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Clinical and Systemic Predictors of Quality of Life in Psoriasis Vulgaris: Implications for Rehabilitation and Lifestyle Medicine

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Abstract: The increase of autoimmune diseases in general and psoriasis in particular during the last decades has raised awareness due to the impact of the disease on patients' quality of life and the difficulties in assessing its objective and subjective severity, both from a clinical standpoint and regarding the perceived impact on the part of the patients. In our study, in a patient cohort with a confirmed diagnosis of psoriasis vulgaris, we have used the patients' PASI and DLQI score values and examined how they correlated with each other and with lifestyle factors and systemic inflammation markers. In our patients, the DLQI score ranged from 0 to 30, with a mean of 5.13 ± 6.01, its distribution indicating that a significant subgroup reported a moderate, large, or very large impact on quality of life, with many patients reporting no or small impact. Based on our analyzed data, the impact of psoriasis on the quality of life does not solely depend on clinical severity; the DLQI and PASI correlation was very strong ($r_s = 0.880$, $p < 0.001$); the DLQI also correlated with BMI, ESR, fibrinogen, and CRP. The multiple linear regression model, with DLQI as the dependent variable, was shown to be statistically significant and explained 61.6% of the variation in the DLQI score. These findings suggest that PASI was the main independent predictor while BMI and systemic inflammation showed univariate associations but were not independently significant after adjustment. Moreover, DLQI is clinically relevant because it translates patient-reported burden and can identify individuals with quality-of-life impairment not fully reflected by clinical severity alone.

Keywords: psoriasis vulgaris; quality of life; DLQI; PASI; systemic inflammation; metabolic burden; lifestyle factors

1. Introduction

During these last decades, the incidence of autoimmune pathologies seems to be increasing. One of the most well-known and studied autoimmune pathologies is psoriasis, which is characterized by a complex pathogenesis and multifactorial etiology. The epidemiological data of psoriatic patients exhibit geographical variations; at a worldwide level, more than 100 million patients are estimated to suffer from the disease [1].

Psoriasis is characterized by a multitude of manifestations of fluctuating severity between different patients and also in the same patient at different times; the most important manifestations, from the perspective of the patient's quality of life, are the cutaneous manifestations [2-5].

An assessment of quality of life is essential for the global evaluation of patients with psoriasis because, beyond the clinical severity determined by dermatological scores, psoriasis is a condition that involves social, emotional, and professional restrictions [6-9]. Previous studies have primarily focused on disease severity as measured by the Psoriasis Area and Severity Index (PASI), its relationship with Body Mass Index (BMI), lifestyle factors, inflammatory markers, and cardiovascular risk [10-13].

The PASI score remains a widely used tool in clinical practice for assessing psoriasis severity [14], but it does not always accurately reflect the subjective impact of the disease on the patient [15,16]. In this context, the Dermatology Life Quality Index (DLQI) provides a complementary perspective centered on the patient's experience, which can highlight aspects of the disease not fully captured by the severity of cutaneous lesions [17,18].

There has been a fair amount of research concerning how accurately the PASI score reflects the objective and subjective burden of disease, and how the PASI and DLQI score values correlate with each other . However, the results from the relevant scientific literature show that there is no definite consensus in these matters. Therefore, it has been the aim of our study to demonstrate how perceived psoriasis severity, as evaluated using the DLQI score, affects patients' quality of life, and how patient score values correspond with PASI score values, and correlate with systemic inflammation markers, based on the methodology of our previous research on patients with the same pathology [19,20]. The study aims to assess the relationship between DLQI and the clinical severity, metabolic status, demographic factors, as well as systemic inflammatory markers in patients with psoriasis vulgaris; also, we aimed to determine which of these variables remain independently associated with the impairment in quality-of-life using a multivariable model.

2. Materials and Methods

2.1. Study design

This was a retrospective observational cross-sectional study, conducted using a database comprising 287 patients, who presented to the Elias University Hospital, Bucharest, between January 2022 and December 2024, with a diagnosis of psoriasis vulgaris. From a demographic perspective, the minimum patient age was 18 years old, and the maximum patient age was 79 years old; mean patient age was 48.38 ± 14.07 years old. The sample included 149 women and 138 men. In order for patient data to be included in the study, the relevant clinical and paraclinical data pertaining to disease severity and its impact on quality of life had to be available at the time of inclusion in the study group.

2.2. Data collection

Data were collected retrospectively from patient medical records and included biological markers, clinical scores and demographic parameters available at the time of evaluation. The PASI and DLQI scores were used to assess the clinical severity of psoriasis. Additionally, information was collected regarding systemic inflammatory markers used in the primary analysis, as well as the Body Mass Index (BMI). To be eligible for analysis, patients had to meet the following criteria: be at least 18 years old, have been diagnosed with psoriasis vulgaris, possess recorded PASI and DLQI scores in their clinical documentation, and have all the necessary demographic and biological data for the primary analysis. The analysis focused on the relationship between DLQI and PASI, BMI, age, sex, ESR, fibrinogen, and CRP, according to the structure of the database. Patients under 18 years of age and cases with incomplete data for the primary variables of the analysis were excluded. Patients with active infections or neoplasias were also excluded. Being based on retrospectively available clinical records, patients with incomplete data for the primary variables were excluded.

The interpretation of the Dermatological Life Quality Index (DLQI) was the following:

- 0-1 = no effect on patient's quality of life
- 2-5 = small effect on patient's quality of life
- 6-10 = moderate effect on patient's quality of life
- 11-20 = very large effect on patient's quality of life
- 21- 30 = extremely large effect on patient's quality of life.

2.3. Statistical analysis

The primary dependent variable was the DLQI score, evaluated as both a continuous and a categorical variable. The independent variables examined included the PASI score, BMI, age, sex, ESR, fibrinogen, and CRP. Within this framework, the PASI score served as an indicator of clinical severity, while inflammatory markers and BMI were considered as potential supplementary factors that could impact quality of life.

Statistical analyses were performed using IBM Statistics 27 software. Categorical variables were described using frequencies and percentages; for continuous variables, the mean and standard deviation (SD), confidence intervals or median were used. Graphical analysis and the Kolmogorov–Smirnov and Shapiro-Wilk tests were used to verify the normality of distributions. The Spearman correlation coefficient (rs) was employed to evaluate relationships between continuous variables. For group comparisons, depending on the data distribution, independent samples t-tests, Mann-Whitney U, or Kruskal-Wallis tests were applied, with Bonferroni correction utilized when necessary.

A multiple linear regression model was developed to identify independent predictors of quality-of-life impairment. The DLQI score was used as the dependent variable, while PASI scores, ESR, fibrinogen, CRP, BMI, age, and sex were used as independent variables. Collinearity analysis, residual diagnostics, and the Durbin-Watson statistics were used to verify model assumptions. Multicollinearity was assessed using variance inflation factors (VIF), with values below the accepted threshold indicating no relevant multicollinearity. The statistical significance threshold was set at $p<0.05$.

3. Results

The analyzed cohort comprised 287 adults with a certain diagnosis of psoriasis vulgaris, of whom 149 were female (51.92%) and 138 were male (48.08%). Patient age ranged from 18 to 79 years, with a mean of 48.38 ± 14.07 years and a median of 50 years; no notable differences were observed between sexes ($p = 0.964$). PASI scores ranged from 1 to 54, with a mean of 8.57 ± 6.88 and a median of 7.5. A PASI threshold of over 10 indicated that 80 patients (27.87%) presented with severe forms of psoriasis, while 207 (72.13%) had mild-to-moderate forms.

Table 1. Summary of PASI and DLQI distribution across the study cohort

Parameter	Subgroup	Interval (Min – Max)	Mean ± SD	Median	N
PASI score	Male	1 – 30	8.86 ± 6.49	8	138
	Female	1 – 54	8.30 ± 7.23	6	149
	Total	1 – 54	8.57 ± 6.88	7.5	287
DLQI by psoriasis severity	Mild–moderate psoriasis	0 – 19	2.49 ± 2.61	2	207
	Severe psoriasis	2 – 30	11.95 ± 6.90	10	80
	Total	0 – 30	5.13 ± 6.01	3	287
DLQI by BMI category	Normal weight	0 – 30	4.25 ± 5.16	2	157
	Overweight	0 – 26	6.17 ± 6.97	3.5	86
	Obesity grade I	1 – 30	6.00 ± 6.60	4	27
	Obesity grade II	0 – 10	4.82 ± 3.37	5	11
	Morbid obesity	0 – 24	9.67 ± 9.27	6	6

3.1. The impact of psoriasis on quality of life

There were no significant differences between sexes ($p = 0.922$). The DLQI score ranged from 0 to 30, with a mean value of 5.13 ± 6.01, CI: [4.43; 5.83] , and a median

value of 3. Regarding category distribution, the disease had no impact on quality of life in 26.13% of patients (n = 75). A total of 45.30% of patients (n = 130) reported a small impact; 17.42% of patients (n = 50) reported a moderate impact; 6.62% (n = 19) reported a large impact; and 4.53% (n = 13) reported a very large impact. These data show that although most patients reported a low or minimal impact on quality of life, approximately one quarter of the patients experienced at least a moderate deterioration in their quality of life.

3.2. The relationship between quality of life and clinical disease severity

Spearman correlation analysis revealed a very strong positive correlation between the PASI score and DLQI (rs = 0.880; p < 0.001), suggesting that a higher degree of clinical psoriasis severity is associated with a significant deterioration in quality of life; (Figure 1a). In the mild-to-moderate group, DLQI scores ranged from 0 to 19, with a mean of 2.49 ± 2.61 and a median of 2. Conversely, in the severe psoriasis group, DLQI ranged from 2 to 30, with a mean of 11.95 ± 6.90 and a median of 10. In the mild-to-moderate group, the no effect (36.23%, n= 75) and small effect (57%, n = 118) DLQI categories predominated. In the severe group, the category representing a moderate effect on quality of life was most prevalent (48.75%, n=39), followed by the categories for large effect (20.00%, n=16) and very large effect (16.25%, n=13). Notably, some patients in the mild-to-moderate PASI group reported high DLQI values, with scores compatible with large effects on the quality of life. These cases suggest that patient-reported burden may be disproportionately high in selected individuals despite lower objective severity.

3.3. Relationship between quality of life and age

A weak but statistically significant positive correlation was observed between age and DLQI score (rs = 0.120; p = 0.043), indicating a slight tendency for quality-of-life impact to increase with age. However, the magnitude of this association was low, suggesting that age has a minimal contribution in explaining DLQI score variability (Figure 1b).

3.4. Relationship between quality of life and metabolic status

Spearman's correlation analysis revealed a weak positive association between BMI and DLQI (rs = 0.180; p = 0.002), suggesting that individuals with a higher BMI tended to report greater impairment in quality of life (Figure 1c). Though small, this relationship indicates that the patient's metabolic status contributes to the perceived disease burden.

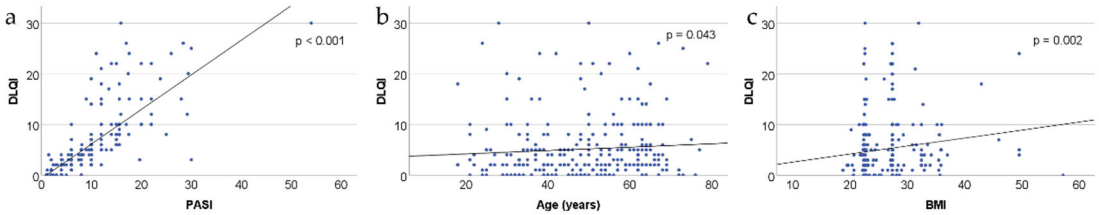

Figure 1. Relationship between quality of life and clinical disease severity (a), age (b), and metabolic status (BMI).

Among normal-weight patients, DLQI ranged from 0 to 30, with a mean of 4.25 ± 5.16, CI: [3.44; 5.07] and a median of 2.

In the overweight group, DLQI ranged from 0 to 26, with a mean of 6.17 (standard deviation 6.97; CI: [4.68; 7.67]) and a median of 3.5.

Among obese patients (overall), DLQI ranged from 0 to 30, with a mean of 6.20 (standard deviation 6.42; CI: [4.25; 8.16]) and a median of 4. In particular, patients with obesity grade I had a DLQI score with a mean of 6.00 (standard deviation 6.60; CI: [3.39; 8.61]) and a median of 4, and patients with obesity grade II had a DLQI score with a mean of 4.82 (standard deviation 3.37; CI: [2.55; 7.08]) and a median of 5, respectively.

Patients who were morbidly obese (grade III) had a DLQI score with a mean of 9.67 (standard deviation 9.27; CI: [0; 19.39]) and a median of 6.

The observed differences between overweight and obesity grades I-II likely reflect subgroup variability and the uneven distribution of clinical severity. However, it is possible that patients with moderate obesity perceive disease impact differently compared to the overweight, as DLQI assesses subjective perception, not objective severity.

The relationship between systemic inflammatory markers and quality of life was positively correlated with the DLQI score of the inflammatory markers analyzed. Therefore, a weak to moderate positive correlation was discovered between DLQI and ESR (rs = 0.252; $p < 0.001$) (Fig. 2a), and correlation of similar intensity was found between DLQI and fibrinogen (rs = 0.258; $p < 0.001$) (Fig. 2b). A weak positive association was also found between DLQI and CRP (rs = 0.121, p = 0.040)(Fig. 2c). Overall, these findings indicate that although the association is weak, there is a statistically significant relationship between systemic inflammation and greater impairment in quality of life.

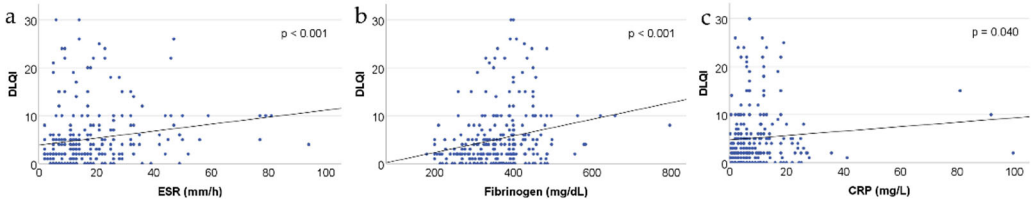

Figure 2. Correlation between DLQI and systemic inflammatory markers, ESR (a), fibrinogen (b), and CRP (c).

3.5. Multivariable linear regression analysis of DLQI score

A multiple linear regression model was used to identify independent predictors influencing quality of life. In this model, DLQI was used as the dependent variable, while the PASI score, ESR, fibrinogen, CRP, BMI, age, sex, and other variables were included as independent variables. This model was statistically significant (F = 63,910; $p < 0.001$). Additionally, it was accounted for 61.6% of the variance in DLQI score (R^2 = 0.616; R^2 adjusted = 0.606). All VIF values were low, ranging from 1.034 to 1.540 (age: 1.165; sex: 1.052; BMI: 1.069; PASI: 1.139; ESR: 1.464; fibrinogen: 1.540; CRP: 1.034). These values are well below the commonly accepted threshold of 5, indicating that multicollinearity was not a concern in the regression model.

The only independent significant predictor of DLQI in this model was the PASI score (B = 0.684; CI: [0.616; 0.752]; $p < 0.001$). After adjusting for age, sex, BMI, and inflammatory markers,, each 1-point increase in the PASI score was linked to a roughly 0.68 increase in the DLQI score. Fibrinogen, ESR, CRP, BMI, age, and sex did not remain independent predictors in the final model. These results indicate that in our cohort, clinical severity as measured by PASI was the dominant independent factor associated with DLQI. While BMI and systemic inflammatory markers correlate with DLQI in univariate analyses, they did not retain independent significance after adjustment.

4. Discussion

The main objective of this study was to show that the clinical severity of psoriasis was primarily associated with the impairment of the patient's quality of life. In the examined cohort, the DLQI score ranged from 0 to 30, with a mean of 5.13 ± 6.01. Its distribution indicated that a significant subgroup reported a moderate, large, or very large impact on quality of life, while many patients reported no or small impact.

The data presented in this study show that clinical severity was the main independent factor associated with quality-of-life impairment, while BMI and systemic inflammatory markers were associated with DLQI only in univariate analyses. Although the DLQI correlated very strongly with PASI (rs = 0.880, $p < 0.001$), it also exhibited

significant correlations-ranging from low to weak-moderate intensity-with BMI, Erythrocyte Sedimentation Rate (ESR), fibrinogen, and C-reactive protein (CRP). Furthermore, the multiple linear regression model, with DLQI as the dependent variable, was shown to be statistically significant and explained 61.6% of the variation in the DLQI score. This supports the premise that a focus on the factors affecting quality of life, rather than clinical severity alone, is highly relevant. Conversely, 38.4% of the variability cannot be explained by the included variables, suggesting that other factors not currently analyzed may contribute to this impairment, such as lesion location, stigmatization, psychological status, treatment type, disease duration, or others.

In the analyzed cohort, the DLQI score correlated very strongly with the PASI score, and only PASI remained an independent predictor of DLQI in the exploratory multivariable model. However, inflammatory markers, BMI, and sex did not retain their statistical significance after adjustment. This indicates that the clinical expression of disease in our study group accounts for the majority of what the patients experience. Additionally, the associations between metabolic status, systemic inflammation and DLQI seem to substantially overlap with clinical severity in the present model.

These results are consistent with the essential role that DLQI plays in the assessment of psoriasis today. According to the AAD-NPF and EuroGuiDerm Guidelines, DLQI is still the most widely used tool for assessing the impact of psoriasis on health-related quality of life [21,22]. Quality of life instruments, such as the DLQI, provide relevant clinical information, complementary to objective severity scores [23]. At the same time, research shows that there is a link between PASI and DLQI, but the extent of the correlation is not completely certain. Generally, validity assessments indicate a moderate correlation between the two instruments [24], and clinical and observational studies have confirmed that an improvement in PASI is usually accompanied by an improvement in DLQI [14]. In comparison, the strong correlation we found in our study may suggest a greater clinical overlap between objective severity and the perceived burden in this specific group. This might be possible due to the fact that the analysis is cross-sectional and that finer psychological or phenotypic variables, such as lesion location, stigmatization, or affective symptoms, were not included in the model [25].

It should be noted that in our study, the DLQI score results, although having moderate mean values, were heterogenous when evaluated by category, suggesting that the disease burden was not uniform. Thus, while patients who had severe forms were concentrated more in the classes of moderate, large, and very large impact on the quality of life, underlying data from recent literature reveal a variable but close relationship between severity and quality of life [26]. Furthermore, the involvement of certain areas such as the scalp, face, palms, soles, or genital area can cause a disproportionately high impact on the quality of life compared to the overall severity score of skin involvement, highlighting the fact that DLQI score values should not be interpreted strictly and exclusively in relation to the overall disease severity but rather in conjunction with the clinical distribution of the lesions and, respectively, with the socio-functional impact [27]. This fact can also explain why patients with lower PASI scores reported high DLQI, as PASI does not fully capture lesion visibility, symptoms, impairment, or psychosocial impact.

In our analysis, we found that systemic inflammatory markers and BMI have a significant correlation with DLQI score values in univariate analyses; however, they were not independent predictors in the final model. These findings are in accordance with biological and clinical observations and data. Obesity is recognized as an exacerbating factor for psoriasis and is associated with a higher metabolic and inflammatory burden. In psoriasis patients with obesity as a comorbidity, weight-loss interventions have been associated with improvements in both lesions and quality of life [28,29].

On the other hand, the relevant scientific literature regarding inflammatory biomarkers in psoriasis remains heterogeneous. Recent reviews show that, although

there are many promising markers, there is still a limited amount of evidence regarding their use in routine clinical practice [30]. Consequently, while it can be demonstrated that ESR, fibrinogen, and CRP correlate with DLQI score values, they seem to no longer be significant after adjusting for PASI. This supports the assumption these parameters reflect the overall inflammatory intensity of the disease rather than being an individual measure of the patient's perceived suffering, Furthermore, previous studies on the same cohort have demonstrated that PASI was correlated with BMI, as well as with ESR and fibrinogen. Therefore, the interpretation is consistent with these findings.

Regarding metabolic status, there is a weak positive correlation between BMI and DLQI values in our patients, with higher DLQI values in overweight patients compared to those with normal weight. However, BMI did not remain an independent predictor in the developed multivariable model, suggesting that excess weight has a rather indirect impact, by increasing clinical severity, systemic inflammation, and the psychosocial burden of the disease, respectively [31]. Thus, our data aligns with recent literature that describes obesity in psoriasis patients not only as an exacerbating factor, even if indirectly via metabolic processes, but also as a cause of stigmatization, impaired body image, and decreased quality of life [32].

As far as demographic factors are concerned, our study found only a weak association between age and DLQI values; it did not reveal significant differences between sexes. However, the conclusions available in the relevant scientific literature are rather mixed. While some studies have shown no significant differences between men and women regarding DLQI values, other analyses and reviews have shown that, despite lower PASI scores, women might report a higher subjective burden [23,33]. This apparent discrepance indicates that psychological, cultural and individual perception factors also shape the relationship between clinical severity and the impact on quality of life, which are not always captured by the PASI or biological markers. In this regard, the lack of a significant distinction in our cohort does not contradict the literature, but rather places it within the existing broader and more diverse context.

The findings presented here are of a certain clinical relevance. Currently, objective scores continue to dominate the assessment of psoriasis, and some data indicate that the decision to initiate biologic therapy is more closely linked to PASI score values than DLQI [34]. However, the same studies show that the DLQI values can present the patient's suffering and the socio-functional costs of the disease more accurately [23]. For this reason, our findings support the systematic integration of the DLQI in the current evaluation of the psoriasis patient. DLQI is used not as substitute for PASI, but as an additional tool that helps differentiate between objective disease control and the remaining subjective burden. It is precisely here that the previous analysis of the same cohort, which examined PASI, BMI, lifestyle, and systemic inflammation levels, demonstrates the added value of the present study [19].

Another important observation is related to the inflammatory markers, namely the correlation of ESR, fibrinogen, and CRP with DLQI score values. These associations were not maintained after adjusting for PASI and other covariates, suggesting that systemic inflammation leads to the impairment of quality of life primarily by modulating clinical severity and the metabolic profile, and to a lesser extent through a direct linear effect on the subjective perception of the disease. Recent studies have shown that patients with psoriasis and metabolic comorbidities may maintain higher DLQI scores after clinical improvement, suggesting areas of incomplete overlap between the biological and psychosocial burdens [35]. Furthermore, there are reports associating higher CRP and ESR values with depression in psoriasis patients, supporting the hypothesis that inflammatory biomarkers reflect a systemic process that goes beyond mere localized involvement [36,37]. In this context, the analysis of inflammatory biomarkers demonstrates its value within a broader framework of patient stratification, moving beyond the simple independent prediction of quality of life [38].

In spite of the significance of the results and conclusions drawn, when analysing the data of our study, there remain certain limitations which must be mentioned. To begin with, the causal direction of the observed relationships cannot be established due to the retrospective and cross-sectional design. Also, the single-center design and convenience sampling limit the generalizability of the findings to other clinical settings. In addition, our research design was not aimed towards examining variables known to influence the quality of life in individuals with psoriasis, comprising nail, scalp, or genital area involvement, the presence of psoriatic arthritis, disease duration, psychological status, or social stigmatization [25]. Moreover, although the DLQI score is a recognized and widely used tool, some studies have also highlighted its drawbacks. For example, the scoring method for "not relevant" responses has the potential to create a misleading impression and underestimate the impact on some patients. Another limitation is that recording PASI and DLQI in the same clinical evaluation might have increased the observed association between the two measures via shared context. Furthermore, the DLQI scores showed a skewed distribution. Under these circumstances, the interpretation of the DLQI score values must be done with great care, as exploratory rather than definitive, and ideally, should be complemented in future studies with additional tools targeting patient-reported outcomes.

Finally, we acknowledge that potential confounders such as treatment status, disease duration, systemic therapy, and comorbidities may influence inflammatory markers and PASI scores. These variables were not consistently available in this convenience sample and have now been explicitly acknowledged as limitations of the study.

Despite these limitations, our study also has a number of strengths. Most importantly, a uniform selection of adults from the same clinical practice was performed, suggesting a useful analytical repositioning. Going beyond the already known and published relationships among PASI, BMI, and inflammation, the study focuses on patient-reported outcomes. Therefore, the study logically complements previous scientific literature on the subject and provides a perspective closer to real-world clinical practice. In this context, therapeutic success is not limited to the reduction of the PASI score, but also includes the alleviation of the daily burden associated with the disease.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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