Clinical, Cosmetic and Investigational Dermatology Dovepress

Open Access Full Text Article ORIGINAL RESEARCH

The Association Between Life's Essential 8 and Psoriasis in American Adults: A Cross-Sectional NHANES Study

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Purpose: Life's Essentials 8 (LE8) is a new indicator developed by the American Heart Association to assess cardiovascular health, including diet, physical activity, nicotine exposure, sleep health, body mass index, blood lipids, blood glucose and blood pressure. And more and more studies have shown that this index can evaluate other diseases, such as chronic kidney disease, abdominal aortic calcification and so on. However, there is no relevant study to evaluate the association between LE8 and psoriasis. The purpose of this study was to investigate the relationship between LE8 and the prevalence of psoriasis in American adults.

Patients and Methods: The data are from the National Health and Nutrition Examination Survey (NHANES) of the United States from 2003 to 2006, 2009 to 2014. Psoriasis was the dependent variable. LE8 is an independent variable and is divided into three levels: high, medium and low. Multivariate logistic regression model was used to explore the relationship between LE8 and psoriasis.

Results: A total of 13430 people were included in this study, including 391 patients with psoriasis and 13039 patients without psoriasis. The prevalence of psoriasis was 2.91%. In the fully adjusted logistic regression model, LE8 score was negatively correlated with psoriasis (OR=0.99; 95% CI, 0.98–0.99, P=0.0003). And this result still exists when LE8 is divided into high, medium and low groups. Compared with the low LE8 group, the high LE8 group had a 61% lower risk of psoriasis (OR=0.39; 95% CI, 0.26–0.57, p <0.0001).

Conclusion: This cross-sectional study suggested that LE8 score was negatively correlated with psoriasis risk.

Keywords: Life's Essentials 8, NHANES, Cross-sectional study, Psoriasis

Introduction

Psoriasis is a chronic inflammatory skin disease that affects around 2–3% of the global population.[1] Psoriasis is characterized by well-defined erythematous patches covered with silvery white scales, which typically occur symmetrically on the elbows, knees, trunk, and scalp, and can cause significant physiological and psychological issues for patients.[2] Moreover, there is an increasing awareness that psoriasis is not solely a skin disease but also linked to systemic conditions such as Crohn's disease, diabetes (especially type 2 diabetes), metabolic syndrome, depression, and cardiovascular disease.[3–6] It is evident that psoriasis poses a significant public health burden.

In 2010, the American Heart Association introduced Life's Simple 7 (LE7), an indicator for assessing cardiovascular health. This initiative aims to shift the focus from solely treating diseases to promoting and safeguarding positive health in both the general population and individuals.[7] Later, it was updated to Life's Essentials 8 (LE8) in July 2022. Compared to LE7, LE8 includes sleep indicators and updates other scoring algorithms.[8] LE8 was initially used as an indicator to evaluate cardiovascular health, and the LE8 score is positively correlated with the degree of cardiovascular health.[9] Some scholars have also found that it is applicable as an indicator for other diseases. For example, Zongao Cai et al found a negative correlation between the LE8 score and the risk of abdominal aortic calcification in elderly individuals in the

Received: 2 July 2024
Accepted: 4 November 2024
Published: 12 November 2024

United States.[10] Yuqing Ren et al discovered a nonlinear negative correlation between LE8 and the prevalence of chronic kidney disease.[11] However, LE8 has not been utilized to assess the risk of psoriasis. Therefore, in this study, we investigated the relationship between LE8 and psoriasis to address this knowledge gap.

Materials and Methods

Data Source

The NHANES, a publicly accessible database in the United States, served as the data source for this study. The NHANES database contains information on demographics, diet, exams, lab tests, and questionnaires, as well as restricted data. Access to restricted data requires the submission of an application. The ethics review committee of the National Research Center for Health Statistics approved the method of the study because all participants provided written permission at the beginning of recruitment.

Study Participants

We combined NHANES cycles from 2003–2004, 2005–2006, 2009–2010, 2011–2012, and 2013–2014, as these are the only cycles containing information about psoriasis, for subsequent analysis. The exclusion criteria included: (1) lack of psoriasis information; (2) incomplete LE8 score (missing any of the four health behaviors or four health factors); and (3) missing data for other covariates. A total of 13,430 participants were included in the analysis. (Figure 1).

Definition of LE8

The LE8 scoring algorithm comprises four health behaviors (diet, physical activity, nicotine exposure, and sleep duration) and four health factors (body mass index [BMI], non-high-density-lipoprotein cholesterol, blood glucose,

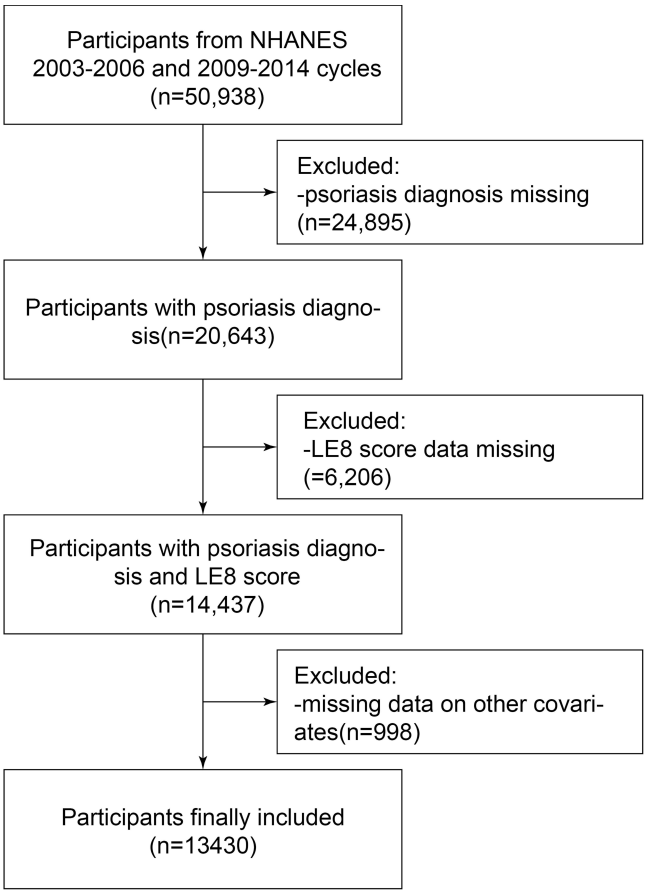

Figure 1 Flow chart of participant selection.

and blood pressure). Each indicator is scored on a scale from 0 to 100 points, reflecting its contribution to overall cardiovascular health.[9] Diet indicators were assessed using the Healthy Eating Index 2015. Questionnaire data were used to collect information on physical activity, nicotine exposure, sleep duration, and diabetes status. Laboratory data provided information on blood lipids and blood glucose levels, while blood pressure, height, and weight measurements were taken at the mobile examination center. The detailed algorithm to calculate the LE8 scores for the indicators in the NHANES data has been published previously (Table S1), in which each of the 8 indicators was scored on a scale ranging from 0 to 100, and the total LE8 score was calculated as an unweighted average of the 8 indicators.[9]

Definition of Psoriasis

Psoriasis was diagnosed by professional physicians through pattern recognition, which involved careful morphological assessment of the skin lesions.[12] The classic description of psoriasis includes well-defined erythematous patches covered with silvery scales. Information was collected using an interviewer-assisted questionnaire. Participants were asked, "Have you ever been told by a health care provider that you had psoriasis?" In our study, participants who answered affirmatively were classified as having psoriasis, while those who refused to answer or indicated that they did not know were excluded.

Covariates

Based on previous literature, the following covariates were selected: age at interview, sex (male, female), race/ethnicity (Mexican American, Other Hispanic, non-Hispanic white, non-Hispanic black, other race/multiracial), family Poverty Income Ratio (PIR) (<1.30, 1.30–3.50, >3.50), education levels (Less than high school, High School Grad or Equivalent, More than high school), marital status (divorced/separated/widowed, Married/living with a partner, never married), and cardiovascular disease (yes, no). A positive response to any of the following statements was considered indicative of cardiovascular disease: "ever told you had congestive heart failure", "ever told you had coronary heart disease", "ever told you had angina/angina pectoris", "ever told you had a heart attack", or "ever told you had a stroke".[13]

Statistical Analysis

Data merging was performed using EmpowerStats (version 2.0) and the statistical software package R (version 4.1.3), while images in this paper were created using Adobe Illustrator (version 2021). Categorical variables were expressed as percentages, while continuous variables were expressed as standard deviations. While sampling weights are typically used to produce representative and unbiased statistics in the analysis of a complex survey, they could also reduce the precision of the estimates. Additionally, sampling weights could introduce a degree of over-adjustment bias.[14–16] Thus, we conducted the analysis without incorporating sampling weights, consistent with some previous research using NHANES data.[14–16] The chi-square test and Kruskal–Wallis test were used to assess significant differences between psoriasis patients and non-psoriasis patients. Multivariate logistic regression models were initially used to evaluate the independent association between LE8 and psoriasis. In this study, Model I was unadjusted for covariates, Model II was adjusted only for sex, age, and race, and Model III was adjusted for PIR, education level, marital status, and cardiovascular disease based on Model II. The dose-response association between Life's Essential 8 and psoriasis was then assessed using smooth curve fitting. Subgroup analysis and interaction tests were performed to assess the effect of confounders on the relationship between Life's Essential 8 and psoriasis. Statistical significance was defined as a p-value below 0.05.

Result

Baseline Characteristics of Participants

Baseline characteristics of the 13,430 subjects included in this study showed that 48.65% were males and 51.35% were females. The overall prevalence of psoriasis in the study population was 2.91%. Patients with psoriasis had a higher average age (47.33 ± 17.03 years), a higher proportion of non-Hispanic white individuals (61.64%), and a higher prevalence of cardiovascular disease (15.09%) compared to those without psoriasis, which are consistent with previous

research findings.[17] Furthermore, the LE8 score was significantly higher in psoriasis patients compared to non-psoriasis patients. (Table 1).

The Association Between LE8 and Psoriasis

The results indicated that the risk of psoriasis decreased with an increase in the LE8 score (Table 2). Model I (OR=0.99; 95% CI, 0.98–0.99, p<0.001) and model II (OR=0.99; 95% CI, 0.98–0.99, p<0.001) showed significant correlation. In model III, the relationship between LE8 score and psoriasis was consistent (OR=0.99; 95% CI, 0.98–0.99, p=0.0003).

Table 1 Baseline Characteristics of Participants (N=13430)

	No PS (n=13039)	PS (n=391)	*P* value
Age, (year, mean ± SD)	47.33 ± 17.03	50.14 ± 16.16	0.001
Sex, (%)			0.400
Male	48.71	46.55	
Female	51.29	53.45	
Race/Ethnicity, (%)			<0.001
Mexican American	14.66	7.93	
Other Hispanic	8.15	8.18	
Non-Hispanic White	47.06	61.64	
Non-Hispanic Black	20.45	13.55	
Other Race/Multiracial	9.68	8.70	
Education level, (%)			0.184
Less than high school	21.43	17.65	
High School Grad or Equivalent	21.95	23.79	
More than high school	56.62	58.58	
Marital status, (%)			0.009
Divorced/separated/widowed	20.19	26.34	
Married/living with a partner	60.62	57.29	
Never married	19.19	16.37	
Poverty ratio, (%)			0.093
<1.3	30.99	34.78	
1.3–3.5	36.08	30.95	
>3.5	32.93	34.27	
Cardiovascular disease, (%)			<0.001
Yes	8.85	15.09	
No	91.15	84.91	
LE8 score	67.24 ± 14.49	64.13 ± 15.07	<0.001
Health behaviors score	64.64 ± 19.67	62.64 ± 20.16	0.048
Health factors score	69.85 ± 19.17	65.63 ± 19.32	<0.001

Table 2 Association Between LE8 and Psoriasis in Different Models

Exposure	Model I (OR, 95% CI, P-value)	Model II (OR, 95% CI, P-value)	Model III (OR, 95% CI, P-value)
LE8 score	0.99 (0.98, 0.99) <0.0001	0.99 (0.98, 0.99) <0.0001	0.99 (0.98, 0.99) 0.0003
LE8 score, (group)			
Low (LE8<50)	1.0	1.0	1.0
Moderate (50≤LE8<80)	0.58 (0.45, 0.75) <0.0001	0.59 (0.45, 0.77) <0.0001	0.65 (0.49, 0.79) 0.0002
High (LE8≥80)	0.40 (0.28, 0.56) <0.0001	0.38 (0.27, 0.55) <0.0001	0.39 (0.26, 0.57) <0.0001

Notes: LE8, Life's Essential 8; Model I was unadjusted. Model II was adjusted for sex; age; and race. Model III adjusted for sex; age; race; Education level; Marital status; Poverty ratio; and Cardiovascular disease.
Abbreviations: OR, odds ratio; CI, confidence interval.

Furthermore, converting the LE8 score from a continuous variable to a categorical variable revealed more significant results. Participants in the fully adjusted highest group had a 61% (OR=0.39; 95% CI, 0.26–0.57, p <0.0001) lower risk of psoriasis compared to those in the lowest group. The risk of psoriasis in the moderate group was significantly lower than that in the lowest group (OR=0.65;95% CI, 0.49–0.79, p=0.0002). Additionally, smooth curve fitting was used to assess the relationship between the LE8 score and psoriasis, revealing a negative correlation in this study, as depicted in Figure 2.

Subgroup Analysis

In order to further explore the role of confounding factors in the association between the LE8 score and psoriasis, participants were divided into subgroups based on cardiovascular diseases, gender, age, race, education level, marital status, and poverty ratio (Table 3). A statistically significant association was observed only in elderly men of other Hispanic or other race/multiracial race, with education beyond high school, middle income, no cardiovascular disease, and a partner (all p<0.05). However, we did not find any significant interaction between the LE8 score and these potential confounders (all P values of interaction>0.05).

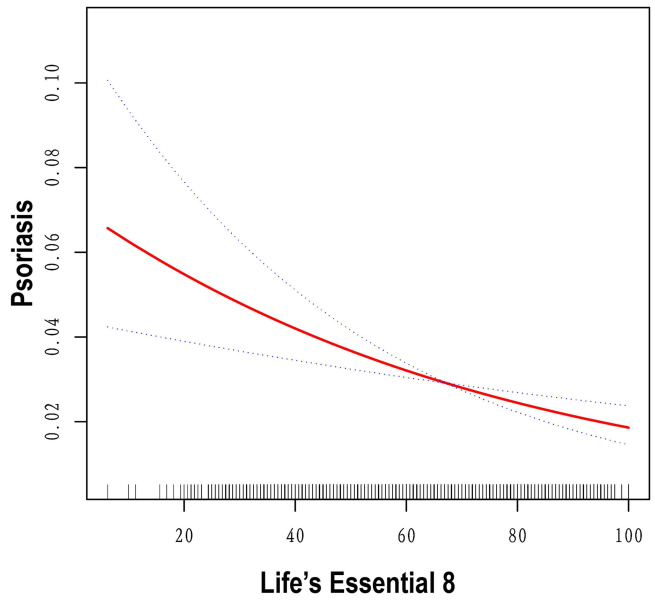

Figure 2 Dose-response relationship between LE8 and psoriasis. A nonlinear association between LE8 and psoriasis was identified using a generalized additive model. The solid red line represents the smooth curve fit between the variables, while the blue bands represent the 95% confidence interval from the fit. All analyses were adjusted for sex, age, race, PIR, education level, marital status, and cardiovascular disease.

Table 3 Subgroup Analysis for the Association Between LE8 and Psoriasis

Subgroup	N	Psoriasis [OR (95% CI)]	P for Interaction
Age			0.6288
20–45	6517	0.989 (0.978, 1.001) 0.0732	
46–60	3586	0.988 (0.975, 1.001) 0.0626	
61–80	3327	0.981 (0.966, 0.995) 0.0089	
Sex			0.2715
Male	6533	0.982 (0.971, 0.993) 0.0018	
Female	6897	0.990 (0.981, 1.000) 0.0534	
Race/Ethnicity			0.2637
Mexican American	1942	0.989 (0.960, 1.019) 0.4727	
Other Hispanic	1095	0.967 (0.940, 0.994) 0.0105	
Non-Hispanic White	6377	0.992 (0.983, 1.002) 0.1230	
Non-Hispanic Black	2720	0.987 (0.966, 1.008) 0.2123	
Other Race/Multiracial	1296	0.971 (0.946, 0.996) 0.0246	
Education level			0.6644
Less than high school	2863	0.983 (0.965, 1.001) 0.0640	
High School Grad or Equivalent	2955	0.992 (0.977, 1.008) 0.3436	
More than high school	7612	0.985 (0.976, 0.994) 0.0019	
Marital status			0.7190
Divorced/separated/widowed	2736	0.986 (0.972, 1.000) 0.0541	
Married/living with a partner	8128	0.984 (0.974, 0.994) 0.0015	
Never married	2566	0.992 (0.975, 1.009) 0.3582	
Poverty ratio			0.2246
<1.3	4147	0.993 (0.980, 1.006) 0.2685	
1.3–3.5	4822	0.978 (0.965, 0.991) 0.0012	
>3.5	4461	0.991 (0.978, 1.005) 0.1997	
Cardiovascular disease			0.3472
Yes	1213	0.995 (0.976, 1.014) 0.5833	
No	12217	0.985 (0.977, 0.993) 0.0004	

Discussion

This cross-sectional study is the first to investigate the association between the LE8 score and the risk of psoriasis in a large, nationally representative sample. The cross-sectional survey revealed a negative correlation between the LE8 score and the likelihood of psoriasis. A higher LE8 score was associated with a lower probability of psoriasis.

The LE8 score was initially developed to assess cardiovascular health, and its role in assessing the relationship between cardiovascular diseases appears to be well-established.[18,19] It is worth mentioning that in recent years, the LE8

score has become increasingly widely used in clinical settings. Some scholars have found that the LE8 score is associated with abdominal aortic calcification and nonalcoholic fatty liver disease.[10,20] However, there are no reports on the relationship between LE8 and psoriasis. Therefore, there is no reason not to explore this relationship. We will explore the relevant reasons from the following aspects.

Firstly, the LE8 score includes four healthy behaviors: diet, physical activity, nicotine exposure, and sleep health. Regarding diet, a study from the French NutriNet-Santé cohort indicated a negative correlation between the Mediterranean diet and the severity of psoriasis.[21] Furthermore, in mouse experiments, the Western diet was found to activate the interleukin-23 (IL-23) signaling pathway, thereby increasing IL-23-stimulated γδ IL-17A production in T cells, which is essential for skin inflammation development.[22,23] Additionally, IL-23 overexpression resulted in reduced microbial diversity and significant dysbiosis in mice fed a Western diet.[24] Interestingly, switching from the Western diet to the standard diet after IL-23 release led to a decrease in skin inflammation and partial reversal of intestinal microbiota.[24] Moreover, Frankel et al discovered that engaging in at least 20.9 MET-hours (equivalent to 105 minutes of running or 180 minutes of swimming or playing tennis) of vigorous exercise per week reduced the risk of psoriasis by 25–30% compared to not engaging in any vigorous exercise.[25] Furthermore, skin lesions are the primary pathological changes in psoriasis, causing itching that typically worsens at night due to reduced sensory thresholds, leading to sleep disturbances.[26,27] This contributes significantly to poor sleep quality in patients with psoriasis. Interestingly, insufficient sleep may also promote the development of psoriasis. Wen Qing Li et al found that the hazard ratio for psoriasis among night shift workers during a 10-year follow-up period was 1.23.[28] Furthermore, smoking is a recognized risk factor for psoriasis. Eun Joo Lee et al demonstrated a positive correlation between the amount of smoking and/or smoking duration and the occurrence of psoriasis.[29]

Additionally, the LE8 score includes four health factors: body mass index, blood lipids, blood glucose, and blood pressure. Obesity is a well-established risk factor for psoriasis. Mechanistic research suggests that this association may be attributed to obesity and endoplasmic reticulum stress in adipocytes, which increase the production of proinflammatory cytokines in adipose tissue. These cytokines enter the bloodstream, triggering inflammation in various tissues, including the skin, and consequently, inducing the development of psoriasis.[30] Metabolic syndrome is characterized by a cluster of conditions including obesity, blood pressure abnormalities, dyslipidemia, and blood glucose abnormalities, all of which have been reported to be associated with psoriasis.[31–33] These findings substantially contribute to understanding the role of LE8 in the development of psoriasis.

Overall, the components of the LE8 score are closely associated with the risk of psoriasis. Thus, using the LE8 score to assess psoriasis is meaningful. Additionally, the LE8 score can serve as a reminder for individuals, particularly those at high risk of psoriasis, to maintain a healthy lifestyle. Our study findings could offer valuable guidance for managing and preventing the risk of psoriasis.

Our study has several notable strengths. Firstly, the data for this study are from the NHANES database, which is representative, publicly available, free, and easy to access. Secondly, we comprehensively evaluated the direct impact of the LE8 score on psoriasis, filling a gap in previous studies. However, the study also has some limitations. Firstly, causality cannot be determined in cross-sectional studies. Secondly, the diagnosis of psoriasis is based on a self-reported questionnaire, which introduces the possibility of recall bias. Thirdly, the NHANES database only contains data from Americans and may not represent the demographic data of other countries. Finally, we cannot draw direct conclusions from the research results, and further prospective studies are needed to confirm these findings.

Conclusion

The LE8 score was negatively correlated with the prevalence of psoriasis in adults. The results emphasize that LE8 can be applied to clinical practice, help patients and the general population to identify the risk of psoriasis as soon as possible, and minimize the disease burden. The causal relationship and exact mechanism between LE8 and psoriasis should be further explored in the future.

Abbreviations

LE8, Life's Essential 8; LE7, Life's Simple 7; OR, odds ratio; CI, confidence interval; PIR, Poverty Income Ratio.

Ethical Approval and Consent to Participate

These studies involving humans have been approved by the Ethics Review Committee of the National Center for Health Statistics. These studies were conducted based on local legislation and institutional requirements. According to national legislation and institutional requirements, participants or their legal guardians/close relatives do not require written informed consent. For detailed information, please visit https://www.cdc.gov/nchs/Nhanes/irba98.htm. In addition, in China, the National Health Commission, the Ministry of education, the Ministry of science and technology and the State Administration of traditional Chinese Medicine published the "life science and medical research involving human beings" in February 2023, which stipulates that "under the premise of using human information data or biological samples, causing no harm to human beings, and not involving sensitive personal information or commercial interests", some cases of life science and medical research involving human beings can be exempted from ethical review. Our research is about the NHANES database and does not involve sensitive personal information or commercial interests, therefore our research is exempt from ethical approval.

Acknowledgments

We thank the staff of the CDC National Center for health statistics for designing, collecting, managing NHANES data and publishing data for public use. We thank all the research participants for their cooperation.

Disclosure

Weiqing Zhang and Zengze Yuan contributed equally to this work and share first authorship. All authors declare no conflicts of interest in this work.

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