

Psoriasis scoring and its outcome on the quality of human life: An updated review

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Abstract

Psoriasis is a chronic skin condition with the presence of abundant T lymphocyte. Mostly affected at the age of 20 or 50 years and is associated with co-morbidities like cardiovascular risk factors, diabetics mellitus, inflammatory bowel disease (IBD), obesity, metabolic syndromes, non-melanoma, and its skin cancer. Psoriasis patients suffer from the physical, psychological, emotional, social and economic burden and are challenging to their health-related quality of life. Disease severity is measured with the assistance of numerous scoring such as i) Psoriasis Area Severity Index (PASI), ii) Physician Global Assessment (PGA) and iii) Body Surface Area (BSA) while the quality of life impairment of patient is measured with various indexes such as i) Dermatology Life Quality Index (DLQI), ii) Feelings of Stigmatization Questionnaire (FSQ), iii) Short form 36 (SF 36), and iv) Human Anxiety and Depression Scale (HADS). Usage of these screening tools concludes how the severity of the disease affects the patient's day to day activities and their quality of life. The primary intention for psoriasis treatment is to scale down the severity of disease condition as well as improve the quality of life. The proper choice of drug therapy for the identified disease with patient compliance can improve the status of patient life. The present manuscript covers literature related to the demographic characteristics, psychological status, disease severity, and its co-morbidities, medication effect and economic burden on Human Related Quality of Life (HRQoL). On account of the collected data better treatment can be suggested and the psychological burden on their life can be reduced.

Keywords: Psoriasis, quality of life, severity score, clinical, skin, dermal.

1. Introduction

Psoriasis is an immunological constrain of the skin with itching, rashes and white or red plaques mostly touching the extensor surfaces of the body such as scalp, knees, elbows, natal cleft, nails, and umbilicus (Higgins, 2017). Irrespective of gender and ethnic origin the condition affects all age groups with a peak onset between the age group of 20 to 30 years and 50 to 60 years. Patients with psoriasis are associated with co-morbidities which can greatly minimize the quality of life of the patient (Li and Armstrong, 2012).

1.1. Epidemiology

As per the WHO Global Report on Psoriasis, the prevalence of psoriasis condition was reported to be 11.4% in European countries and the evidence shows that the prevalence rate is increasing from 1.5 to 5 % in most of the developed countries ("World Health Organization-Global report on psoriasis, 2016). More research studies focused on the prevalence rate of psoriasis but data obtained from these are extremely difficult to estimate the difference due to variation in the definition available for prevalence, case definition of psoriasis, the population age understudied and the population sampling techniques. The prevalence rate in China was reported to be 0.17% in the year 1984 and it was found to be 0.59% by 2009 while the prevalence in Spain in 1998 was 1.43%, and in 2013 it was reported to be 2.31% ("World Health Organization-Global report on psoriasis, 2016). The prevalence rate in the United States reported by National Health and Nutrition Examination Survey shows a rise from 1.62% in 2004 to 3.10% in 2010 in the United States ("World Health Organization-Global report on psoriasis, 2016; Helmick, 2014). In India, prevalence rate reports are mostly based on hospital-based studies. Okhandiar *et al* in 1963 reported the incidence of psoriasis to be 0.44 -2.2% based on the comprehensive data collected from North India (Okhandiar and Banerjee, 1963) and it commonly affects individuals in the age groups of 21-30 and 41-50 years with males being affected more than the females (Dogra and Yadav, 2010).

1.2. Immunopathogenesis

T cell is the key mediator in psoriasis and various subsets of T cells are involved in the process of immunopathogenesis and other chronic inflammatory responses in psoriasis. Their subsets are Th-1, Th-2, Th-17, and T-reg which is known as regulatory T cells. Various factor studies genetic, epigenetic, environmental, pathological, nutritional may trigger the immune response of the body where the Naive T cell is activated by the antigen-presenting cell (APC) in the epidermis mainly Langerhans cells. Cytokines (both interleukin IL-12 and IL-23) are released by the APC which will promote Naive T cell to differentiate further into Th-1 and Th-17. Activated T cells in the lymph node migrate to the skin and stimulate the release of cytokines.







These cytokines interact with the epidermal and dermal cells and cause hyperproliferation of the keratinocytes and results in acanthosis followed by dermal angiogenesis and neovascularization with an accumulation of inflammatory cell. Finally,

hyperplasia with deep red plaques can be observed on the affected skin surface (Zeng *et al.*, 2017; “Role of cytokines on the keratinocytes differentiation,”n.d).

1.3. Psoriasis and its types

Clinical presentation of psoriasis ranges from the mild condition with the presence of isolated patches on the skin to severe condition with confluent plaques formation on multiple areas of the body (Li and Armstrong, 2012). Various types of psoriasis are tabulated with their symptoms and cause in Table 1 (Schleicher, 2016).

Table 1: Description of various types of psoriasis with its symptoms and causes

Types	Prevalence	Symptoms	Causes	Image
Plaque psoriasis (Psoriasis vulgaris)	Mainly 80-85% on elbows, knees, scalp and lower back	<ul style="list-style-type: none"> A spherical lesion which grows into patches Red-colored lesions which are silvery, loose and shinning 	<ul style="list-style-type: none"> General infections Sunlight Skin abrasion Stress Medications Smoking Drinking 	
Guttate psoriasis	Around 10% on the trunk, arms, legs, and scalp	<ul style="list-style-type: none"> Lesions are minute raindrop size The eruption of lesion results in an upper respiratory infection. 	<ul style="list-style-type: none"> Contagious viral/bacterial infection Skin wounds, burns Insect bites Sunlight Medications 	
Psoriatic arthritis	Generally, occur in 6% to 40% of the population having a skin disorder and inflammatory condition of joints in hand and feet	<ul style="list-style-type: none"> Inflated, sore, thick and painful joints 	<ul style="list-style-type: none"> Shock or wounds Medication Agents that cause skin irritation Smoking Drinking 	
Pustular Psoriasis	Occur in less than 5% of population affecting feet, hands or finger-tips	<ul style="list-style-type: none"> Fluid-filled lesion on the soles and palms Very scaly skin Alteration in nails The eruption of the lesion after discontinuation of creams and some medications. 	<ul style="list-style-type: none"> Systemic steroids Mental and emotional stress Overexposure to UV light Sudden withdrawal of certain medication 	
Erythroderma (Exfoliative psoriasis)	Very uncommon type but lethal	<ul style="list-style-type: none"> Whole body with inflation and soreness The skin may slough off which is tender and generally itchy. Incapable to monitor body temperature. 	<ul style="list-style-type: none"> Steroid Extreme Sunburn Drinking alcohol Contagious disease Sensitivity 	
Nail psoriasis	Uncommon type	<ul style="list-style-type: none"> Yellow or brownish spots Deposition of cells under the nails which are impenetrable 	Unknown, but generally consider genetic factors	

1.4. Treatment

Treatment for psoriasis is based on the disease severity, its impact on the quality of life (Li and Armstrong, 2012), patient preference, and associated co-morbidities. First-line treatments are mostly topical therapy such as emollient, vitamin D analogues such as Calcipotriol, tar, corticosteroids for mild condition (Higgins, 2017) while a second-line treatment prefers systemic treatment with methotrexate, cyclosporine, acitretin, apremilast along with phototherapy for the severe condition.

Currently, treatment with biologics (Adalimumab, Etanercept, Infliximab) is prominent but seems to be very expensive (Schleicher, 2016).

The psoriasis patient shows a negative link with the quality of life due to the physical, socio-economic and psychological burden. Hence treatment should be selected to overcome these burdens. Psoriasis is a dermatological condition and the most preferred instrument to assess and evaluate the impact on the quality of human life is Human Related Quality of Life (HRQoL). Assessment of psoriasis severity was done through clinical severity scores as well as the quality of life impairment scores as shown below in Table 2 (Dogra and Mahajan, 2016).

Table: 2 Scoring tools

Clinical severity scores	Quality of life impairment scores
1. Psoriasis Area Severity Index (PASI)	1. Short-form 36 (SF 36)
2. Body Surface Area (BSA)	2. World Organization quality of life (WHOQoL)
3. Physician Global Assessment (PGA)	3. Euro QoL 5D5 (EQ5D)
	4. Dermatology life quality index (DLQI)
	5. Psoriasis disability index (PDI)
	6. Psoriasis quality of life questionnaire (PQLQ)
	7. Patients global psoriasis assessment (PGA)
	8. Psoriasis symptoms assessment (PSA)
	9. Visual analogue scale (VAS)
	10. Short-form 12 (SF 12)
	11. Skindex-29

The main symptoms of psoriasis are lesions on the skins which affect the psychological emotions of the patient. As all people in the world give importance to their appearance, the psoriatic patients feel ashamed of these lesions and badly affect their quality of life. Psychological impacts like anxiety, depression, etc can be assessed and evaluated by using the scoring scales shown in Table 3 (Petraškienė *et al.*, 2016; Elgendi *et al.*, 2015; Łakuta *et al.*, 2016; Łakuta and Basista, 2017; Hawro *et al.*, 2014; Álvarez *et al.*, 2018).

Table: 3 Anxiety and Depression Scoring Scales

Assessment of anxiety and depression
• Hospital Anxiety and Depression Scale (HADS)
• Zung Depression Scale (ZDS)
• Social Anxiety Questionnaire (SAQ)
• Beck Depression Inventory (BDI)
• Feelings of Stigmatization Questionnaire (FSQ)
• Appearance Schemas Inventory-Revised (ASI-R)
a) Self Evaluative Saliency (SES)
b) Motivational Saliency
• Rosenberg Self-Esteem Scale
• COPE-28

Based on the scaling score to assess the severity of disease, the quality of Life (QoL) measures and body surface area, The Medical Advisory Board of the National Psoriasis Foundation defined mild, moderate, and severe psoriasis (Pariser *et al.*, 2007).

1) Mild psoriasis – Less than 5% of the body surface area is affected and disease doesn't alter the patient's QoL and treatment has no serious risk (Dogra and Mahajan, 2016).

2) Moderate psoriasis – Mostly 2 - 20% of the body surface area is involved and disease alters the QoL of patients and therapies used have minimal risk (Dogra and Mahajan, 2016).

3) Severe psoriasis – More than 10% of the body surface area and alters the patient's QoL and therapies don't have a satisfactory response (Dogra and Mahajan, 2016).

From last two decades, investigators perform various studies to review the quality of life and found that irrespective of the degree of severity of psoriasis, patient's suffer psychological distress, impaired physical and emotional behavior, negative body self-image and restriction in their daily activities (de Korte *et al.*, 2004).

2. Demographic characteristics and HRQoL-Patients and cohabitants

There are numerous studies conducted to analyze the influence of psoriasis on the quality of human life and psychosocial status and level of patients (Martinez-Garcia *et al.*, 2014). By relating the demographic and clinical characteristics Daudena *et al* in 2013 evaluated the HRQoL of 1217 patients who suffered from moderate to severe psoriasis. The severity of psoriasis was recorded with PASI, BSA, PGA, and assessment of the HRQoL was done with SF-36, EQ-5D, DLQI, and PDI (Daudén *et al.*, 2013). The prospective observational study (VACAP) reported that severe psoriasis state in the patient showed psychological discomfort, a negative feeling on self-image, feelings of stigmatization, and reduced social interactions which lead to impairment in the HRQoL. The results show that a positive relationship exists between the severity of disease and impairment in quality of life (Daudén *et al.*, 2013).

In 2016, an analogous study was conducted by Petraškiene *et al* who evaluated the demographic and clinical factors affecting the quality of human life and the psycho-emotional status of patients suffering from psoriasis. This evaluation also provided the prevalence rate of psoriasis in Lithuanian. The evaluation and assessment of the patient's quality of life were done with standardized DLQI and the severity of psoriasis was measured by the physician by applying PASI. Moreover, the anxiety and depression in patients were evaluated using HAD (Petraškiene *et al.*, 2016).

The study concludes that psoriasis severity was more in women than men, and a significant change was also observed by them in their quality of life. It was reported that people aged more than 55 years and women having psoriasis also experienced the symptoms of depression and anxiety (Petraškiene *et al.*, 2016).

Over time, there are very few studies that rationalized the effect on cohabitants of psoriatic patients. Martinez-Gracia *et al* in 2014 analyzed the effect of psoriasis on the different levels of anxiety and depression, and its effects exerted on quality of life (Martinez-Gracia *et al.*, 2014). A total of 130 participated inclusive of patients, cohabitants and control. DLQI and Family DLQI used as a tool to measure the quality of life and psychological state measured using HADS. 87.8% of the cohabitants impaired the quality of life and had a higher state of anxiety and depression (Martinez-Gracia *et al.*, 2014). This research study shows that not only the psoriasis patients who suffer from impairment in quality of life but also the cohabitants too.

3. Psychological Status of psoriasis patients

Exposure to continuous stress associated with feelings of stigmatization, disapproval of one's external appearance as well as with the chronic nature of the disease results in a considerable decrease in the patient's quality of life (Preedy, 2010) and contributes to mood disorders mainly depression and anxiety. Research proved that the condition of depression is recurrent in psoriasis patients more than in the general population or even more when compared to other dermatological patients. The patients who felt stigmatized in social situations showed more exacerbated depressive symptoms.

3.1 Depression and Anxiety in Patients with Psoriasis / Stigmatization: A strong predictor of quality of life

Łakuta *et al* in 2016 focused on the interdependence of psoriasis and depression, using multiple mediation models on 193 patients of 20-67 years. The intervention of SES of psoriasis patients with depression and negative emotional attitudes to the body was evaluated (Łakuta *et al.*, 2016). Stigmatization Scale, BDI, Appearance Schemas Inventory-Revised (Body Image schemas) and Body Surface Index and the Body Emotions Scale, Sociodemographic and disease characteristics were evaluated to explain the relationship. The study inferred that patients experienced stigmatization, irrational belief of appearance affecting the emotional attitude in a negative way towards the body and ones on salience (Łakuta *et al.*, 2016).

A similar type of study was already conducted in the past by Hawro *et al* in 2014 who analyzed the involvement of visible and genital areas in 115 patients suffering from psoriasis vulgaris and investigated the effect on stigmatization and impairment of QoL by the clinical and demographic variables. FSQ, DLQI, WHOQoL were used as tools to measure stigmatization and quality of life (Łakuta and Basista, 2017). The higher degree of stigmatization was observed in women and an unemployed patient who have localized psoriatic lesions on visible skin surface especially back of the hands which cannot be covered by clothing. All patients reported some stigmatization level irrespective of the type of psoriasis and lesions (Hawro *et al.*, 2014).

Considering the above reports, a much more elaborate study was performed by Łakuta *et al* in 2017 to determine the circumstance in which psoriasis is well related to the psychological impairment with main focus on the onset of disease, potential determinants of social anxiety and depression, gender moderated disease severity index and emotional relation and experience of stigmatization and body image (Łakuta and Basista, 2017).

The investigation is done with 193 Adult psoriasis patients and disease severity measured using BSA and quality of life measured with BDI, Stigmatization scale, SAQ, Body Emotions Subscale, ASI-R (Łakuta and Basista, 2017).

The results justify that body image emotion, gender and the onset of disease significantly influenced the severity of disease with depression in patients. The patients with pre-adult onset and female expressed a higher degree of stigmatization and negative emotional attitude (Łakuta *et al.*, 2016) towards the body and showed a higher degree of disease severity with depression. These studies show that early diagnosis of psychological vulnerability in patients and the comprehensive management of psoriasis in children and adolescents is very important (Łakuta and Basista, 2017).

Despite the substantial improvement in the skin lesion, patients with psoriasis under controlled therapy reflect the presence of psychological effects. The majority of patients with no or mild psoriasis still showed symptoms of anxiety.

A recent study conducted by Álvarez *et al* in 2018 assessed the impact of systemic treatment on the psychological status of patients with mild or no disease. With a total of 220 patients, an epidemiological, cross-sectional, observational, non-interventional study of 2 cohorts (case and control) was performed. Tools such as Rosenberg Self-Esteem Scale, the COPE-28, Skindex-29, and HADS are used to measure each parameter and the results of the study rationalized the need for assessment of the psychological status of the patient since it persists even after the disease state is controlled. It's very significant to account for the psychological attention which will be necessary to evaluate the patient's health status (Álvarez *et al.*, 2018).

4. Disease severity and HRQoL

Psoriasis vulgaris, the most common among the patients affects the scalp, knees, and elbows with chronic erythematous plaques covered by silvery-white scales. This plaque shows measurable harm to the patient's HRQoL. Palmoplantar is localized pustular type psoriasis primarily affecting the palms and soles and clinicians need to pay particular attention when treating the functional impairment. So management of the condition with medication is very crucial. Mostly treatment begins with topical agents, followed by phototherapy or combined therapy with systemic, topical or phototherapy. Chung, J. *et al* in 2014 conducted a comparative study among patients with a plaque and palmoplantar psoriasis and evaluated clinical characteristics along with patient outcomes. Patients were enrolled and a cross-sectional descriptive study was performed based on the inclusion and exclusion criteria. The patient-reported outcomes were reported as DLQI, EQ-5D and the frequency of topical medication used and the clinician's measured severity of the condition based on the estimated BSA and PGA Scale. Chung *et al* concluded that palmoplantar psoriasis has a significant impact on the HRQoL as compared to moderate or severe plaque psoriasis. Palmoplantar psoriasis reported more difficulty with daily activities due to mobility impairment and more adherence to topical medication but no major differences were observed for pain, discomfort, and psychological impairment (Chung *et al.*, 2014).

In contrary to Chung *et al* study, Al Raddadi *et al* in 2016 performed a prospective observational cross-sectional survey to compare the effect of topical and combined treatments on the clinical severity of patients suffering from psoriasis vulgaris. A total of 41 patients including both males and females were selected and 21 patients were on combination therapy of topical with either systemic or Narrow Band-UV-B and 20 were on topical treatments only. The severity of the disease is assessed with DLQI and PASI. The study includes no inclusion or exclusion criteria and descriptive statistics are used to analyze the patient's data. PASI score was moderate in both groups and the DLQI score showed only a small effect on the patient's QoL. The study concludes that there is no significant difference between the groups with the type of treatment (Al Raddadi *et al.*, 2016).

5. Medication effects and betterment of QoL with dietary supplements

The treatment choice for psoriasis is based on the severity of the condition. As the Dermatology Association recommended biologic therapy as medication for moderate to severe psoriasis conditions. Mostly preferred monoclonal antibodies with anti-interleukin activity are Secukinumab and Ustekinumab, and with tumor necrosis factor inhibitor, Etanercept (Puig L *et al.*, 2018). So many research studies were conducted to evaluate the efficacy of drugs on the psoriatic condition, self-medication of dietary supplements for the betterment of QoL, also the negative impact of the drug on the quality of life affected by psychological status.

Yousefzadeh *et al* in 2017(a) investigated the impact of self-medication of these dietary supplements on the disease severity and QoL among both psoriasis and non-psoriasis patients. The consumption of dietary supplements by these patients was to improve the immune system thereby maintain a healthy body. The most commonly used dietary supplement are multivitamin/mineral supplements(MVM), omega-3 fatty acids or fish oil, folic acid and herbal extracts (Sahu *et al.*, 2011). The parameters included for the evaluation are education, age at the onset of disease, associated comorbidities, and smoking. All patients were taking at least one dietary supplement for 30 days. PASI and DLQI were calculated. The recorded data shows no significant distinction in PASI and DLQI with the consumption of dietary supplement and a negative correlation was drawn between education and the use of supplements (Yousefzadeh *et al.*, 2017a).

In contrary to dietary supplement study, Yousefzadeh *et al* in 2017(b) investigated a comparative study of the clinical efficacy of Methotrexate (MTX) alone and along with micronutrient supplementation (MM) and study its effect on DLQI measurement in psoriasis patients. The patient's selection was based on the inclusion and exclusion criteria and treated for 12 weeks then the clinical response such as scaling, skin erythema, and thickness of the patient's lesion was evaluated. The PASI score and DLQI index were recorded at the start of the studies and after 12 weeks of therapy. The study inferred that patients who received both MTX and supplement showed a significantly higher decrease in PASI score and patient satisfaction was more prominent with no side effects and decline in DLQI (Yousefzadeh *et al.*, 2017b).

Intake of supplementary diet along with medication improves the patient's satisfaction thereby the quality of life. So the selection of treatment with proper medication comes into pace. In severe psoriasis, biologics are preferred and Elgendi *et al* in 2015 assessed the changes in symptoms of depression in psoriasis patients before and after the Adalimumab therapy using the

ZDS. A non-comparative, prospective, observational, post registered surveillance study was performed on patients. Demographic, baseline clinical data, follow up data were collected and treatment effectiveness for psoriasis was manifested using PASI and ZDS. There was a significant interdependence with the improvement in psoriasis severity and reduction in depression symptoms with Adalimumab treatment (Elgendi *et al.*, 2015).

Puig *et al* in 2018 conducted a study to assess the treatment effect of subcutaneous injection of Secukinumab and Ustekinumab. The area under the curve was performed for 52 weeks (AUC)_{0-52wks}. A multicenter randomized double-blind study named CLEAR was conducted and evaluated PSAI score, HRQoL based on DLQI response and symptom relief from (AUC)_{0-52weeks} (Puig L *et al.*, 2018).

The subcutaneous injection of Secukinumab reveals greater efficacy and sustained action in clearing skin within 52 weeks. The patients reported a greater decline in related symptoms of psoriasis, a better quality of life with no skin disease, increases work productivity and daily activities (Puig L *et al.*, 2018).

6. Psoriasis and associated Co-morbidities

Psoriasis itself is a burden to a patient due to its severity. Several studies show that there is a remarkable overlap of pro-inflammatory mediators in psoriasis and co-morbidities (Egeberg *et al.*, 2015) and there are some researchers who estimated the reasons, factors, and outcomes relating to psoriasis and its comorbidities.

Cyclosporine is commonly used in moderate to severe psoriasis but its reported side effects are renal impairment. By using National Health Insurance Database (NHIRD) (Al Raddad *et al.*, 2016) under International Classification of Diseases, 9th revision, Clinical Modification (ICD-9-CM) of Taiwan, Yu *et al* in 2017 arranged a retrospective cohort study to investigate the risk of renal disease, chances of chronic renal failure and end-stage renal disease (ESRD) (Yu *et al.*, 2017) in psoriasis and non-psoriasis patients with cyclosporine treatment. The results of the study imply that renal disease is not initiated by the treatment but systemic inflammation in psoriasis can aggravate the pre-existing renal disease. It was noted that cyclosporine exhibited an increased risk of chronic renal failure and ESRD in psoriasis patients but does not remarkably increase the risk of renal diseases and in the case of non-psoriasis patients, the use of cyclosporine leads to a higher risk of renal diseases (Yu *et al.*, 2017).

A case series study was conducted by Hassan *et al* in 2017 in King Abdulaziz Medical City (KAMC) tertiary hospital approved by the Institutional Review Board appointed at King Abdullah International Medical Research Center (KAIMRC). The main focus was to analyze the co-morbidities in the psoriatic population. Sampling was done through simple random technique and select a sample size of 81 patients from 8000 outpatients of both genders. The study reported that the prevalence of co-morbidities such as hypertension, diabetes; dyslipidemia and obesity are more prominent among them (Hassan *et al.*, 2017).

A nationwide cohort study was performed on the Danish population by Egeberg *et al* in 2015 to investigate the correlation between the severity of psoriasis and the risk of a new-onset migraine condition. The data are recorded in the International Statistical Classification of Diseases, 10th Revision (ICD-10) codes. The study concluded that a disease severity-dependent increased the risk of migraine in patients with psoriasis, and patients with psoriatic arthritis are more vulnerable to the condition of migraine (Egeberg *et al.*, 2015).

A cross-sectional study was performed on Taiwan NHIRD by Tu *et al* in 2016 to investigate the prevalence of schizophrenia in psoriasis patients. Psoriasis, schizophrenia, and co-morbidities were ascertained by the International Classification of Diseases, 9th revision, Clinical Modification (ICD-9-CM) coding. The prevalence of schizophrenia was significantly higher with a ratio of 1.77 in psoriatic patients as compared to other populations. Most affected patients are of both gender within the age limit of 40 and 59 years. When further stratification was done among psoriasis patients, those with chronic pulmonary disease, cerebrovascular disease, and liver disease exhibited a higher prevalence of schizophrenia. These studies show that the pathogenesis of psoriasis involves the release of cytokines (both IL-12 and IL-23) which has a crucial role in this disease condition (Tu *et al.*, 2016). The role of salivary IL-1 β in psoriasis patients was investigated by Mastrodonato *et al* in 2007 using a comparative study of healthy controls and psoriasis patients under a standardized stressful procedure. All the participants were subjected to a pre-stress resting phase, experimental stress session containing mental arithmetic task and Stroop Colour Test, the post-stress resting phase. The perceived stressfulness was rated using VAS. The interplay between IL-1 β and cortisol responses to stress in both groups was studied by collecting saliva samples before and after stress. At the baseline, IL-1 β was higher in psoriasis patients due to changes in pro-inflammatory cytokine activity in the psoriatic skin but the mean cortisol level remained the same in both the groups. But after stress, IL-1 β level increased among the control but not in psoriasis patients and the cortisol level increased in both the groups. It was concluded that there was no significant correlation observed between changes in IL-1 β and cortisol levels (Mastrodonato *et al.*, 2007).

To investigate the role of HRQoL and its linkage with obesity and alexithymia in psoriasis patient and also to examine whether alexithymia mediates psoriasis and leads to poor HRQoL, Innamorati *et al* in 2016 conducted a study in 100 adult outpatients and 97 healthy controls aged 18-79 years. A checklist to assess the sociodemographic characteristic and psychometric questionnaires assessing psychological variables was given to the participants. HRQoL was measured using Difficulties in Emotion Regulation Scale (DERS), SF-12, HADS, Toronto Alexithymia Scale (TAS-20), Food Cravings Questionnaire-Trait-reduced (FCQ-T-r) and severity of psoriasis were assessed using PASI and BSA (Innamorati *et al.*, 2016).

In comparison with the control group the psoriasis patients frequently reported obesity, anxiety, alexithymia, depression, and food cravings. The low scoring is reported for the mental and physical element of HRQoL (Innamorati *et al.*, 2016).

7. Health state utilities (HSU) and Willingness to Pay (WTP) concerning DLQI.

HSU and WTP explain the physical and economic burdens of a psoriasis patient (Barot *et al.*, 2016). HSU is “cardinal values that represent the strength of an individual’s preferences for specific health-related outcomes” (Tolly, 2009). WTP is a construct reflecting disease burden. Many types of research have been performed to evaluate the interdependence of HSU and WTP concerning DLQI.

Keeping a primary aim of measuring HSU and the WTP for curing psoriasis and atopic eczema Lundberg *et al* in 1999 performed an interview section with 366 patients. The main focus was to draw out a relationship between HSU and WTP with dimensions of HRQoL. SF-36, DLQI, and VAS were analyzed and it was observed that the WTP was correlated with the DLQI and disease activity, but not with SF-36. It was feasible to measure HSU and WTP among the patient population and the substantial WTP suggested a significant decline in the quality of life (Lundberg *et al.*, 1999). A much more advanced study was done on Taiwanese psoriasis patients by Ko *et al* in 2016. Instruments used are DLQI, VAS, Time trade-off (TTO), EQ-5D, WTP. The reported data shows a relation of HSU and WTP with DLQI, but their interconnection with PASI scores vary to differing levels. The EQ-5D and VAS scores measure the DLQI and remained consistent when considering different PASI levels, but the correlation between the TTO and DLQI seems to be less. The study concludes that VAS, EQ-5D, and WTP are the perfect measuring tools for the determination of DLQI thereby assess the wellness of psoriasis patients in Taiwan (Ko *et al.*, 2016). Psoriasis and so many other conditions are there which affects the quality of life and their assessment through scoring tools helps in lowering the total cost of the disease and improve the confidence and lifestyle of the patient (Vimala and Goyal, 2018; Unissa *et al.*, 2019).

Conclusion

On reviewing this entire literature one can conclude that the reliability of the results on HRQoL depends on the population size, duration of the studies and set of questionnaires.

In most of the studies, either subjective assessment or objective assessment was conducted to evaluate the HRQoL but it is necessary to conduct both assessment studies. Likewise, both self-reported data of patients as well as clinician’s diagnosis data should be accounted for. This shows that using a validated and reliable scoring tool will be easier to assess the degree of severity of the disease, psychological impact, patient history and interventions in patients. The proper diagnosis of the disease type, its severity, and associated co-morbidities enable the physician to provide proper medication thereby early relief from the disease can be attained. Also, the psychological impact which affects the psoriasis patient can be taken into consideration and reduce anxiety, depression, stigmatization thereby enable them to face the social opportunities and challenges to explore their lives.

Conflict of interest statement:

Authors report no conflict of interest.

References

- Álvarez, M.M.B., Hernández, G.C., Quesada, A.G., Martín, J.M.G. Measurement of the Psychological Impact of Psoriasis on Patients Receiving Systemic Treatment. *Actas Dermo-Sifiliográfica*. Available: <https://doi.org/10.1016/j.ad.2018.05.007>
- Barot, P.A., Brahmabhatt, N.Y., Malhotra, S.D, and Patel, V.J. 2016. Study of drug prescribing patterns in psoriasis and assessment of rationality using SIGN and NICE guidelines at a tertiary care teaching hospital. *International Journal of Pharmaceutical Sciences and Research*. 7(7), pp. 3073-3079.
- Chung, J., Duffin, K.C., Takeshita, J., Shin, D.B., Krueger, G.G., Robertson, A.D., Troxel, A.B, Voorhees, A.S.V., Edson-Heredia, E., Gelfand, J.M.2014. Palmoplantar psoriasis is associated with greater impairment of health-related quality of life compared with moderate to severe plaque psoriasis. *J Am Acad Dermatol*. 71(4), pp.623-32. <http://doi:10.1016/j.jaad.2014.04.063>.
- Daudén, E., Pujolb, R.M, Sánchez-Carazoc, J.L., Toribiod, J., Vanaclochae, F., Puigf, L. M., Yébenesg, M. Sabaterg, E., Casadog, M.A., Calotoh, M.T., Aragónh, B., 2013. Demographic characteristics and health-related quality of life of patients with moderate-to-severe psoriasis: The VACAP study. *Actas Dermosifiliogr*. 104(9), pp. 807-814. <http://dx.doi.org/10.1016/j.ad.2013.03.005>.
- de Korte, J., Momber, F.M.C., Bos, J.D., 2004. Quality of life in patients with psoriasis: a systematic literature review. *J Investig Dermatol Symp Proc*. 9(2), pp.140-147.<http://doi.org/10.1046/j.1087-0024.2003.09110.x>
- Dogra, S. and Mahajan, R. 2016. Psoriasis: Epidemiology, clinical features, comorbidities, and clinical scoring. *Indian Dermatol Online J*, 7(6), pp. 471-480.<http://doi:10.4103/2229-5178.193906>.
- Dogra, S. and Yadav, S., 2010. Psoriasis in India: Prevalence and pattern. *Indian Journal of Dermatology, Venereology, and Leprology*, 76(6), pp.595-601. <http://doi:10.4103/0378-6323.72443>.
- Egeberg, A., Mallbris, L., Gislason, G.H., Skov, L., and Hansen, P.R.2015. Increased risk of migraine in patients with psoriasis: A Danish nationwide cohort study. *J Am Acad Dermatol*. 273 (5). Pp. 829-35.<http://doi.org/10.1016/j.jaad.2015.08.039>
- Elgendi, A., Nada, H., Mosbeh, A.S., Maatouk, M.2015. Depression Over Psoriasis: Assessment of associated Relief by addition of Adalimumab for the treatment of Psoriasis: Observational study (DORADO - Ps). *Journal of Dermatology & Dermatologic Surgery*. 19(1), pp. 15-20. <https://doi.org/10.1016/j.jdds.2014.03.005>.

- Hassan, S.A.K., Abdullah, O.A.H., and Rana, O.A.H., 2017. Proportions of major comorbid medical conditions among psoriasis patients in a tertiary hospital, Riyadh. *Journal of Health Specialties*. 5(3), pp. 176. https://doi.org/10.4103/jhs.JHS_136_16
- Hawro, M., Maurer, M., Weller, K., Maleszka, R., Zaleska-Janowska, A., Kaszuba, A., Zofia Gerlicz-Kowalczyk, Z., and Hawro, T. 2014. Lesions on the back of hands and female gender predispose to stigmatization in patients with psoriasis, *J Am Acad Dermatol.*, 76(4), pp.648-654. <http://doi:10.1016/j.jaad.2016.10.040>.
- Helmick, C.G., Lee-Han, H., Hirsch, S.C., Baird, T.L. and Bartlett, C. L, 2014. Prevalence of Psoriasis Among Adults in the U.S: 2003–2006 and 2009–2010 National Health and Nutrition Examination Surveys. *American Journal of Preventive Medicine*, 47(1), pp.37-45. doi: [10.1016/j.amepre.2014.02.012](https://doi.org/10.1016/j.amepre.2014.02.012)
- Higgins, E., 2017. Psoriasis. *Medicine*, 45(6), pp. 368-378. <https://doi.org/10.1016/j.mpmed.2017.03.010>
- Innamorati, M., Quinto, R.M., Imperatori, C., Lora, V., Graceffa, D., Fabbriatore, M., Lester, D., Contardi, A., Bonifati, C.2016. Health-related quality of life and its association with alexithymia and difficulties in emotion regulation in patients with psoriasis. *Comprehensive Psychiatry*. 70, pp.200-208.<https://doi.org/10.1016/j.comppsy.2016.08.001>.
- Ko, W.C., Tsai, T.F., and Tang, C.H., 2016. Health state utility, willingness to pay, and quality of life among Taiwanese patients with psoriasis. *Dermatologica sinica*. 34(4), pp. 185-191. <http://dx.doi.org/10.1016/j.dsi.2016.05.004>.
- Lakuta, P., Basista, H.P.,2017. Toward a better understanding of social anxiety and depression in psoriasis patients: The role of determinants, mediators, and moderators. *J Psychosom Res.* ,94, pp.32–38.
- Lakuta, P., Marcinkiewicz, K., Bergler-Czopd, B., Ligia.2016. The relationship between psoriasis and depression: A multiple mediation model. *Body Image*. 19, pp. 126–132. <https://doi.org/10.1016/j.bodyim.2016.08.004>
- Li, K., and Armstrong, A.W., 2012. A Review of Health Outcomes in Patients with Psoriasis. *Dermatol Clin.*, 30(1), pp. 61-72 <http://doi:10.1016/j.det.2011.08.012>.
- Lundberg, L., Johannesson, M., Silverdahl, M., Hermansson, C., and Lindberg, M.,1999. Quality of life, health-state utilities and willingness to pay in patients with psoriasis and atopic eczema. *British Journal of Dermatology*. 141, pp.1067-1075.
- Martinez-Garcia, E., Arias-Santiago, S., Valenzuela-Salas, I., Garrido-Colmenero, C., Garcia-Mellado, V., and Buendia-Eisman, A., 2014. Quality of life in persons living with psoriasis patients. *J Am Acad Dermatol*. 71(2), pp. 302-307. <http://doi:10.1016/j.jaad.2014.03.039>.
- Mastrodonardo, M., Alicino, D., Zefferino, R., Pasquini, P., and Picardi, A.,2007. Effect of Psychological Stress on Salivary Interleukin-1b in Psoriasis. *Archives of Medical Research*. 38, pp. 206-211.<http://doi.org/10.1016/j.arcmed.2006.09.009>.
- Okhandiar, R.P., and Banerjee, B.N., 1963. Psoriasis in the tropics: An epidemiological survey. *Journal of the Indian Medical Association*, 41, pp. 550-556.
- Pariser, D.M., Bagel, J., Gelfand, J.M., 2007. National Psoriasis Foundation Clinical Consensus on Disease Severity. *Arch Dermatol.*, 143, pp.239-24. <https://doi.org/10.1001/archderm.143.2.239>
- Petraškienė, R., Valiukevičienė, S., Macijauskienė, J., 2016. Associations of the quality of life and psychoemotional state with sociodemographic factors in patients with psoriasis. *Medicina*, 52(4), pp. 238-243. <http://dx.doi.org/10.1016/j.medic.2016.07.001>.
- Puig, L., Augustin, M., Blauvelt, A., Gottlieb, A.B., Vender, R., Korman, N. J., Thaçi, D., Zhao, Y., Gilloteau, I., Sherif, B., Williams, N., Guana, A., Lebwohl, M.G., 2018. Effect of secukinumab on quality of life and psoriasis-related symptoms: A comparative analysis versus ustekinumab from the CLEAR 52-week study. *J Am Acad Dermatol*. 78(4), pp.741-748. <http://doi.org/10.1016/j.jaad.2017.10.025>
- Raddadi, A.A., Jfri, A., Samarghandi, S., Matury, N., Habibullah, T., Alfarshoti, M., Mahdi, M., 2016. Psoriasis: Correlation between severity index (PASI) and quality of life index (DLQI) based on the type of treatment. *Journal of Dermatology & Dermatologic Surgery*. 20(1), pp. 15–18. <https://doi.org/10.1016/j.jdds.2015.05.002>
- Role of cytokines on the keratinocytes differentiation, [Online]. Available: <https://medicalxpress.com/news/2016-05-closer-source.html>, Accessed: 2 October 2018
- Sahu, R., Jain, N.K., Tiwari, P., Singh, N., Dixit, A., and Singh, G., 2011. Herbal remedies: A new era for psoriasis diseases. *International Journal of Pharmaceutical Sciences and Research*. 2(3), pp. 525- 533
- Schleicher, S.M.,2016. Psoriasis: Pathogenesis, Assessment, and Therapeutic Update. *Clin Podiatr Med Surg.* , 33(3), pp. 355-366 <https://doi.org/10.1016/j.cpm.2016.02.004>.
- Tolly, K. What are health utilities, Health economics [Online] 2009 Available: http://www.bandolier.org.uk/painres/download/What%20is%202009/What_are_health_util.pdf Accessed: 15 October 2018.
- Tu, H.P., Yu, C.L., Lan, C.C.E., and Yu, S.2017. Prevalence of schizophrenia in patients with psoriasis: a nationwide study. *Dermatologica sinica*. 35(1), pp.1-6. <https://doi.org/10.1016/j.dsi.2016.07.005>
- Unissa, R., Kumar, P.M., Sunil, G., 2019. Psoriasis: A comprehensive review. *Asian Journal of Research in Pharmaceutical Sciences*, 9(1), pp. 29-38.
- Victor, R Pedddy.2010. Psoriasis, *Handbook of Disease Burdens and Quality of Life Measures*.6, pp.4300.http://doi.org/10.1007/978-0-387-78665-0_147.
- Vimala, G., Goyal, R.C., 2018. Quality of life of elderly in India: A Review. *Int. J. Nur. Edu. and Research*. 6(4), pp.425-430.
- World Health Organization. Global report on psoriasis, [Online]. Available: http://www.apps.who.int/iris/bitstream/10665/204417/1/9789241565189_eng.pdf, [Accessed: 2 October, 2018].
- Yousefzadeh, H., Azad, F.J., Banihashemi, M., Rastin, M., Mahmoudi, M., 2017(a). Investigation of dietary supplements prevalence as complementary therapy: Comparison between hospitalized psoriasis patients and non-psoriasis patients,

correlation with disease severity and quality of life. *Complement Thera Med.* 33, pp. 65-71. <http://doi:10.1016/j.ctim.2017.06.005>.

Yousefzadeh, H., Azad, F.J., Banihashemi, M., Rastin, M., Mahmoudi, M., 2017(b). Clinical efficacy and quality of life under micronutrients in combination with methotrexate therapy in chronic plaque of psoriatic patients, *Dermatologica Sinica.*, 35(4), pp.187-189. <https://doi.org/10.1016/j.dsi.2017.06.005>

Yu, S., Tu, H.P, Yu, C.L, Lee, C.H and Hong, C.H., 2017. Is psoriasis an independent risk factor of renal disease? A nationwide retrospective cohort study from 1996 to 2010. *Dermatologica sinica.* 35(2), pp. 78-84.

Zeng, J., Luo, S., Huang, Y., Lu, Q., 2017. Critical role of environmental factors in the pathogenesis of psoriasis. *J Dermatol.*, 44(8), pp. 863–872. <http://doi:10.1111/1346-8138.13806>.

