoms that diffuse to more than 90% of the body; generalized pustular psoriasis is the most dangerous form featured with clustered blister, pustules followed by fever and infection; palmoplantar psoriasis involves palms and soles. Painful joints from inflammatory arthritis especially on knees and elbows may also occur. Pathological reasons for psoriasis are not fully understood. Genetic mutation on chromosome 1q, 2q, 7q, 6q, 8q, that normally modulate keratinocyte differentiation and development, are proven to increase the susceptibility for psoriasis, though exact pattern of inheritance is not clear. Human leukocyte antigen (HLA) gene region falls within these aberrant chromosomes that mediates the immune cells functions, suggesting immune response deregulation is the major pathogenesis in psoriasis. (2)

Current treatment in standard medicine ranges from topical corticosteroid to human monoclonal antibody, immunosuppressants and phototherapy. While treatments in outpatient setting is quite enough for most patients, some patients having a sudden flare-up or in critical condition will need to be hospitalized. (3) Inpatient setting will offer more rigorous regimen of topical corticoid, systemic biological agents, or UV lights. The cost of management of psoriasis is often enormous due to life-long use of drugs and higher price from advanced therapy. In China, despite the mainstream western treatment, many resort to Traditional Chinese Medicine (TCM) including herbal drugs and acupuncture. (4) A combination of western medicine and Traditional Chinese Medicine is common in clinical practice throughout the country.

Epidemiology of psoriasis

Prevalence of psoriasis in different countries varies from 0.09% (5) to 11.4% (6). In industrialized countries, it ranges between 1.5% to 5% (7). Most cases happen in adults but can also occur on children. Age onset of psoriasis are often between 15 to 30 years old. Early onset of psoriasis (before or equal to 40 years old) is proposed to be attributable to HLA gene, and late onset of psoriasis (after 40 years old) is lacking HLA association, though this bimodality is not observed in every study (8). Epidemiology data indicates psoriasis is most common among Northern Europe population and the least in eastern Asia population. (9) This is in line with the result of gene polymorphism analysis showing that Asian are less likely to develop psoriasis compared to Caucasian (10). In a study from United States, Caucasians have twice higher prevalence of psoriasis than Black, Hispanic, and other ethnic groups (11). In China, there are few epidemiological studies for psoriasis but they are either outdated (12) or sampling in mostly the rural areas (13). Large scale multicenter study in 2012 (13) shows prevalence of psoriasis is 0.47% nationwide, with 0.54% for men and 0.44% for women.

Severity measurement of psoriasis

There are many ways to examine psoriasis severity. Psoriasis Area and Severity Index (PASI) is perceived as a gold standard. It uses standardized mathematic formula with each factors weighted to produce the total score by taking into account the body surface area (BSA) involvement, lesion location, the extent of redness and thickness. However, PASI has limitation because of the insensitivity to small affected body surface area and variability on measuring body surface area (14). These drawbacks limit its use in clinical practice and reproducibility. Dispute about whether PASI serves as single indicator for psoriasis severity remains inconclusive among clinicians.

European Medicines Agency recommended examining the improvement of Physician Global Assessment (PGA) along with PASI to determine psoriasis severity in a clinical trial (15). PGA has been applied for various diseases in the clinical assessment due to its simplicity. It is a subjective evaluation relying on doctor's judgments on lesions characteristics without considering how much body surface areas involved or where the lesion is. Such way to evaluate the severity, though a little abstract, is in parallel with clinical practice that meticulous measures

on characteristics of psoriatic lesions are seldom performed and often replaced with crude observation. The validation of PGA is not widely done, but some studies suggest it has sound and validated in psoriasis study (16,17). However, there is no standardized version of PGA. Multiple items form (i.e. the extent of erythema, plaque elevation, scale were specified) or single item form (i.e. final score assigned without lesion traits specified) are both available and no consensus has been made for scoring scale for PGA. Clinical workers often choose among 5 points, 6 points, and 7 points according to how detailed the severity needs to be described in the interested study. But the method for rating is the same: lowest score represents “clear condition” or “slight” and the highest score is “serious” or “severe”.

Quality of Life and Health Related Quality of Life definition

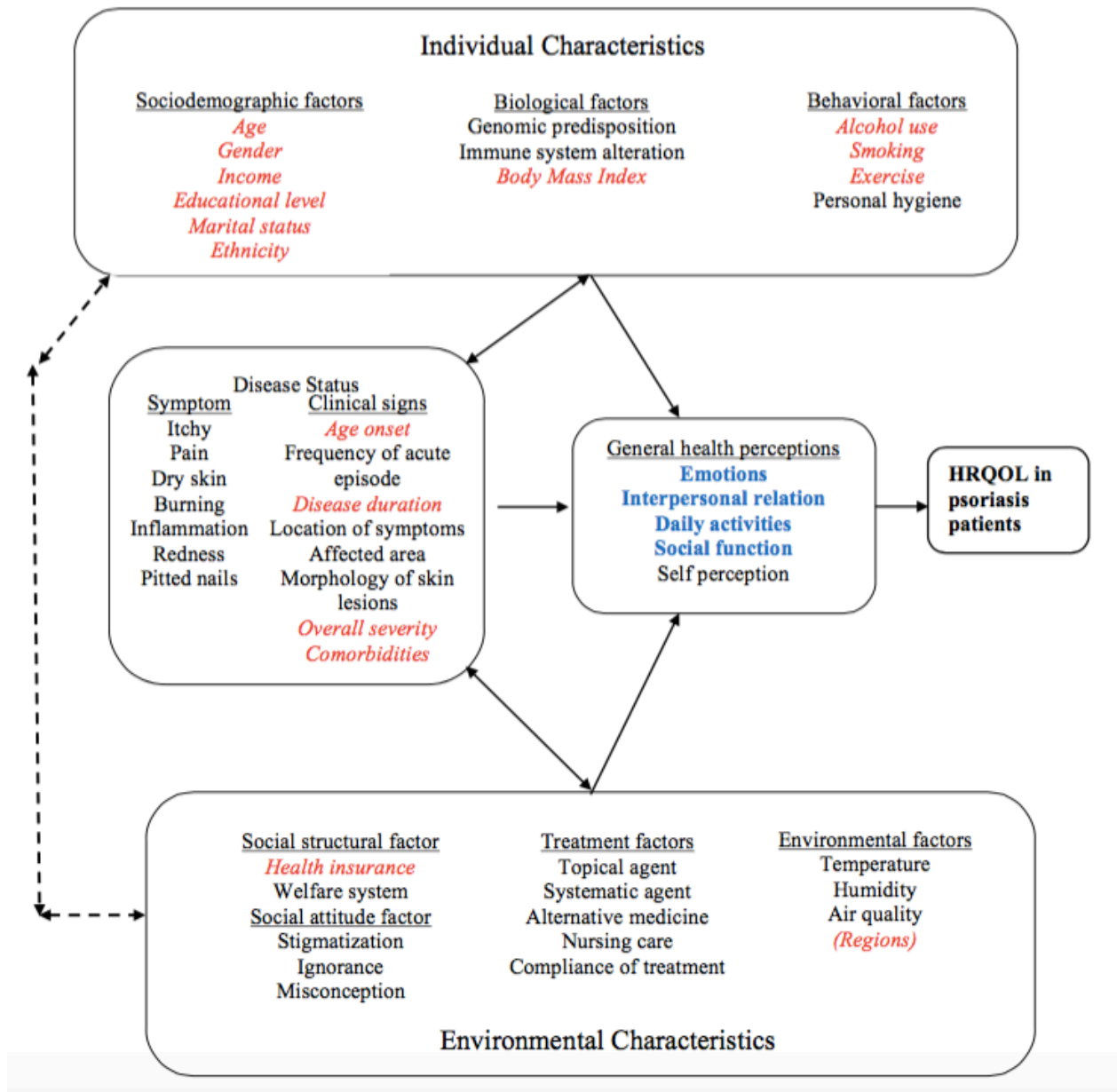
World Health Organization defined quality of life (QOL) as “the individuals’ perception of their position in life, in the context of the cultural and value systems in which they live and in relation to their goals, expectations, standards and concerns (18).” The description implies the importance of subjective experience to quality of life rather than healthcare worker’s observation. In clinical practice, subjective assessment of quality of life is often not in line with the improvement of clinical parameters. Patients with similar severity of diseases usually have different opinions about their own quality of life. Therefore, instead of observant evaluation, self-reporting assessment becomes the mainstay method to measure QOL. On the other hand, the term “Health-Related Quality of Life (HRQOL)” specifically indicates the quality of life under disabilities, disorders, or diseases. It differs from the concept of general QOL in a sense that HRQOL focuses more on the aspects that are influenced by health status or that can influence health status. Without the absolute definition, HRQOL is commonly perceived as a collected result from physical, psychological, and social dimension. In clinical practice, it has increasingly become crucial for its usefulness on allocating resources or determining clinical trial endpoint.

Health-Related Quality of Life (HRQOL) components

The conceptual framework in Figure 1 is adapted from Wilson and Cleary model of HRQOL (19). It roughly explains how various factors affect and interact with HRQOL for psoriasis patients. The variables available in the dataset are highlighted in red while the aspects captured in this study’s HRQOL measurement are highlighted in blue. It is hard to identify a single pathway

about how each factor leads to the quality of life. Individual characteristics increase the likelihood to develop a disease and also interact with clinical factors to disrupt quality of life. Environmental characteristics relate to how a person with psoriasis fit into the surroundings and influence how well the patient cope with the disease. Clinical factors decide the exact disease status and meanwhile interact, associate with individual and environmental factors. Individual and environmental characteristics also interact with each other.

Age and gender are linked to the psoriasis quality of life with elder people experiencing higher psychological stress and females having more anxiety and depression (20). Ethnicity difference in quality of life impact is observed in the previous study where non-Caucasians are shown to feel more impact from the disease than Caucasians do (20,21). Emotional support can be provided by marriage to deal with mental stress from skin diseases (23). Income and medical insurance correlates to the health care patients received, hence affects the severity of disease. Having better income and insurance also helps personal satisfaction and mental preparedness for the disease. Education could help to achieve better skin disease intervention (24) and low education level is inclined to have lower self-perceived health (25). Overweight is correlated with high psoriasis severity (26,27) and alters a patient's feeling by influencing the self-conception of body image. Tobacco use is a known triggering factor for psoriasis by facilitating the inflammation and it has previously shown to be associated with higher clinical severity in psoriasis (28,29,30). Heavy alcohol intake is reportedly a aggravating factor for inflamed skin diseases (31) by stimulating production of pro-inflammatory factors (32). Continued drinking interferes with treatment compliance (33). Exercise helps weight control thus helps psoriasis healings and facilitate the stress reduction (34). Psoriasis incidence relates to geographical region (7) and different climate in different provinces influences how often the symptoms flared up (35). Clinical factors are the major components determining the extent of disability and directly impair patients emotion and social function. Long duration of disease is associated with more anger and shame (36); early onset of psoriasis has shown to cause more interpersonal difficulties than late onset patients (37); overall severity suggest how strong the itchy and pain feeling is; psoriasis patients are found at higher risk to develop common comorbidities such as cardiovascular disease and diabetes (38), both of which add up the disease burden (37,38).



Red: the variables available in the dataset
Blue: the aspects captured in this study's HRQOL measurement.

Figure 1 Conceptual framework for Health-Related Quality of Life in psoriasis patients

Health-Related Quality of Life (HRQOL) instruments

When it comes to dermatology, there are 3 kinds of HRQOL instruments available: generic instruments, dermatology specific instruments, and condition specific instruments (41). Generic instrument can be used for any general disease, irrespective of the types of illness or conditions, eg. World Health Organization Quality of Life (WHOQOL), Short Form Health Survey (SF-36). Dermatological specific instruments are suitable and valid for skin diseases only, eg. Dermatology Quality of Life Index (DLQI), Skindex 16, Skindex 29. Condition specific instruments are only for comparison between patient groups who have same diagnosis, eg. Psoriasis Disability Index (PDI), Psoriasis Quality of Life-12 Items (PQOL-12). The choice of instruments depends on the interests of researchers and the aim of the study. If used in other countries, different language versions of HRQOL questionnaires need to go through backward and forward translation and tested before they used for the research. DLQI is the most commonly used HRQOL instrument in dermatology. Mandarin Chinese version of DLQI in previous research has shown reliability (internal consistency, Cronbach's α is 0.91) and established convergent validity by spearman correlation ($r=0.77$ correlated with Psoriasis Disability Index and $r=-0.35$ to -0.56 correlated with SF-36) and confirmatory factor analysis (42). A 5 points improvement in DLQI is considered the minimum efficacy goal in treatment (43). Some guidelines perceive DLQI above 10 together with PASI as the criterion for a psoriasis patient to be treated with a biological agent (42,43).

BACKGROUND

Skin condition is one of top 20 leading health burden worldwide and ranks 4th on non-lethal causes in years lost due to disability (46). Psoriasis is a chronic inflammatory skin disease that causes physical and psychological stress. In western countries, psoriasis prevalence ranges between 2% and 3% (7). Low and middle income countries mostly has psoriasis prevalence below 0.5% (7). Most epidemiological data of psoriasis are from high income countries, suggesting a huge knowledge gap from low and middle income countries. The insufficient supply of dermatologist in low-middle income countries worsens the quality of life in such patients (9). Unlike most systemic chronic diseases that affect health internally and subtly, psoriasis patients suffer from disrupted outlook, interpersonal difficulties, and disabled social functions. The quality of life of such patients is not solely constructed by clinical conditions. World Health Organization (WHO) recognizes the needs to have multilateral management of psoriasis (9) that looks beyond the physical illness and the efforts to establish the factors behind the poor quality of life. Some studies have researched about quality of life in psoriasis patients in China before but they focus a lot on clinical trial setting and are in small scale (45,46). By understanding psoriasis patients' quality of life and its determinants, it helps policy makers to allocate the intervention resources on different patient groups. In this study, we seek to investigate quality of life in psoriasis patients in China and its association with demographic, life style, and clinical factors.

RESEARCH QUESTIONS

What are the associated factors for quality of life in psoriasis patients in China?

Aim

To describe the health- related quality of life in psoriasis patients in China, and to explore the relationship between their health-related quality of life and risk factors.

Specific objectives

- 1) To describe and compare the health related quality of life among the psoriasis patients in China who have different demographic, life style, and clinical factors.
- 2) To explore whether demographic, life style, clinical factors are associated with health related quality of life in psoriasis patients in China.

METHODOLOGY

Study design

This is a cross-sectional study based on secondary data from a hospital-based survey done in 9 medical centers in China between July 2013 and September 2015. The survey was conducted at doctor visits or inpatient stay, collecting dermatological patients' demographic, clinical profile, and life style facts. 4 HRQOL questionnaires (DLQI, Skindex 16, Skindex 29, WHOQOL) were also given to the participants. Dermatology Quality of Life Index (DLQI) was chosen as our outcome measure.

DLQI questionnaire consists of 10 items measuring how much the skin problem has affected several aspects of life over the past week, with each item rating from 0 to 3. The questions can be categorized in six domains: symptoms and feelings (Question 1 and 2), daily activities (Question 3 and 4), leisure (Question 5 and 6), work and school (Question 7), personal relationship (Question 8 and 9), treatment-caused burdens. (Question 10) Appendix A shows the template of DLQI questionnaire in English. Appendix B has the scoring guideline and instruction of use for DLQI. Question formats are “Over the last week, how bothering (itchy, painful, stinging) has your skin been?” or “over the last week, how much has the skin problem made it difficult for a certain activity (eg. home, school, sports, sexual activity)?” Possible answers are : 0 (“not at all”) or (“non-relevant”), 1 (“a little”), 2 (“a lot”), 3 (“very much”). The total score is calculated by summing up score of each question, generating a range of possible values from 0 to 30. The total score could also be expressed by percentage out of 30. Higher the total score, the poorer the quality of life. Besides, each domain has subscale that can be scored separately. In the incomplete questionnaires, if there is only one unanswered item, it will be replaced as 0 and included in the sum-up. Question number 7 has two parts. First the patients were asked whether the disease has prevented them to go to work or school. If yes, it is scored as 3. If no, patients are then asked how much the skin problems affects work or school. “A little” is scored as 1 and “a lot” is scored as 2. If two or more questions are left unanswered, the questionnaires will be considered invalid.

Study setting

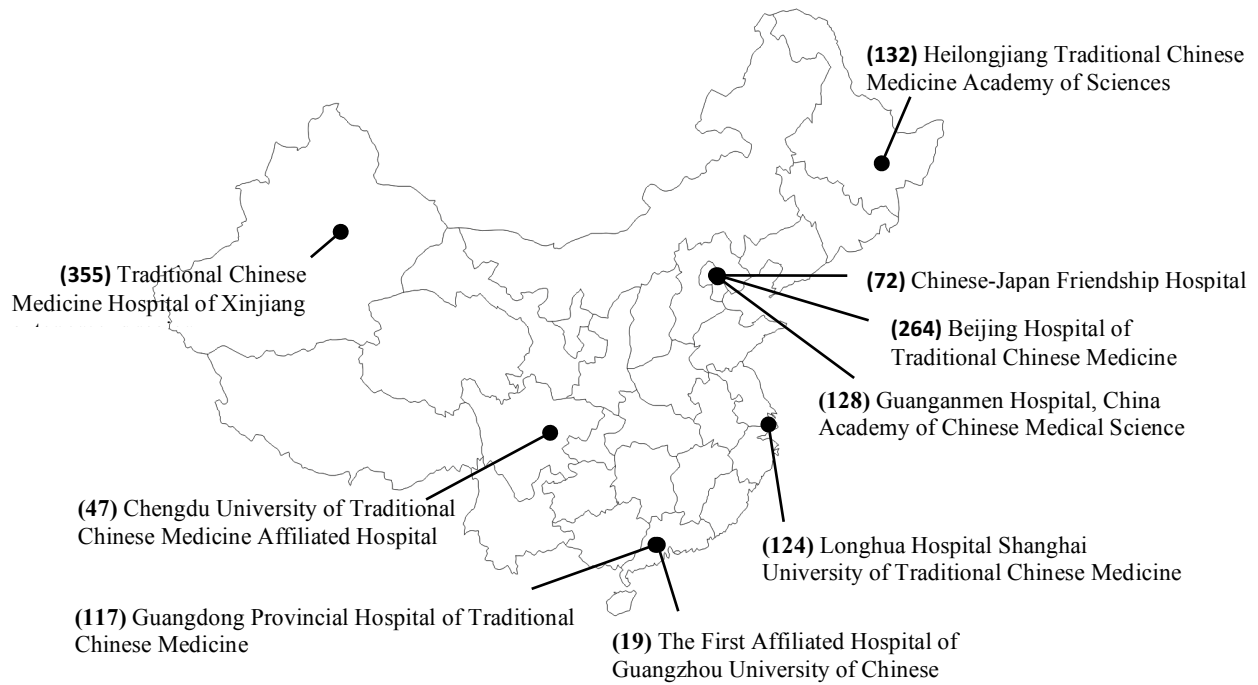


Figure 2 participated hospitals and the number of patients each contributed

Nine medical centers participated in this study: 3 from Beijing city, 1 from Heilongjiang province, 1 from Shanghai city, 1 from Xinjinag province, 1 from Sichuang province, 2 from Guangdong province. Figure 2 shows the list of attended hospital and the number in parenthesis indicates the how many patients from each site were included in the final analysis.

Sampling criteria

These 9 medical centers from different provinces were selected based on cluster sampling method. All patients were eligible to participate if they were confirmed with diagnosis of any dermatological diseases, absence of severe mental illness, and were able to answer the questionnaires by themselves. As many as 10,042 patients completed the questionnaires, where 1,314 of them have psoriasis as one of the diagnosis. Psoriasis patients below 16 years old or having two or more questions unanswered in their DLQI questionnaires were then excluded. The final dataset contains 1,258 psoriasis patients. The selection process is illustrated in Figure 3.

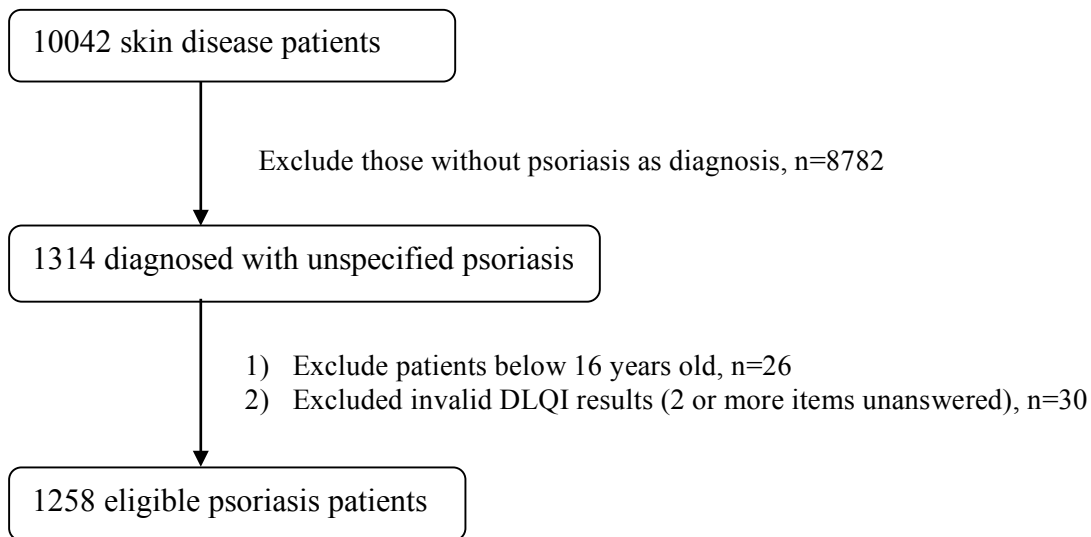


Figure 3. Selection process for data analysis

Data collection

Survey questionnaires and HRQOL questionnaires were completed by participants.

Self-reported variables from patients are as follows:

- 1) Demographic factors: age, gender, weight, height, marital status, type of department, location of sampled medical center, living city, ethnicity, food preference, education level, medical insurance type, occupation, income, money spent in outpatient and inpatient departments, average frequency of outpatient visits per month, average frequency of inpatient visit last year, having comorbidities or not, specific comorbidities.
- 2) Life style: whether or not have habits of smoke, alcohol, exercise and their amounts.
- 3) Generic and dermatology specific health related quality of life questionnaires. (Skindex16, Skindex29, DLQI, WHOQOL)

Doctors were responsible for other clinical aspects variables like diagnosis, duration of the disease, and physician global assessment for severity. The food preference, occupation, type of visit, frequency of any types of visit during last year or last month were excluded in the descriptive and regression analysis for its irrelevance to cause on the quality of life in psoriasis. Specific comorbidities are collected but excluded in the study due to the low frequency of each specific comorbidity.

Variable selection and definition

Variables were selected in this study due to their correlation with the quality of life based on literature research or theoretical association. Variables included in the crude analysis were age, gender, marital status, region, ethnicity, educational level, having medical insurance or not, income above 4000 RMB (Chinese Yuan) or not (around 5000 Swedish kronor), Body Mass Index (BMI), duration of disease, severity, having comorbidities or not, drinking alcohol habit, smoking habit, exercise habit. The categorization of variables was established on rationale of literature research or the purpose to evenly distribute samples. Detailed grouping rationales and variables definition are explained as follows:

- 1) Quality of Life: Total scores of Dermatology Quality of Life Index were calculated by adding up the score of every item in DLQI. Scores >10 were considered largely affected quality of life, indicating worse life quality; scores ≤10 were defined as less affected quality of life, indicating better life quality (43,47).

2) Risk factors:

- a) Age was classified as young adults (16-35 years old), middle age (36-65 years old) and elder people (more than 65 years old) (50).
- b) Age onset was calculated by age minus disease duration expressed by years. In line with clinical definition (51), early onset psoriasis was defined as ≤ 40 years old and late onset psoriasis was >40 years old.
- c) Body Mass Index (BMI) was calculated through dividing weight in kg by square of height in meters and BMI interval was defined (52) as underweight ($\leq 18.50 \text{ kg/m}^2$), normal (18.51-24.9 kg/m^2), overweight (25.0-29.9 kg/m^2), obese ($\geq 30.0 \text{ kg/m}^2$).
- d) Regions were regrouped based on location of medical centers instead of patient residence since all participants live within the province where their hospitals situate. Heilongjiang province and Beijing city were categorized as northern area, Guangdong as southern area, Shanghai as eastern area, Xinjiang and Sichuan as western area.
- e) 4000 RMB of income was the mean of entire samples thus has been chosen as a cutoff criterion.
- f) Marital status was collected as married, single, divorced or separated, widowed and regrouped as married or not married.
- g) The possession of medical insurance was originally collected as no medical insurance and different types of insurance: public funded medical insurance, urban employee medical insurance, urban residence medical insurance, rural medical insurance, poverty help, commercial medical insurance.
- h) Duration of disease was recorded in month. We later calculated them as years and rounded up to the nearest integer with 1 decimal.
- i) Severity of disease was assessed by physician global assessment with 5 points scale from 1 to 5, corresponding to “slight” “mild” “moderate” “serious” “severe”.
- j) Comorbidity was defined as systematic chronic diseases. Co-existing skin problems were not counted as comorbidities.
- k) Whether having exercise habit and its amount were answered liberally by patients. We defined the habitual exercise as “regular activity”: at least one time per week and at least 30 minutes each time (53).

- l) Whether having drinking habit and its amount were answered liberally by patients. The amount was collected as at least 1 drink in a year, in a half year, in a month, in a week and everyday. We defined habitual drinking as at least 1 drink averagely per week due to low availability in daily drinker and excessive omission of consumption amount.
- m) Whether having smoking habit and its amount were answered liberally by patients. We defined habitual smoking as “daily smoker”: at least 1 cigarette everyday (53).

Data Management

All data was recorded in Microsoft Excel file in Mandarin, later translated into English, then imported into SPSS software, SPSS version 22 (SPSS, Inc., Chicago, IL). Missing values in DLQI questionnaires were considered “not answered” or “not applicable”. For example, second part of question number 7 in DLQI is not applicable if first item is answered, and vice versa. In the situation where double entry is found in question number 7, first part’s answer is chosen to represent the correct value. If values of both parts are missing, number 7 is considered not answered. For single unanswered question in DLQI, a score of 0 was imputed. Any person who left 2 or more than 2 unanswered questions in DLQI was eliminated from the dataset. Minimum value recorded was assumed for those who claimed to have exercise and smoking habit but failed to report the consumption amount. Samples with any variable having missing values remained in the dataset since missing values in each variable were all below 10%, except 13.1% missing values were observed in income level.

Statistical analysis

All statistical analysis was performed with SPSS version 22 (SPSS, Inc., Chicago, IL) Descriptive statistics were performed: mean, standard deviation and median were used for summarizing numerical variables, and frequencies and percentages for the categorical variables. Histogram, Q-Q plot and Kolmogorov-Smirnov test are used to examine the normality of DLQI scores distribution. DLQI scores were then dichotomized as above 10 and below 10 to represent largely affected quality of life and less affected quality of life. Chi-square test were used to compare the distribution of categorical variables among people with DLQI above 10 or below 10. Mann Whitney test was used to determine the difference for non-normal distributed continuous

variables in two groups. Univariate and multivariable binary logistic regression were used with 95% confidence interval to determine the association between risk factors and DLQI above 10. Crude and adjusted odds ratios were calculated. Variables with p-value smaller or equal to 0.25 in univariate logistic regression were candidates to be included in multivariable logistic regression. Enter, backward, forward methods in multivariate regression were all used and only results from backward selection method is presented. Cluster effect within each hospital was taken into account and included in the final multivariable regression analysis. Missing data in the final model were handled with listwise deletion method: participants with any missing value in any variable were excluded in multivariable regression (n=1,121). Final model only included statistically significant variables. P-values less than 0.05 were considered significant.

Ethical consideration

The use of dataset was agreed by lead research group in Guangdong Provincial Hospital of Traditional Chinese Medicine, which Dr. Ze-Hui He affiliates with. Before questionnaire administration, written informed consent was collected by patients' physicians along with oral explanation to each participant. The ethics committee in Guangdong Provincial Hospital of Traditional Chinese Medicine approved the study, along with the approval from ethics committees in other 8 participated hospitals.

RESULTS

Study group profile

The demographic profile of study population is shown in Table 1. Of 1,258 participants most people were from outpatient department, and the majority was below 65 years old. There were 59.1% male and 40.9% female. Most patients were married (70.3%), living in Northern China (47.4%) and Western China (32.0%), and were Chinese descents (96.0%). There were 80.1% of patients having college or even higher education degree. There were 80.4% of patients currently having medical insurance, and 70.6% of patients with monthly income lower than 4000 RMB (equal to around 5000 SEK). While only 6.9% were considered obese, 50.6% of our study population had normal BMI. More than 80% of patients started to experience psoriasis symptoms before 40 years old. Half of people had disease duration under or equal to 7 years. Severity of psoriasis was mostly at moderate level (54.0%) and mild level (22.0%) assessed by physician global assessment. Few had severe (2.3%) or slight level (2.4%) of psoriasis. Almost half of patients (41.0%) were living with at least one kind of coexisting systematic diseases. The majority didn't have habit of drinking alcohol (67.9%) and smoking (63.4%) but 55.0% of them had exercise habit for at least 30 minutes per week.

Descriptive analysis

From Table 1, the study population had 605 largely affected people (48.1%) and 653 less affected people (51.9%). The proportions of DLQI score above 10 were significantly different in medical insurance status ($p=0.001$), severity of disease ($p<0.001$), and exercise ($p=0.02$). People with insurance had 12% more with worse quality of life than people without insurance. People with severe disease had 44% more to have worse quality of life than those in slight disease. People without exercise habit had 6.5% more to have worse quality of life than those exercise regularly. Median duration of disease was 8 years in people with $DLQI>10$, significantly different than 6 years in people with $DLQI\leq 10$ ($p=0.001$).

Table 1 Characteristic of 1258 psoriasis patients from medical centers and association between demographic factors, clinical factors, life style factors, and the proportion of DLQI>10 in each group

Factors		Number of patients (% in valid cases)	DLQI >10 (% in subgroup) n=605	DLQI ≤10 (% in subgroup) n=653	χ^2	<i>P</i>
Demographic factors						
Age	16-35 years old	643 (51.1)	304 (47.3)	339 (52.7)	0.98	0.61
	36-65 years old	571 (45.4)	282 (49.4)	289 (50.6)		
	>65 years old	44 (3.5)	19 (43.2)	25 (56.8)		
Gender	Male	737 (59.0)	361 (49.0)	376 (51.0)	0.48	0.48
	Female	513 (41.0)	241 (47.0)	272 (53.0)		
Marital status	Unmarried	369 (29.7)	177 (48.0)	192 (52.0)	0.002	0.96
	Married	875 (70.3)	421 (48.1)	454 (51.9)		
Regions	Northern	596 (47.4)	288 (48.3)	308 (51.7)	2.06	0.559
	Southern	136 (10.8)	58 (42.6)	78 (57.4)		
	Eastern	124 (9.9)	63 (50.8)	61 (49.2)		
	Western	402 (32.0)	196 (48.8)	206 (51.2)		
Ethnicity	Not Chinese	48 (4.0)	23 (47.9)	25 (52.1)	<0.001	0.99
	Chinese Han	1165 (96.0)	559 (48.0)	606 (52.0)		
Education level	below college	249 (19.9)	118 (47.4)	131 (52.6)	0.06	0.79
	College and higher	1000 (80.1)	483 (48.3)	517 (51.7)		
Medical insurance	No	233 (19.6)	89 (38.2)	144 (61.8)	10.46	0.001
	Yes	956 (80.4)	478 (50.0)	478 (50.0)		
Income level	≤4000 RMB	777 (70.6)	376 (48.7)	396 (51.3)	0.48	0.82
	>4000 RMB	321 (29.4)	154 (48.0)	167 (52.0)		

(continue to the next page)

(continued from table 1)

Factors		Number of patients (% in valid cases)	DLQI >10 ¹ (% in subgroup) n=605	DLQI ≤10 (% in subgroup) n=653	X ²	P
Clinical related factor						
BMI ²	Underweight	104 (8.6)	46 (44.2)	58 (55.8)	2.25	0.52
	Normal	683 (56.4)	318 (46.6)	365 (53.4)		
	Overweight	340 (28.1)	173 (50.9)	167 (49.1)		
	Obese	83 (6.9)	39 (47.0)	44 (53.0)		
Age onset	≤40 years old	987 (83.0)	483 (48.9)	504 (51.1)	1.59	0.20
	>40 years old	202 (17.0)	89 (44.1)	113 (55.9)		
Duration of the disease (year) ³		7 (2.4-13.3)	8 (3.0-15.0)	6 (2.0-13.0)		0.001 §
Severity	Slight	29 (2.4)	9 (31.0)	20 (69.0)	55.24	<0.001
	Mild	272 (22.4)	88 (32.4)	184 (67.6)		
	Moderate	654 (54.0)	319 (48.8)	335 (51.2)		
	Serious	229 (18.9)	141 (61.6)	88 (38.4)		
	Severe	28 (2.3)	21 (75.0)	7 (25.0)		
Comorbidity	No	724 (58.6)	334 (46.1)	390 (53.9)	2.07	0.15
	Yes	511 (41.4)	257 (50.3)	254 (49.7)		
Life style factors						
Smoking ⁴	No	802 (63.7)	374 (46.6)	428 (53.4)	1.88	0.17
	Yes	456 (36.3)	231 (50.7)	225 (49.3)		
Alcohol ⁵	No	1173 (85.1)	561 (47.8)	612 (52.2)	0.49	0.48
	Yes	85 (14.9)	44 (51.8)	41 (48.2)		
Exercise ⁶	No	581 (45.0)	300 (51.6)	281 (48.4)	5.43	0.02
	Yes	677 (55.0)	305 (45.1)	372 (54.9)		

¹DLQI>10: largely affected quality of life (worse quality of life); DLQI≤10: less affected quality of life (better quality of life)

²in kg/m², definition for interval is: underweight ≤18.50 kg/m², normal 18.5-24.9 kg/m², overweight 25.0-29.9 kg/m², obese ≥30.0 kg/m²

³expressed as continuous variable and median with interquartile range in overall population

§ result of Mann Whitney test comparing median disease duration between DLQI>10 and ≤10

⁴at least 1 cigarette everyday.

⁵at least 1 drink averagely per week

⁶at least one time per week and at least 30 minutes each time.

Regression analysis

Table 2 shows the crude odds ratio and adjusted ratio from logistic regression analysis for risk factors and DLQI>10. In univariate analysis, factors associated with DLQI above 10 were: having medical insurance (OR 1.62; 95% CI [1.12, 2.17]; $p=0.001$), 1 year longer duration of disease (OR 1.02; 95% CI [1.0, 1.03]; $p=0.003$), serious level of disease (OR 3.56; 95% CI [1.55-8.17]; $p=0.003$), severe level of disease (OR 6.67; 95% CI [2.08-21.31]; $p=0.001$), and having exercise habit (OR 0.78; 95% CI [0.62, 0.97]; $p=0.03$).

In multivariable analysis, regions, insurance, BMI, age onset, duration, severity, comorbidities, exercise habits were selected into the stepwise model. After backward selection, the significant associated factors to quality of life were: having medical insurance (OR 1.58; 95% CI [1.11-2.25]; $p=0.017$), serious disease (OR 3.50; 95% CI [1.11-10.98]; $p=0.035$), severe disease (OR 7.25; 95% CI [1.29-40.69]; $p=0.029$), and having exercise habits (OR 0.74; 95% CI [0.56-0.97]; $p=0.035$)

Table 2 Crude and adjusted odds ratios (OR) from regression analysis for association between demographic, life style, and clinical factors with DLQI>10 by using 1258 psoriasis patients in hospital-based data

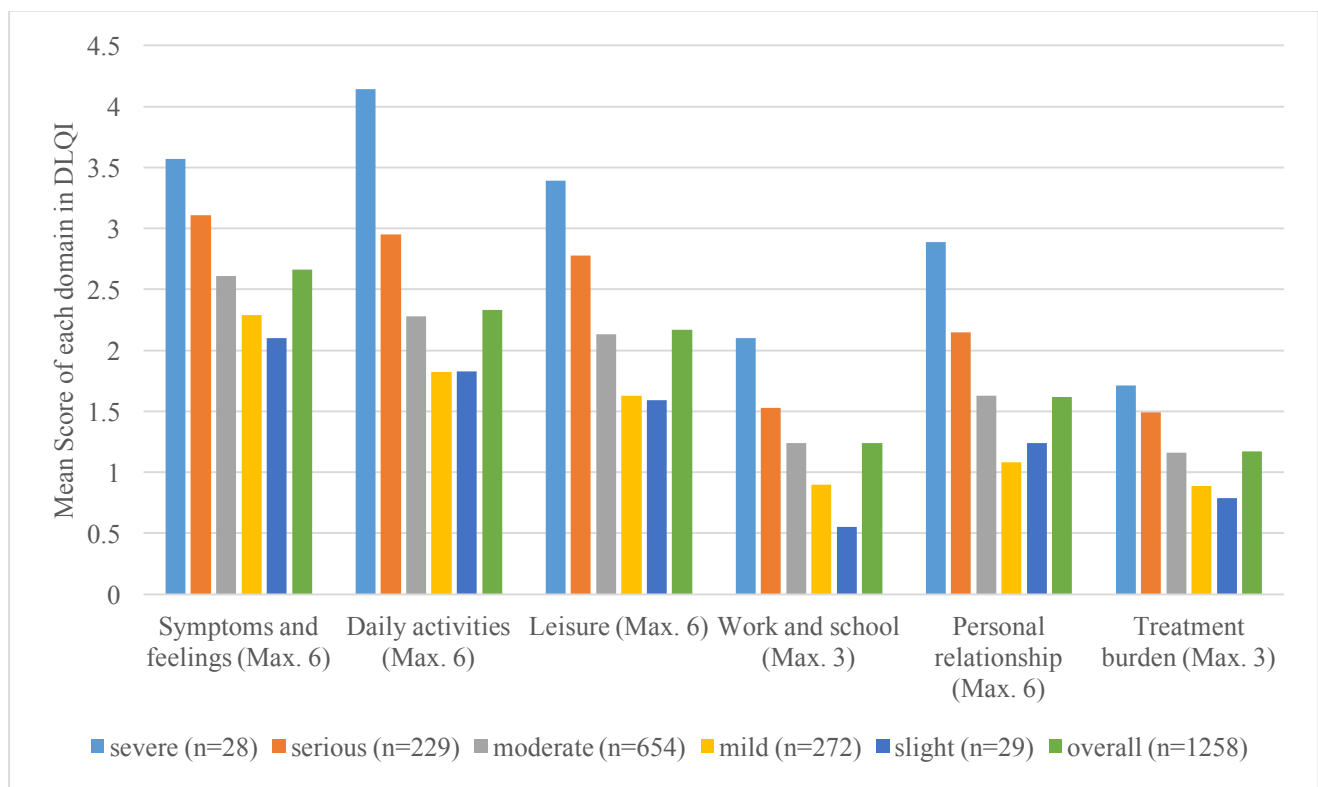
Variables	Category	OR (95% CI)			
		Crude	<i>P</i>	Adjusted ¹	<i>P</i>
Age (years)	16-35	1			
	36-65	1.09 (0.86-1.36)	0.46		
	Above 65	0.84 (0.45-1.57)	0.60		
Gender	Male	1			
	Female	0.92 (0.73-1.15)	0.48		
Marital status	Unmarried	1			
	Married	1.00 (0.78-1.28)	0.96		
Regions	Northern	1			
	Southern	0.79 (0.54-1.15)	0.23		
	Eastern	1.10 (0.75-1.62)	0.61		
	Western	1.02 (0.79-1.31)	0.89		
Ethnicity	Not Chinese Han	1			
	Chinese Han	1.00 (0.56-1.78)	0.99		
Education level	Below college	1			
	College or higher	1.04 (0.78-1.37)	0.79		
Medical insurance	No	1		1	
	Yes	1.62 (1.21-2.17)	0.001	1.58 (1.11-2.25)	0.017
Income level	≤4000 RMB	1			
	>4000 RMB	0.97 (0.74-1.26)	0.83		
BMI	Underweight	1			
	Normal	1.10 (0.73-1.66)	0.65		
	Overweight	1.30 (0.84-2.03)	0.24		
	Obese	1.12 (0.62-1.99)	0.70		
Age onset	≤40 years old	1			
	>40 years old	0.82 (0.60-1.11)	0.20		
Duration of the disease §	Years	1.018 (1.0-1.03)	0.003		
Severity by physician global assessment	Slight	1		1	
	Mild	1.06 (0.46-2.42)	0.88	1.09 (0.29-3.97)	0.88
	Moderate	2.11 (0.94-4.71)	0.067	1.95 (0.54-7.02)	0.26
	Serious	3.56 (1.55-8.17)	0.003	3.50 (1.11-10.98)	0.035
	Severe	6.67 (2.08-21.31)	0.001	7.25 (1.29-40.69)	0.029
Comorbidities	No	1			
	Yes	1.18 (0.94-1.51)	0.135		
Smoking	No	1			
	Yes	1.19 (0.77-1.23)	0.84		
Alcohol	No	1			
	Yes	1.71 (0.75-1.82)	0.48		
Exercise	No	1		1	
	Yes	0.77 (0.61-0.95)	0.02	0.74 (0.56-0.97)	0.035

Variables included in multivariate analysis ($P \leq 0.25$) are highlighted in grey color. § expressed as continuous variable

¹ Final multivariate model is adjusted for medical insurance, severity by physician global assessment, and exercise.

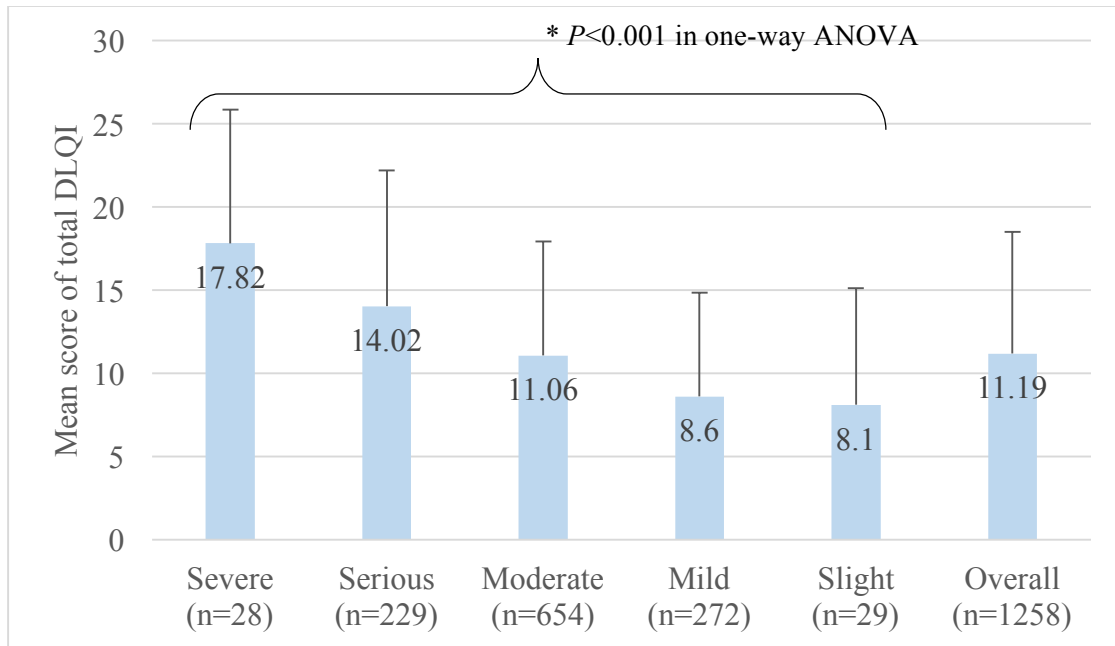
DLQI in different severity groups

To look into the extent of quality of life affected by different severity, we formulated graph 1 to present the mean scores of six domains of DLQI for people with different severity (values are attached in Appendix C). Numbers in parenthesis indicated the maximum score of each subscale. Significant different scores ($p < 0.05$) in each domain were observed. The highest score in any domain always belonged to people with the severe disease. The lowest score in any domain mostly belonged to people with the slight disease, except mild disease group scored the lowest in personal relationship domain. In any domain, mean scores of serious and severe disease were always higher than mean scores of overall study population.



Graph 1 Mean score in six dimensions of DLQI for people with different disease severity

Graph 2 shows mean scores of total DLQI of different severity group and whole study population. Mean scores from different severity groups were significantly different ($p < 0.001$). Mean score (\pm standard deviation) in severe disease was the highest (17.82 ± 8.05), and was more than twice of the mean score in slight disease (8.10 ± 7.0). Overall mean score in our study population was 11.19 ± 7.36 .



Graph 2 Mean score of total DLQI for people with different disease severity

DISCUSSION

Main findings

The first aim of this study was to describe the characteristics in psoriasis patients in China and to compare the health related quality of life among the psoriasis patients who have different demographic, life style, and clinical factors. We found people with medical insurance, and severity higher than moderate level had larger proportion having worse quality of life. People in worse quality of life had significantly longer duration of disease. People who did not exercise regularly displayed a higher proportion of worse quality of life than people exercise regularly. The amount of people having worse quality of life was independent of age, gender, marital status, ethnicity, education level, income, BMI, age onset, comorbidities, smoking, and drinking.

The second aim was to explore the relationship between demographic factors, life style factors, clinical factors, and the quality of life. Our findings were: having severity of disease was significantly associated with worse quality of life. People with serious disease had 3.5 times significantly higher risk of having worse quality of life. People with severe disease had 7.3 times significantly higher risk of having worse quality of life. Having medical insurance was associated with 1.6 higher risk have worse quality of life. Having exercise habit made patients 0.7 times less likely to have worse quality of life. There was no association between quality of life and age, gender, marital status, regions, ethnicity, educational level, BMI, age onset, duration of disease, comorbidities, smoking, and drinking habits.

In addition, we observed when the severity degree was higher, overall quality of life and every aspect in quality of life had more reduction.

Compared with other studies

We discovered that largely affected and less affected patients occupied almost equal proportion in our study population. This finding is not in line with previous studies done in single center settings in Malaysia (54) and in Germany (40) with the same DLQI cut-off 10, which have reported that people with less affected QOL considerably outnumber the largely affected. Perhaps this is because our multiple center design allowed us to recruit patients in more serious condition and healthcare accessibility in China is easier for the patients since transferal system from general physician to medical centers is not yet fully applied. Recruiting from inpatient department also resulted in such observation, as critical conditioned patients usually need hospital admission (55). Further analysis for our study population confirmed that amount of people with worse life quality was significantly higher ($p < 0.001$) in inpatient department than outpatient department.

Contrary to our finding, previous studies in other countries have revealed that women (55,56), younger age, lower income (58), living alone and lack of higher education (59) are correlated with worse quality of life. Such discrepancy might result from different cultural settings, different adjustment of confounding factors, and using different HRQOL instrument and different regression models. Previous studies use linear regression and adopt Psoriasis Disability Index (PDI) as outcome measure (55,58), which includes more specific questions regarding psoriasis per se than non-psoriasis specific DLQI. The questions are phrased with more clarity such as asking temporality of the behavioral changes. PDI widens the measuring time frame of patients' feelings as "over the last four weeks", suggesting it catches a more representative average condition of quality of life than DLQI, which only covers temporary quality of life "over the past week". The loss of power because of dichotomization of DLQI and categorization of continuous variables (age, income) might also lead to such observation. Additionally, demographic factors only explain 2% of variance of overall quality of life in previous study (59), suggesting the influences of demographic factors are generally too weak to be detected.

We failed to reproduce the results from previous study that patients with early onset of psoriasis (<40 years old) has more psychological burden (60) due to the difficulties to express the negative emotion. Patients with onset before 20 years old also has been shown to be more vulnerable to the environmental stress (37). Personality traits are usually more stable after young adulthood (61), possibly explaining the lack of association of life quality and early onset defined as before 40 years old in our study. In addition, the characteristics in Chinese society is hard to be comparative with western culture. Qualitative studies are needed to investigate the psoriasis stigmatization in Chinese cultural context. Literatures yield conclusions that longer disease duration does not necessarily build up psychological vulnerability (36) and possibly the patients become accustomed to living with the disease (57). Similarly, we observed the significance of disease duration in univariate analysis disappeared in the final model.

Similar to our findings, higher severity has been confirmed as the most important determinant for lower quality of life in the previous cross-sectional study done in Malaysia (54) and a longitudinal study in Spain (56) but other studies suggest otherwise that severity and quality of life is poorly correlated (56,60). Our subjective physician global assessment might introduce interviewer bias and increase the variability of severity measurement than the standardized PASI. Besides, different studies have chosen different plethora of confounding factors into regression for adjustment and cross cultural difference of response in dermatology-specific HRQOL instrument is documented (63). Therefore, it is not surprising the result differed from one country to another.

Smoking and alcohol consumption was not associated with worse quality of life in our study while previous reports suggest alcohol and smoking both exacerbate the psoriasis progression (64). The inability to exactly quantify the alcohol or cigarette consumption might generate this result. Alcohol and cigarette consumption strongly relied on questionnaire-based assessments and were subjected to recall bias. Selection bias in the study population might exist as well since the patients are inclined to quit smoking and alcohol drinking. Another possible reason is the intake amount we used to define the habitual behaviors was not strong enough to pose impact on quality of life. In line with our result, improvement of quality of life in psoriasis after physical activity intervention is documented (34,64). There is also a possible reverse causality that people might

refuse to exercise because of the itchy feeling or they might reduce the exercise frequency because of concerns about exposing their appearance.

We are unable to provide a reasonable explanation as to why people who were covered by a medical insurance had worse quality of life. However, to obtain more understanding to this association, we probed further into DLQI question 10 “over the past week, how much trouble has the treatment for skin been, for example, by making your home messy or by taking up time?” We found people with medical insurance score significantly higher on this question than people without medical insurance (1.0 ± 0.94 v.s. 1.2 ± 0.98 , $p=0.003$ in independent t test). This provides a possible explanation to our finding that un-measured confounding effect of treatment-related variables might lead to this result. Patients with medical insurance probably had more vigorous treatment or allowed them to seek care from multiple doctors, which generate poor quality of life due to additional inconvenience.

Strengths and Limitations

The study provides an overview of association or lack thereof between possible demographic factors, life style factors, clinical factors and quality of life in psoriasis patients. To our knowledge, this is the first large-scale hospital-based study aiming to explore the determinants for the quality of life in psoriasis patients in China. The large sample size (more than 1000 participants) renders sufficient statistical power for the study.

However, we acknowledge some of the study limitations.

First, the dataset was originally designed for psychometric evaluation and item response theory test of various HRQOL questionnaires with a target population being individuals with any dermatological disease and not limited to psoriasis alone. Other confounders that exclusively could impact psoriasis-related quality of life were not available for more detailed investigation of clinical determinants in the HRQOL. For example, there is lack of subtype of psoriasis, under treatment or not for the past week, exact treatment ever been used or currently being used, multiple treatments or single treatment, joint and finger involvement, the magnitude of involved body areas, first visit to doctor or not, under flare-up episode or not, PASI score rather than

physician global assessment. Lack of these information made us unable to analyze on more specific psoriasis subgroups since daily functional disability would have been different if arthritis or finger nails were involved. Also, impact on outlook appearance depended on whether affected area was able to be concealed by clothes and whether the characteristics of the symptoms like flaking and eruption of pustule were extensively presented.

Second, the multiple effects that demographic variables impose on quality of life might not be encapsulated in statistical models. Most variables do not have a specific way to be conceptualized in causal relationship and makes it difficult to generate a definitive priori hypothesis. For example, effect of being a woman on quality of life mediated by social stigma is negative, but effect of being a woman on quality of life mediated by more awareness on treatment is positive. These effects might cancel each other and produce the overall non-significant association in statistical model. Further, complex interplay of variables related to quality of life prohibits us to make a thorough interpretation of association. For instance, BMI is related to disease severity and directly affects self-esteem and produce worse quality of life, but BMI is also a mediator in between exercises and quality of life. Moreover, in this study we didn't take interaction terms and multi-collinearity into consideration while these phenomena may exist between several variables (eg. age at onset and duration of disease). A more comprehensive analysis and temporality of variables are needed to solve these problems.

Third, variables are subjected to recall bias. Since participants answered whether having smoking, drinking, and exercise habits based on their own liberal judgment, it is possible that they were not honest about the frequency and quantity of the habits. Furthermore, the definition of variables was restricted due to availability of data. Low frequency of daily drinker (only 24 people reported drink daily) and omission of alcohol consumption amount (1/4 of self-claimed drinker didn't report the intake amount) made us refer to a habitual drinking definition that is actually within recommended amount (66). These biases and practical limitations are perhaps the reasons for the association we observed. In addition, variables might not reflect the circumstances in real life. Medical insurance type was a single choice during data collection while in reality a person can have multiple medical insurances or registered as un-insured in residence province while being insured in another province. Such negligence in data collection complicated our interpretation.

Fourth, evidences on validity of original English version of DLQI are conflicting. The extensive literatures using DLQI as HRQOL measurement and well-documented score interpretation are the main reasons we selected DLQI out of 3 other HRQOL measurements in the dataset. However, although it is true that DLQI has been used in dermatological clinical trial and clinical survey for more than 20 years, the popularity of DLQI in dermatology might be only due to its simplicity and convenience to provide a rough perspective of quality of life, instead of its structural design or accuracy for measuring health related quality of life. In previous literature (67), DLQI has shown well property testing results in Classical Test Theory, such as internal consistency, test-retest reliability, content validity, and construct validity, but the sensitivity test is rarely examined. Floor effect and ceiling effect of DLQI has been demonstrated (68), suggesting that difference of responses from the studied individuals might not reflect on the scores of our outcome measure. The questions in DLQI highly focus on function disability and very few on individual emotion. Each domain in DLQI contains only too few items, suggesting total score of DLQI didn't fully encapsulate the notion in mental health. Furthermore, recent research using Item Response Theory and Rasch analysis unveiled several problems and concerns about the structure of DLQI (62,63). One of the obvious problems is the difficulties to differentiate options "a lot" and "very much" because they are conceptually similar. Another issue is that, according to scoring guideline (Appendix B), "not relevant" responses are scored 0, just the same as "not at all" responses. By following the scoring guideline, we possibly misclassified people as having better quality of life when they actually were in worse quality of life. The DLQI developer claimed DLQI has single construct which failed to be confirmed by statistical methods, and the questions in DLQI cover physical, emotional, functional, and social disability, which are hardly a single construct intuitively. As the psychometric evaluation is evolving, it is not surprising that DLQI as the first generation of dermatology QoL instrument, has failed to meet the newer standard of validation, despite the fact the confirmed validity in Classical Test Theory (71). As for the validity of Chinese version of DLQI, it passed the construct validity test by performing known group comparison, spearman correlation with other HRQOL instruments, and confirmatory factor analysis (42). However, content validity, test-retest reliability (repeatability) and responsiveness are not yet examined for Chinese version of DLQI. A lot more could be done to ensure the validity of Chinese version of DLQI.

Future research

As economy in China is in rapid growth, the balance of productivity and general well-being becomes more essential. As critical skin disease like psoriasis imposes tremendously negative effects on daily life, the continued effort is needed to strengthen the knowledge about psoriasis patients' quality of life. The future studies should collect more possible predictors for quality of life, especially those clinical-related, with more careful definition. Incorporating the information from hospital database is an option to obtain more details about clinical history. Including more variables that have straightforward confounding effect and causal effect is essential, such as temperature, humidity, experiencing stigmatization, under which treatment, etc. Besides, the instruction of administration of questionnaire should be emphasized to ensure the completeness of data. The longitudinal design is absolutely needed to solve the reverse causality problem and comparison with people without psoriasis should be considered. A closer look into other HRQOL measure, such as Skindex and WHOQOL, could provide a clear picture of HRQOL in psoriasis. A well-structured Health Related Quality of Life tool is needed for psoriasis. Item response theory should be harnessed in the validity test when constructing a new instrument. Future study could focus on multiple hospitals from urban and rural areas in single province with longer duration of data collection. A different clinical setting is another research option, for example in hospitals only offering western medicine or primary clinics. Analyzing on specific subtype of psoriasis or specific age group would be another interesting topic.

CONCLUSIONS AND RECOMMENDATIONS

Our findings establish the needs to incorporate the quality of life assessment in the healthcare for adult psoriasis patients in China. Larger proportion of poor quality of life was observed in people with medical insurance, in patients with higher degree of severity, and in patients without exercise habit. Likewise, statistically significant probability for poor quality of life was identified for severe and serious psoriasis, patients with medical insurance, and patients without exercise habit. These findings provide some insights about the target areas in public health measures. Policy makers should place controlling psoriasis severity as priority and put burden of treatment from medical insurance into perspective. Attention must be paid on improving the physical inactivity in psoriasis patients. The disease burden in China is amplified through the rapid growth of economy and population. Implementing an overarching policy for psoriasis patients in this country is imperative. More research should be done to address the risk factors for quality of life impact for patients in China to achieve a multilateral management of psoriasis.

DISCLOSURE

The data provider is the author's co-supervisor, Dr. Ze-Hui He, from Department of Big Medical Data, Department of Clinical Epidemiology in Guangdong Provincial Hospital of Traditional Chinese Medicine. Mutual agreement was established with Dr. Ze-Hui He to exchange the dataset and the study results. The whole study and collection of the data was funded by two projects: The National Key Technology R&D Program for the 12th Five-year Plan of Ministry of Science and Technology, China (No. 2013BAI02B03) and the Financial Industry Technology Research and Development Program of Guangdong Province, China (No. 2011(285)05).

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APPENDIX A DERMATOLOGY LIFE QUALITY INDEX

Hospital No.

Date:

Name

Address

Diagnosis

The aim of this questionnaire is to measure how much your skin problem has affected your life OVER THE LAST WEEK.

Please tick one box for each question.

- | | | | | |
|----|--|--|--|---------------------------------------|
| 1 | Over the last week, how itchy, sore, painful or stinging has your skin been? | Very much
A lot
A little
Not at all | <input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/> | |
| 2 | Over the last week, how embarrassed or self-conscious have you been because of your skin? | Very much
A lot
A little
Not at all | <input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/> | |
| 3 | Over the last week, how much has your skin interfered with you going shopping or looking after your home or garden? | Very much
A lot
A little
Not at all | <input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/> | Not relevant <input type="checkbox"/> |
| 4 | Over the last week, how much has your skin influenced the clothes you wear? | Very much
A lot
A little
Not at all | <input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/> | Not relevant <input type="checkbox"/> |
| 5 | Over the last week, how much has your skin affected any social or leisure activities? | Very much
A lot
A little
Not at all | <input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/> | Not relevant <input type="checkbox"/> |
| 6 | Over the last week, how much has your skin made it difficult for you to do any sport? | Very much
A lot
A little
Not at all | <input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/> | Not relevant <input type="checkbox"/> |
| 7 | Over the last week, has your skin prevented you from working or studying? | Yes
No | <input type="checkbox"/>
<input type="checkbox"/> | Not relevant <input type="checkbox"/> |
| | If "No", over the last week how much has your skin been a problem at work or studying? | A lot
A little
Not at all | <input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/> | |
| 8 | Over the last week, how much has your skin created problems with your partner or any of your close friends or relatives? | Very much
A lot
A little
Not at all | <input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/> | |
| 9 | Over the last week, how much has your skin caused any sexual difficulties? | Very much
A lot
A little
Not at all | <input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/> | Not relevant <input type="checkbox"/> |
| 10 | Over the last week, how much of a problem has the treatment for your skin been, for example by making your home messy, or by taking up time? | Very much
A lot
A little
Not at all | <input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/> | Not relevant <input type="checkbox"/> |

Please check you have answered EVERY question. Thank you.

APPENDIX B Instructions for use of Dermatology Quality of Life Index

Dermatology Life Quality Index (DLQI)

The Dermatology Life Quality Index questionnaire is designed for use in adults, i.e. patients over the age of 16. It is self explanatory and can be simply handed to the patient who is asked to fill it in without the need for detailed explanation. It is usually completed in one to two minutes.

Scoring

The scoring of each question is as follows:

Response	Score
Very much	scored 3
A lot	scored 2
A little	scored 1
Not at all	scored 0
Not relevant	scored 0
Question unanswered	scored 0
Question 7: "prevented work or studying"	scored 3

The DLQI is calculated by summing the score of each question resulting in a maximum of 30 and a minimum of 0. The higher the score, the more quality of life is impaired. The DLQI can also be expressed as a percentage of the maximum possible score of 30.

****Please Note:** That the scores associated with the different answers should not be printed on the DLQI itself, as this might cause bias**

Meaning of DLQI Scores

0-1 = no effect at all on patient's life

2-5 = small effect on patient's life

6-10 = moderate effect on patient's life

11-20 = very large effect on patient's life

21-30 = extremely large effect on patient's life

Detailed analysis of the DLQI

The DLQI can be analysed under six headings as follows:

Section	Questions	Score
Symptoms and feelings	Questions 1 and 2	Score maximum 6
Daily activities	Questions 3 and 4	Score maximum 6
Leisure	Questions 5 and 6	Score maximum 6
Work and School	Question 7	Score maximum 3
Personal relationships	Questions 8 and 9	Score maximum 6
Treatment	Question 10	Score maximum 3

The scores for each of these sections can also be expressed as a percentage of either 6 or 3.

(Continued)

Interpretation of incorrectly completed questionnaires

There is a very high success rate of accurate completion of the DLQI. However, sometimes subjects do make mistakes.

1. If one question is left unanswered this is scored 0 and the scores are summed and expressed as usual out of a maximum of 30.
2. If two or more questions are left unanswered the questionnaire is not scored.
3. If question 7 is answered 'yes' this is scored 3. If question 7 is answered 'no' but then either 'a lot' or 'a little' is ticked this is then scored 2 or 1. If "Not relevant" is ticked, the score for Question 7 is 0. If it is answered 'no', but the second half is left incomplete, the score will remain 0.
4. If two or more response options are ticked, the response option with the highest score should be recorded.
5. If there is a response between two tick boxes, the lower of the two score options should be recorded.
6. The DLQI can be analysed by calculating the score for each of its six sub-scales (see above). When using sub-scales, if the answer to one question in a sub-scale is missing, that sub-scale should not be scored.

Minimal Clinically Important Difference of the DLQI

For general inflammatory skin conditions a change in DLQI score of at least 4 points is considered clinically important (Basra et al, 2015, see below). This means that a patient's DLQI score has to either increase or decrease by at least 4 points in order to suggest that there has actually been a meaningful change in that patient's quality of life since the previous measurement of his/her DLQI scores.

APPENDIX C Mean scores of DLQI from different severity groups and overall study population. (S.D is standard deviation)

	Maximum on the subscale	severe (n=28)	S.D.	serious (n=229)	S.D.	Moderate (n=654)	S.D.	mild (n=272)	S.D.	slight (n=29)	S.D.	overall	S.D.
Symptoms and feelings	6	3.57	1.75	3.11	1.61	2.61	1.45	2.29	1.34	2.1	1.69	2.66	1.52
Daily activities	6	4.14	1.64	2.95	1.93	2.28	1.71	1.82	1.62	1.83	1.64	2.33	1.80
Leisure	6	3.39	1.98	2.78	1.86	2.13	1.59	1.63	1.57	1.59	1.64	2.17	1.72
Work and school	3	2.1	1.03	1.53	1.18	1.24	1.1	0.9	0.99	0.55	0.78	1.24	1.12
Personal relationship	6	2.89	2	2.15	1.91	1.63	1.62	1.08	1.39	1.24	1.59	1.62	1.68
Treatment burden	3	1.71	1.21	1.49	1.04	1.16	0.93	0.89	0.88	0.79	0.9	1.17	0.98
Total	30	17.82	8.05	14.02	8.18	11.06	6.87	8.6	6.26	8.1	7	11.19	7.33