Association of cognitive function impairment in patients with psoriasis: A single-centre study in Malaysia

Kam Veng Chan, MRCP[1,2], Dy-Win Low, AdvMDerm[1], Kian Keong Kong, MSc[3]

[1]Department of Dermatology, Sultanah Bahiyah Hospital, Alor Setar, Kedah, Malaysia, [2]Department of Medicine, Faculty of Medicine, Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia, [3]Clinical Research Center, Duchess of Kent Hospital, Ministry of Health, Malaysia

ABSTRACT

Introduction: Psoriasis is a chronic inflammatory skin condition often associated with comorbidities that may impact cognitive function. This study aims to determine if psoriasis is associated with the risk of cognitive impairment and to assess the relationship between cognitive impairment and various disease-related factors, including psoriasis severity, disease duration, and the presence of psoriatic arthropathy, using the Virtual Cognitive Assessment Tool (VCAT).

Materials and Methods: A total of 160 individuals were selected, comprising 80 psoriasis patients and 80 controls, matched for age, gender, ethnicity, marital status, education levels, and prevalence of comorbidities. Cognitive function was assessed using the VCAT. The relationship between cognitive impairment and various disease-related factors, including psoriasis severity measured using Psoriasis Area Severity Index (PASI scores), disease duration, and the presence of psoriatic arthropathy, was examined.

Results: The mean VCAT scores for the psoriasis and control groups were 25.38 (SD = 3.18) and 25.94 (SD = 2.67), respectively, with no significant difference between the two groups (p = 0.227). While most cognitive domains showed no significant differences, the VCAT attention sub-score was significantly lower in psoriasis patients (p < 0.05). There was no significant association between psoriasis and cognitive impairment. No significant association was found between cognitive function and PASI scores nor psoriatic arthropathy. A negative association was found between disease duration and VCAT scores, suggesting longer disease duration correlates with lower cognitive function (p = 0.05).

Conclusions: This study did not find broad cognitive impairment in psoriasis patients compared to controls, the specific deficit in attention and its association with the duration of psoriasis warrants further investigation. Understanding and addressing the cognitive aspects of psoriasis could significantly improve the overall quality of life for these patients.

KEYWORDS:
Psoriasis, arthropathy, cognitive impairment, Virtual Cognitive Assessment Tool (VCAT)

INTRODUCTION

Psoriasis, a chronic inflammatory skin disorder affecting 0.91%–8.5% of adults, exhibits diverse clinical manifestations. Its onset typically peaks between 20 and 30 years and again between 50 and 60 years, although it can occur at any age.[1] The most prevalent subtype, chronic plaque psoriasis, presents as erythematous plaques with silvery-white scales, often involving the scalp and extensor surfaces. Approximately 20% of patients experience psoriatic arthropathy.[2] Psoriasis is primarily diagnosed clinically, with skin biopsy for confirmation. Its development is influenced by complex genetic and environmental factors, associations with HLA-Cw6, HLA-DR7, HLA-B13, HLA-B17, HLA-B37, and HLA-Bw16.[3]

Psoriasis is a well-known chronic systemic inflammatory disease that is associated with metabolic syndrome and various comorbidities, with particularly pro-inflammatory cytokines and adipocytokines contributing to these conditions.[4] Recent years of research suggest a potential link between psoriasis and cognitive impairment, largely attributed to the cardiometabolic comorbidities that frequently accompany psoriasis, such as hypertension, diabetes, and obesity.[5] It is plausible that the chronic systemic inflammation characteristic of psoriasis, in combination with these cardiometabolic factors, increased the risk of cognitive impairment in affected individuals. Although recent data suggest a higher risk of cognitive impairment and dementia in psoriasis patients, conflicting results exist,[6-9] and there remains a lack of data on cognitive impairment in psoriasis, particularly among Asian populations.

Malaysia's has a highly diverse population, consisting 69.3% Malays, 22.8% Chinese, 6.9% Indians, and 1.0% from other ethnicities.[10] In addition to the Malay language, other commonly spoken languages include English, Mandarin, and Tamil.[11] This linguistic and cultural diversity creates challenges for neuropsychological testing, as the need for translation can alter the accuracy of these assessments. Cognitive tests such as the Mini Mental State Examination (MMSE), and Montreal Cognitive Assessment (MoCA) are standard tools for measuring cognitive function. However, these tests were developed for English-speaking populations, and translating them for use in other languages can compromise their reliability.[12]

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Corresponding Author: Kam Veng Chan
Email: ckveng@gmail.com

Virtual Cognitive Assessment Tool (VCAT) addresses this issue by offering a visual-based assessment that does not require translation. It evaluates five key cognitive domains—memory, visuospatial function, executive function, language, and attention. VCAT has demonstrated sensitivity and specificity comparable to other tests like MoCA in diagnosing early cognitive impairment. Research shows that VCAT effectively detects cognitive impairment across multilingual and multicultural populations, making it particularly suited to diverse societies.[13] Therefore, this study aimed to investigate the relationship between cognitive impairment and psoriasis using VCAT. In addition, the study also explored the impact of psoriasis severity, presence of psoriatic arthropathy, and duration of psoriasis on cognitive function to shed light on this relatively unexplored aspect.

MATERIALS AND METHODS

Study population

The study was conducted at the dermatology clinic of Sultanah Bahiyah Hospital, Alor Setar, Kedah, from June 2023 to December 2023. A total of 160 participants were enrolled, comprising individuals with psoriasis and an age-sex-matched control group without psoriasis. Inclusion criteria for both groups were individuals aged 18 and above. Psoriasis patients were diagnosed at Sultanah Bahiyah Hospital, while the control group included non-psoriasis patients, their family members, and hospital staff. Exclusion criteria encompassed medical conditions such as stroke, Down syndrome, visual or hearing impairments, severe physical limitations affecting pen-holding ability, and depression (assessed using Patient Health Questionnaire-9 with a score >4).

Sample size calculation

To compare two means, a sample size of 71 (n1) for the baseline/control group and a sample size of 71 (n2) for the other group was required in order to detect the mean difference of 1.75 with a power of 0.80 (80%) and an alpha of 0.05. The mean difference of 1.75 was considered the smallest important difference to be detected. The SD of (the variable of interest) was estimated as 3.70 [7]. This calculation was done using ScalexMean version 1.0.2.[14]

Data collection and study tool

Data were collected using a questionnaire consisting of 3 domains. The first domain is the demographic data of the subjects such as age, gender, marital status, education level, and comorbid conditions; the second domain is the VCAT questions; and the third domain is the Psoriasis Area Severity Index (PASI) [15] and presence of psoriatic arthropathy.

Cognitive function assessment

VCAT was conducted by the principal investigator using the Rater Stimulus Booklet for Memory and the VCAT Scoring Guide. The assessment included 14 questions across five domains: 6 for memory, 2 for language, 3 for executive function, 2 for visuospatial abilities, and 1 for attention. Diagnoses of mild cognitive impairment, dementia, or normal were based on total scores: Dementia (0–19), Mild Cognitive Impairment (20-23), and Normal (24-30).[13]

Dermatological assessment

Patients with psoriasis were clinically diagnosed and measured by using parameters such as PASI,[15] and the involvement of psoriasis arthropathy.[16] PASI categorised severity into mild (PASI <10), moderate (PASI >10 to 20), or severe psoriasis (PASI >20),[17] however Dermatology Life Quality Index (DLQI) was not assessed in this study and PASI is the tool for examine the severity. For the present study, all types of psoriasis were included, and disease duration was determined through patient history.

Statistical analysis

Data collected in this study were analysed using SPSS version 28.0 software. The normality of data distribution was assessed using the Kolmogorov-Smirnov test. Parametric data were presented as mean and standard deviation (SD), while non-parametric data were expressed as median + interquartile range (IQR). Descriptive statistics, including mean and SD for numerical variables and percentage distribution for categorical variables, were calculated.

A comprehensive statistical analysis will involve univariate and multivariate regression models. The Logistics regression analysis was used to identify associations between VCAT score and factors such as PASI, psoriatic arthropathy, and total duration of psoriasis. The VCAT score was the dependent variable, and associations with predictor variables were assessed. A p-value <0.05 was considered statistically significant.

Ethical consideration

This study was registered with the National Medical Research Registry Malaysia and was approved by the Medical Research and Ethics Committee, Malaysia (NMRR ID-23-00581-JGY (IIR)).

RESULTS

A total of 160 individuals were recruited for this study, comprising an 80-member psoriasis group and an equally sized control group. Table I summarizes the demographics of both groups. The demographic characteristics were well-matched, with both groups having an average age of 47.2 years and identical gender distribution (46.2% female and 53.8% male). The ethnic composition was predominantly Malay in both groups, with smaller proportions of Chinese, Indian, and other ethnicities. Marital status was also similar, with approximately 78% of participants being married. Educational attainment was comparable between the groups, with slightly more psoriasis patients having completed secondary school (61.3% compared to 50.0% in the control group). Both groups had similar proportions of participants with university education (26.3% in the control group vs. 23.8% in the psoriasis group), while the percentages of those with primary school education or other educational levels were low.

The prevalence of common comorbidities, including hypertension, diabetes mellitus, and dyslipidaemia, was comparable between the psoriasis and control groups. Hypertension was present in 32.5% of the control group and 35.0% of the psoriasis group, while diabetes mellitus was

Table I: Social-demographic data of the participants

Variable	Control (n=80)	Psoriasis (n=80)	p-value
Age, years	47.2 ± 15.5	47.2 ± 15.4	0.996
Gender			1.000
Female	37 (46.2)	37 (46.2)	
Male	43 (53.8)	43 (53.8)	
Ethnic			1.000
Malay	58 (72.5)	58 (72.4)	
Chinese	20 (25.0)	16 (20.0)	
Indian	2 (2.5)	3 (3.8)	
Other	0 (0)	3 (3.8)	
Marital status			0.850
Single	17 (47.2)	19 (52.8)	
Married	63 (50.8)	61 (49.2)	
Education level			0.429
Primary school	8 (10.0)	6 (7.5)	
Secondary school	40 (50.0)	49 (61.2)	
University	21 (26.3)	19 (23.8)	
Other	11 (13.7)	6 (7.5)	
Comorbidities			
Hypertension	26 (32.5)	28 (35.0)	0.867
Diabetes Mellitus	14 (17.5)	17 (21.3)	0.690
Dyslipidaemia	36 (45.0)	30 (37.5)	0.422

Table II: Disease characteristics among psoriasis patients (n = 80)

Variables	n (%)	Mean (SD)	Median (IQR)
Disease onset age, year		32.5 (15.6)	32.0 (23.0)
Disease duration, year *		11.6 (10.7)	9.0 (17.0)
Psoriasis Area and Severity Index *		5.0 (4.7)	3.4 (4.2)
Body surface area*		10.7 (12.5)	5.0 (12.0)
Type of psoriasis			
Plaque	77 (96.3)		
Guttate	1 (1.3)		
Pustular	2 (2.5)		
Presence of arthropathy	19 (23.8)		

* Skewed distribution
SD = standard deviation
IQR = interquartile range

Table III: Differences in VCAT total score and subscales between the psoriasis patients and the control group(n=160)

Variable	Control (n=80)	Psoriasis (n=80)	Mean difference (95% CI)	t statistics (df)	p-value [a]
VCAT	25.94 (2.67)	25.38 (3.18)	0.56 (-0.35, 1.48)	1.21	0.227
VCAT memory	11.40 (1.31)	11.34 (1.53)			0.781
VCAT language	4.33 (0.79)	4.45 (0.83)			0.330
VCAT visuospatial	3.83 (0.38)	3.84 (0.37)			0.834
VCAT executive function	3.71 (1.43)	3.69 (1.44)			0.912
VCAT attention	2.67 (0.84)	2.06 (1.27)			<0.05

[a] Independent t test
CI = confidence interval
df = degree of freedom

Table IV: Association of psoriasis and psoriatic arthropathy with cognitive impairment risk measured using VCAT

Variable		Odd Ratio, OR	(95% CI OR)	χ2 stat. (df)[a]	p-value [a]
Psoriasis	Yes (n=80)	1.834	(0.845, 3.982)	2.408 (1)	0.125
	No (n=80)	1			
Psoriasis Arthropathy	Yes (n=19)	1.415	(0.458, 4.379)	0.356 (1)	0.547
	No (n=61)	1			

OR = odd ratio
CI = confidence interval
df = degree of freedom

Table V: Simple linear regression analysis on the VCAT and other clinical parameters

Independent Variable	b (95% CI β)	t statistics	r	r2	p-value
Psoriasis Area and Severity Index	0.046 (-0.105, 0.197)	0.606	0.068	0.005	0.546
Duration of psoriasis	-0.066 (-0.131, 0.000024)	-1.990	0.22	0.048	0.050

b = VCAT unit score
r = correlation coefficient
r^2 = coefficient of determination

observed in 17.5% and 21.3% of the control and psoriasis groups, respectively. Dyslipidaemia affected 45.0% of the control group and 37.5% of the psoriasis group.

Table II summarizes the disease characteristics among the psoriasis patients. Within the psoriasis group, the mean age of disease onset was 32.5 years, with an average disease duration of 11.6 years. The severity of psoriasis, as measured by the PASI, had a mean score of 5.0, and the mean BSA affected was 10.7%. Plaque psoriasis was the most common type, affecting 96.3% of patients, with smaller proportions presenting with pustular (2.5%) and guttate (1.3%) forms. Additionally, 23.8% of the psoriasis patients had psoriatic arthropathy, indicating joint involvement in a significant subset of patients.

Cognitive function was assessed using the VCAT across both groups, as shown in Table III. The overall VCAT scores did not differ significantly between the psoriasis and control groups, with mean scores of 25.38 (SD = 3.18) and 25.94 (SD = 2.67), respectively (p = 0.227). However, a closer examination of the VCAT sub-scores revealed a significantly lower score in the attention domain for psoriasis patients ($p < 0.05$), suggesting a possible association between psoriasis and specific cognitive impairments, particularly in attention.

The analysis of the association between psoriasis and cognitive impairment, presented in Table IV, did not reveal a statistically significant relationship. The odds ratio for cognitive impairment in psoriasis patients was 1.834 (95% CI: 0.845-3.982) with a p-value of 0.125, indicating that psoriasis alone may not be a strong predictor of cognitive impairment. Similarly, the presence of psoriatic arthropathy did not significantly increase the risk of cognitive impairment, with an odds ratio of 1.415 (95% CI: 0.458-4.379) and a p-value of 0.547.

Further investigation into the relationship between psoriasis severity, duration, and cognitive function was conducted using simple linear regression analysis, as shown in Table V. The analysis indicated no significant relationship between PASI scores and VCAT performance (p = 0.546, r = 0.068). However, there was a borderline significant negative association between the duration of psoriasis and VCAT scores (p = 0.05, r = 0.22), suggesting that prolonged psoriasis might be associated with a modest decline in cognitive performance. Although this finding suggests a potential impact of longer disease duration on cognitive function, the strength of the association was modest.

DISCUSSION

Demographics and disease characteristics

The demographic similarities between the psoriasis and control groups help ensure that the comparisons made in this study are not influenced by disparities in age and gender. This matching strengthens the validity of our findings. The disease characteristics such as age of onset, and psoriasis disease duration observed align with existing data from the Malaysian Psoriasis Registry.[18] However, the predominantly Malay composition of our sample, which differs slightly from the national registry, reflects the specific demographic makeup of the Kedah region.[19] The mean BSA involvement was 10.7%, and the mean PASI score was 5. In comparison, the Malaysian Psoriasis Registry reported a mean BSA involvement of 12.2% and a mean PASI score of 6.5 in adult psoriasis patients. These findings suggest that the patients in our study may have had a slightly lower disease severity than the broader population captured in the national registry.[18] Outpatient clinics typically manage patients with less severe forms of psoriasis, as those with more severe diseases are treated in inpatient settings. Consequently, the patient population in this study may have skewed towards those with slight milder disease.

Cognitive function comparison and association between psoriasis and psoriasis severity

The findings demonstrate that overall cognitive function, as measured by the VCAT, did not significantly differ between the psoriasis and control groups. Specifically, the mean VCAT score was 25.94 ± 2.67 for the control group and 25.38 ± 3.18 for the psoriasis group, with a p-value of 0.227. This suggests that psoriasis, despite being a chronic inflammatory condition, does not independently lead to significant cognitive impairment across most cognitive domains. There was significantly lower VCAT attention sub-score in the psoriasis group compared to the control group ($p < 0.05$). While the attention sub-score for psoriasis patients was lower, it is essential to consider that this assessment is based on a single question, which may limit the reliability of the finding. The significant difference might not robustly reflect a true cognitive deficit but could be an artifact of the limited assessment scope. This result underscores the need for more comprehensive tools to assess attention and other specific cognitive domains in future studies.[20]

The analysis of the association between psoriasis and cognitive impairment revealed an odds ratio of 1.834, with a p-value of 0.125. Although psoriasis patients showed a higher likelihood of cognitive impairment compared to controls, the result was not strong enough to confirm a definitive link. The PASI scores did not correlate significantly with VCAT scores (p = 0.546). This finding is consistent with previous studies,9 which reported similar results, reinforcing

the idea that cognitive impairment, when present, may be more closely related to the associated comorbidities or other factors rather than to psoriasis itself. It is noteworthy that metabolic syndrome, which is often associated with psoriasis,[21-23] has been significantly linked to cognitive impairment. This suggests that while psoriasis alone may not directly cause cognitive decline, the metabolic comorbidities frequently observed in psoriasis patients could contribute to the observed cognitive issues.[24-26] Additionally, the use of the VCAT in our study, compared to other studies that employed tools like the MMSE or MOCA, may have contributed to the negative findings regarding the association between psoriasis and cognitive impairment. VCAT is particularly advantageous in minimizing language-related biases, which can be a limitation in other cognitive assessments, thereby providing a more accurate evaluation of cognitive function across diverse populations.[12]

Psoriatic Arthropathy and Cognitive Function

There was no significant association found between the presence of psoriatic arthropathy and cognitive impairment ($p = 0.547$), contrasting with studies suggesting a link between psoriatic arthritis and cognitive impairment.[8,27] These studies highlight systemic inflammation, chronic pain, and longer disease duration as key contributors.[8,27] Systemic inflammation, a hallmark of psoriatic arthritis, has been suggested to drive neurodegenerative changes or vascular impairments that affect cognitive function.[8,27] Additionally, chronic pain and fatigue associated with psoriatic arthritis may create a mental burden that impairs attention and cognitive processing over time.[27] A possible reason for this discrepancy could be the very small sample size in this study ($n = 19$) compared to other studies[8,27] with larger sample sizes ($n = 96$ and $n = 117$, respectively), which have shown a positive relationship between psoriatic arthritis and cognitive impairment. The limited sample size in this study may have reduced the statistical power to detect such an association.[28]

Duration of Psoriasis and Cognitive Function

The relationship between the duration of psoriasis and cognitive function was found to be negatively associated, with longer disease duration correlating with lower VCAT scores ($p = 0.05$). This finding suggests that the cumulative burden of living with psoriasis over many years may contribute to a decline in cognitive function. However, the data do not provide strong evidence of a true association between psoriasis and cognitive impairment. When considering the overall VCAT scores and most subscales, there is no significant difference between psoriasis patients and controls, except for attention. This suggests that while there might be a potential association between psoriasis duration and cognitive function, it does not appear to be robust across different cognitive domains. Notably, other research has observed an association between psoriasis duration and cognitive impairment,[29] highlighting the need for larger sample sizes and longitudinal studies to better capture the potential long-term impact of psoriasis on cognitive function.

Limitations

This study has several limitations that must be considered. The sample size of 160 participants may be relatively small, which could limit the statistical power and generalizability of the findings. Additionally, the study population, predominantly Malay, may not represent the broader demographic diversity of psoriasis patients, restricting the applicability of the results to other ethnic groups. The use of the VCAT, while suitable for this population, may pose limitations in terms of comparability with other studies that utilize more widely validated cognitive assessment tools, such as the MoCA or MMSE. Furthermore, potential confounding factors, such as medication use and psychological stress, were not controlled for, which may influence cognitive outcomes independently of psoriasis. The cross-sectional design of the study limits the ability to establish causality between psoriasis and cognitive function, and the reliance on single-item measures for attention domains may reduce the reliability of specific findings. Lastly, the exclusion of certain comorbid conditions and the potential for selection bias in the control group further limit the study's generalizability and comparability.

CONCLUSION

While this study did not find broad cognitive impairment in psoriasis patients compared to controls, the specific deficit in attention and its association with the duration of psoriasis warrants further investigation. Understanding and addressing the cognitive aspects of psoriasis could significantly improve the overall quality of life for these patients.

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CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest to disclose.

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AUTHORS' CONTRIBUTIONS STATEMENT

Conceptualization – C.K.V, L.D.W. and K.K.K.; Methodology - C.K.V. and K.K.K.; Software - C.K.V. and K.K.K.; Data curation - C.K.V. and K.K.K.; Supervision – L.D.W.; Investigation - C.K.V.; Validation - C.K.V. and K.K.K.; Formal analysis - C.K.V.and K.K.K.; Visualization – C.K.V. and K.K.K.; Project administration - C.K.V.; Writing - original draft - C.K.V. and K.K.K.; Writing - review & editing - C.K.V., L.D.W. and K.K.K.

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