rather than sharply demarcated patches with decreased pigmentation.

Alexander M. Cartron, BS,[a,b] Alison M. Treichel, MD,[a,b] Deeti J. Pithadia, MD,[a,b] Joel Moss, MD, PhD,[a] and Thomas N. Darling, MD, PhD[b]

From the Pulmonary Branch, National Heart, Lung, and Blood Institute, National Institutes of Health, Bethesda, Maryland[a]; and Department of Dermatology, Uniformed Services University of the Health Sciences, Bethesda, Maryland[b]

Funding sources: Supported by the Intramural Research Program, National Institutes of Health (NIH), National Heart, Lung, and Blood Institute. This research was also made possible through the NIH Medical Research Scholars Program, a public-private partnership supported jointly by the NIH and generous contributions to the Foundation for the NIH from the Doris Duke Charitable Foundation, the American Association for Dental Research, the Colgate-Palmolive Company, alumni of student research programs, and other individual supporters via contributions to the Foundation for the National Institutes of Health. For a complete list, please visit the Foundation website at http://fnih.org/what-we-do/current-education-and-training-programs/mrsp. The opinions and assertions expressed herein are those of the authors and do not reflect the official policy or position of the Uniformed Services University, the Department of Defense, or the National Institutes of Health.

Conflicts of interest: None disclosed.

IRB approval status: Each study participant provided written informed consent under protocol 96-H-0100, which was approved by the National Heart, Lung, and Blood Institute IRB at the National Institutes of Health.

Correspondence to: Thomas N. Darling, MD, PhD, Department of Dermatology, Uniformed Services University, 4301 Jones Bridge Rd, Bethesda, MD 20814

E-mail: thomas.darling@usuhs.edu

REFERENCES

1. McWilliam RC, Stephenson JB. Depigmented hair. The earliest sign of tuberous sclerosis. *Arch Dis Child*. 1978;53(12):961-963.
2. Kumar P, Brindha S, Manimegalai M, Premalatha S. Tuberous sclerosis with interesting features. *Indian J Dermatol Venereol Leprol*. 1996;62(2):122-124.
3. Thompson KG, Marchitto MC, Ly BCK, Chien AL. Evaluation of physiological, psychological, and lifestyle factors associated with premature hair graying. *Int J Trichology*. 2019;11(4):153-158.
4. Triwongwaranat D, Thuangtong R, Arunkajohnsak S. A review of the etiologies, clinical characteristics, and treatment of canities. *Int J Dermatol*. 2019;58(6):659-666.
5. Orr-Walker BJ, Evans MC, Ames RW, Clearwater JM, Reid IR. Premature hair graying and bone mineral density. *J Clin Endocrinol Metab*. 1997;82(11):3580-3583.

https://doi.org/10.1016/j.jaad.2020.05.038

Association between psoriasis and risk of dementia: A systematic review and meta-analysis

To the Editor: Psoriasis is a chronic inflammatory skin condition associated with psychiatric and neurologic disorders,[1] including dementia. Although the etiology of many dementias are poorly understood, neuroinflammation and vasculopathy are hypothesized to play a role. We conducted a systematic review and meta-analysis to better characterize the association between psoriasis and dementia.

We registered a protocol in PROSPERO (CRD42020166789). We searched MEDLINE and Embase on January 25, 2020, using key terms for dementia and psoriasis (the search strategy is provided in Supplemental Tables I and II; available via Mendeley at https://doi.org/10.17632/h5j8yrksch.2). We included cross-sectional, case-control, and cohort studies examining the incidence or prevalence of dementia among adults with psoriasis compared to adults without psoriasis. Case reports, abstracts, and review articles were excluded. Risk of bias in individual studies was assessed using the Newcastle-Ottawa scale.[2] Random-effects meta-analyses using pooled hazard ratios (HRs) were performed. The I^2 statistic was used to assess heterogeneity across studies. A funnel plot was used to evaluate potential publication bias. Analyses were conducted using Review Manager, version 5.3 (The Nordic Cochrane Centre, Copenhagen, Denmark).

A total of 8 articles met our eligibility criteria and were included in the qualitative synthesis (Supplemental Fig 1, available via Mendeley at https://doi.org/10.17632/h5j8yrksch.2; Table I, citations of included studies removed due to journal citation constraints and are available from the authors upon request). The mean ages of participants with psoriasis and control individuals were 59.7 and 47.9 years, respectively.

Four studies reported effect measures for the association between dementia and psoriasis and were included in quantitative analyses. Three studies

Table I. Participant characteristics from the included studies

Study	Study design	Number of participants		% Female		Age, y, mean (SD)		Confounders adjusted for
		Psoriasis	Control	Psoriasis	Control	Psoriasis	Control	
Study 1	Cohort	3603	14,330	51.4	59.6	52.19 (16.71)	49.73 (19.33)	Age, sex
Study 2	Cross-sectional	149	—	51.0	—	>70	—	—
Study 3	Cohort	3820	15,280	36.4	36.4	≥40	≥40	Sex, age, level of urbanization of residence, hypertension, heart disease, diabetes, hyperlipidemia, stroke, depression
Study 4	Cohort	13,675	141,040	49.6	49.5	—	—	Birth year and sex
Study 5	Cross-sectional	188,089	86,865,066	47.6	58.6	59.88 (16.8)	47.89 (28.00)	Age, sex, race/ethnicity, and insurance status
Study 6	Cohort	318*	9678	55.6	58.3	66.86 (8.89)	66.10 (10.87)	Age, sex, education
Study 7	Case control	48	44	35.4	35.4	42.92 (12.20)	39.98 (11.45)	—
Study 8	Cohort	—	—	44.7	—	56.5	—	Age strata

SD, Standard deviation.
Citations of included studies removed due to journal citation constraints and are available from the authors upon request.
*A total of 311 were followed for incident dementia.

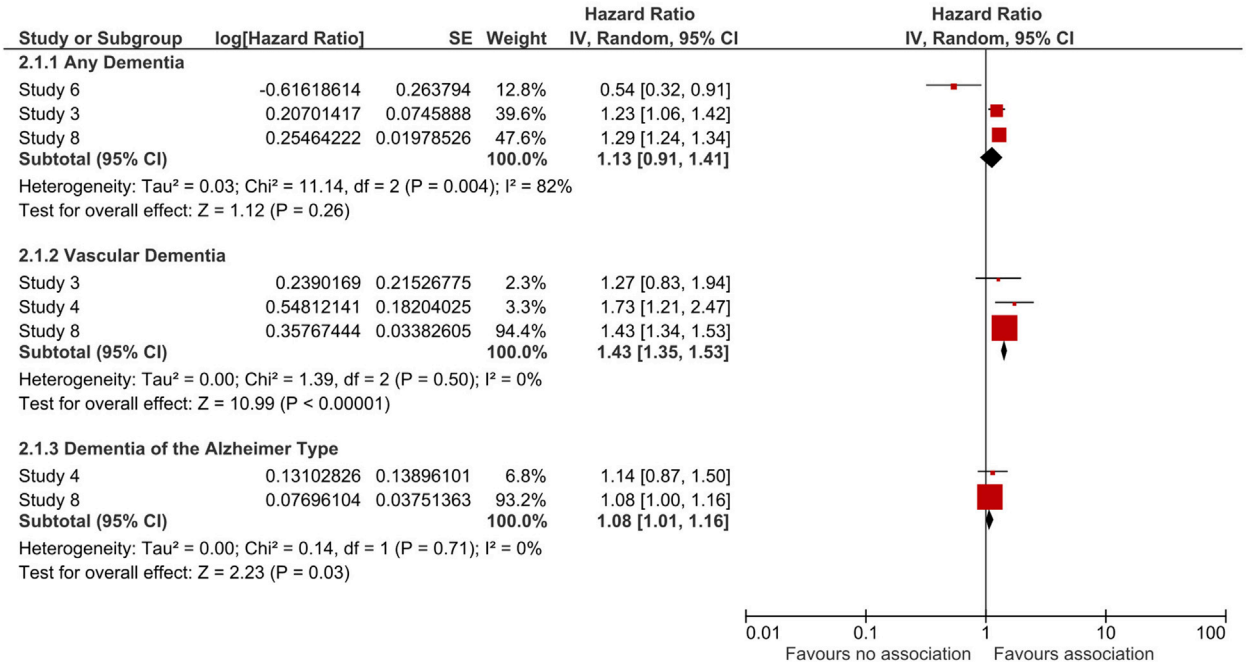

Fig 1. Random-effects meta-analysis of the association of dementia and psoriasis in cohort studies.

examined the association between any dementia and psoriasis with a pooled HR of 1.13 (95% confidence interval [CI], 0.91-1.41) and with substantial heterogeneity across the 3 studies (I^2 = 82%) (Fig 1). One of the included studies (study 6) found a negative association; in a sensitivity analysis where this study was removed to explore sources of heterogeneity, the pooled HR increased to 1.29 (95% CI, 1.24-1.34), and I^2 was reduced to 0% (Supplementary Fig 2). A significant association was found between vascular dementia and psoriasis, with a pooled HR of 1.43 (95% CI, 1.35-1.53; $I^2 = 0\%$). Dementia of the Alzheimer type was also found to have a significant, but more modest, association with psoriasis (HR, 1.08; 95% CI, 1.01-1.16; $I^2 = 0\%$) (Fig 1).

Vasculopathy associated with psoriasis, including arterial stiffness and impaired endothelial function, may predispose patients with psoriasis to dementia, particularly vascular dementia.[3] Oxidative stress and proinflammatory cytokines, which are elevated in patients with psoriasis, may impair neurogenesis and synaptic plasticity, promoting neurodegenerative processes and contributing to cognitive decline.[4] Individuals with psoriasis have been reported to have deficiencies in executive functioning, suggesting some involvement of the prefrontal cortex.[5]

Our systematic review was limited by the small number of studies included in our meta-analysis. Although these studies were all cohort studies, substantial heterogeneity was found in the pooled analysis for overall dementia, making firm conclusions difficult.

In conclusion, our findings support an association between psoriasis and vascular dementia, with more modest associations with other dementias. More research is needed to understand the impacts of psoriatic inflammation and associated predisposition to vascular disease on dementia risk and cognition.

We would like to thank the staff and research consultation team at McMaster University, Health Sciences Library, for their assistance with development of the search strategy.

Megan Lam, BSc,[a] Reza Khorvash,[b] and Aaron M. Drucker, MD, ScM[c,d]

From the Michael G. DeGroote School of Medicine, Faculty of Medicine, Hamilton, Ontario, Canada[a]; Faculty of Science, McMaster University, Hamilton, Ontario, Canada[b]; Division of Dermatology, University of Toronto, Toronto, Ontario, Canada[c]; and Women's College Research Institute, Women's College Hospital, Toronto, Ontario, Canada.[d]

Funding sources: None.

Disclosure: In the last 3 years, Dr Drucker has been a consultant for Sanofi, RTI Health Solutions, Eczema Society of Canada, and Canadian Agency for Drugs and Technology in Health and has received honoraria from Prime Inc, CME Outfitters, and Eczema Society of Canada, and his institution has received educational grants from Sanofi and research grants from Sanofi and Regeneron; none are relevant to this article. Authors Lam and Khorvash have no conflicts of interest to declare.

IRB approval status: Not applicable.

Reprints not available from the authors.

Correspondence to: Aaron M. Drucker, MD, ScM, Division of Dermatology, Women's College Hospital, 76 Grenville St, Toronto, ON M5S1B2, Canada

E-mail: aaron.drucker@wchospital.ca

REFERENCES

1. Amanat M, Salehi M, Rezaei N. Neurological and psychiatric disorders in psoriasis. *Rev Neurosci*. 2018;29(7):805-813.
2. Wells GA, Shea B, O'Connell D. *The Newcastle-Ottawa Scale (NOS) for Assessing the Quality of Non-randomized Studies in Meta-analysis*. Ottawa, ON, Canada: Ottawa Health Research Institute; 2019.
3. Yiu KH, Yeung CK, Chan HT, et al. Increased arterial stiffness in patients with psoriasis is associated with active systemic inflammation. *Br J Dermatol*. 2011;164(3):514-520.
4. Maes M, Yirmyia R, Noraberg J, Brene S, Hibbeln J, Perini G. The inflammatory & neurodegenerative (I & ND) hypothesis of depression: leads for future research and new drug developments in depression. *Metab Brain Dis*. 2009;24:27-53.
5. Colgecen E, Celikbilek A, Keskin DT. Cognitive impairment in patients with psoriasis: a cross-sectional study using the Montreal cognitive assessment. *Am J Clin Dermatol*. 2016;17(4):413-419.

https://doi.org/10.1016/j.jaad.2020.05.091

Ethnic variations in scalp pruritus and hair loss

To the Editor: Scalp pruritus is a common dermatologic problem that significantly affects patients' quality of life. The multifactorial etiology and limited understanding of scalp pruritus poses significant diagnostic and therapeutic challenges for clinicians.[1-3] This cross-sectional study aims to evaluate the prevalence of and risk factors for scalp pruritus in a general dermatology population, with secondary interests in scalp dysesthesia (eg, tingling, pain, burning) and hair loss.

Anonymized 22-question surveys were collected sequentially from patients attending an outpatient general dermatology clinic at Barnes Jewish Hospital in St Louis, Missouri, from April 2016 through September 2016. The questionnaire assessed demographics, presence of scalp pruritus and associated symptoms, hair care practices, and medical comorbidities. Baseline comparisons of characteristics stratified by presence of scalp pruritus were tested using the chi-square test for categorical variables and analysis of variance for continuous variables (Table I). Ethnic variation in scalp pruritus, dysesthesia, and hair loss were assessed by using multivariate logistic regression models (Table II) and