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Letter to the Editor

Association of dietary magnesium intake and magnesium depletion score with psoriasis among US adults: A cross-sectional NHANES study

Dear editor,

Psoriasis is a chronic systemic inflammatory disorder that clinically manifests as erythematous plaques covered silvery scales[1–2]. Magnesium is an essential mineral nutrient, serving as a crucial cofactor for hundreds of enzymatic reactions. It is fundamental to energy metabolism, protein and DNA synthesis, nerve transmission, muscle function, and blood glucose regulation[3]. Low levels of magnesium have been associated with numerous chronic diseases, including Alzheimer's disease, insulin resistance, and type-2 diabetes mellitus[4]. However, the epidemiological link between magnesium and psoriasis remains unclear, partly because serum magnesium levels do not accurately reflect cellular deficiency. To circumvent the limitations of serum measurements, Fan and colleagues developed the Magnesium Depletion Score (MDS)[5], a composite score that assesses the risk of magnesium deficiency by evaluating factors that impair kidney reabsorption. This study investigates the association between MDS, dietary magnesium intake, and psoriasis risk, an aspect that has not been previously explored.

Data from the National Health and Nutrition Examination Survey (NHANES) cycles 2003–2006 and 2009–2014 were analyzed (https://www.cdc.gov/nchs/nhanes/). The MDS consists of[5]: (1) current diuretic use (1 point); (2) current proton pump inhibitor use (1 point); (3) renal function (1 point for eGFR 60–<90 mL/min/1.73 m^2 and 2 points for eGFR <60 mL/min/1.73 m^2); and (4) heavy alcohol consumption (1 point), defined as more than one drink per day for females or more than two drinks per day for males. In this study, MDS values were categorized into four groups: Q1 (MDS = 0), Q2 (MDS = 1), Q3 (MDS = 2), and Q4 (MDS ⩾ 3), consistent with previous methods[6]. Dietary magnesium intake was calculated as the mean of two 24-hour dietary recall interviews. Covariates included sociodemographic and health behavioral characteristics. For normally distributed continuous variables, data were presented as mean ± standard deviation (SD) and analyzed using Student's *t*-tests; for categorical variables, data were expressed as frequencies and percentages and analyzed using Chi-square tests. Associations between dietary magnesium intake, MDS, and psoriasis were evaluated using multivariable logistic regression. Restricted cubic splines (RCS) were employed to investigate potential nonlinear relationships between dietary magnesium intake, MDS, and psoriasis. Subgroup analyses were conducted to identify factors influencing the association between MDS and psoriasis. All analyses were performed using R (version 4.4.1), with $P < 0.05$ considered statistically significant.

The analysis included 17 823 participants —511 cases of psoriasis and 17 312 controls —drawn from the NHANES data for the years 2003–2006 and 2009–2014. Psoriasis cases showed a significantly higher prevalence in the highest MDS quartile compared with controls (Q4: 8.00% *vs* 4.81%; $P < 0.001$), whereas dietary magnesium intake did not differ significantly between the two groups (***Table 1***). When the MDS was categorized into four groups, with Q1 serving as the reference, Q4 exhibited a dose-dependent increase in risk within the fully adjusted model (odds ratio[OR]=1.97; 95% confidence interval[CI]: 1.14–3.45; P =0.046; ***Supplementary***

△These authors contributed equally to this work.

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Table 1 **Demographics and characteristics of participants from NHANES 2003–2006 and 2009–2014.**

Characteristic[a]	Total (*n* = 17 823)	Non-Psoriasis (*n* = 17 312)	Psoriasis (*n* = 511)	*P*
Age (year)				0.096
[20,40) years	6 693 (40.10%)	6 534 (40.30%)	159 (33.96%)	
[40,60) years	6 867 (42.25%)	6 655 (42.20%)	212 (43.90%)	
≥60 years	4 263 (17.65%)	4 123 (17.50%)	140 (22.13%)	
Sex				0.203
Female	9 102 (50.89%)	8 833 (51.01%)	269 (47.47%)	
Male	8 721 (49.11%)	8 479 (48.99%)	242 (52.53%)	
Race				<0.001
White	8 257 (68.71%)	7 942 (68.32%)	315 (80.46%)	
Black	3 674 (11.13%)	3 607 (11.30%)	67 (6.01%)	
Other race	5 892 (20.16%)	5 763 (20.38%)	129 (13.53%)	
Education				0.262
Under high school	1 556 (4.53%)	1 528 (4.58%)	28 (3.02%)	
High school	2 501 (10.59%)	2 436 (10.63%)	65 (9.34%)	
Over high school	13 766 (84.88%)	13 348 (84.79%)	418 (87.65%)	
BMI (kg/m^2)				0.193
Normal	5 270 (31.74%)	5 152 (31.92%)	118 (26.20%)	
Overweight	5 862 (32.90%)	5 692 (32.82%)	170 (35.43%)	
Obese	6 691 (35.36%)	6 468 (35.26%)	223 (38.37%)	
Smoke				<0.001
Never smoker	9 866 (54.99%)	9 641 (55.43%)	225 (41.74%)	
Former smoker	4 063 (23.17%)	3 893 (22.71%)	170 (37.01%)	
Current smoker	3 894 (21.85%)	3 778 (21.87%)	116 (21.25%)	
Alcohol				0.287
No	15 675 (84.97%)	15 233 (85.04%)	442 (82.61%)	
Yes	2 148 (15.03%)	2 079 (14.96%)	69 (17.39%)	
Diabetes				0.149
No	15 041 (88.86%)	14 630 (88.95%)	411 (86.04%)	
Yes	2 782 (11.14%)	2 682 (11.05%)	100 (13.96%)	
Dietary Magnesium (mg)	282.50 ± 135.22	282.00 ± 135.72	297.00 ± 129.10	0.052
MDS_Q				<0.001
Q1	8 566 (46.21%)	8 374 (46.65%)	192 (32.99%)	
Q2	5 820 (35.63%)	5 628 (35.34%)	192 (44.47%)	
Q3	2 373 (13.24%)	2 290 (13.19%)	83 (14.54%)	
Q4	1 064 (4.92%)	1 020 (4.81%)	44 (8.00%)	

[a]Continuous variables are reported as mean ± standard deviation, and categorical variables are expressed as n (weighted %). *P* <0.05 is considered statistically significant. For MDS_Q, Q1 indicates MDS = 0, Q2 indicates MDS = 1, Q3 indicates MDS = 2, and Q4 indicates MDS ≥ 3.
Abbreviations: BMI, body mass index; MDS, magnesium depletion score.

Table 1). The RCS analysis confirmed a nonlinear dose-response relationship (*P* for nonlinearity = 0.007; ***Fig. 1***). The identified inflection point occurred at an MDS of 2.82, indicating that individuals within the highest MDS quartile had a significantly elevated risk of psoriasis. Subgroup analyses further assessed the robustness of these findings. Notably, a significantly higher risk of psoriasis was observed among

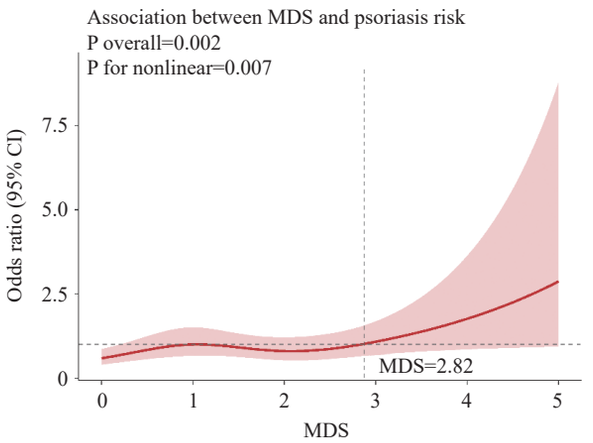

Fig. 1 **Nonlinear association between MDS and psoriasis risk.** The figure presents the results of an RCS analysis investigating the relationship between MDS and the risk of psoriasis. Abbreviations: MDS, Magnesium depletion score; RCS, restricted cubic spline.

individuals aged 20–40 years, females, and participants with a normal BMI (***Fig. 2***). Additionally, interaction analysis suggested that race/ethnicity may significantly modify the association between MDS and psoriasis risk (*P* for interaction = 0.02).

This study demonstrates a significant association between systemic magnesium deficiency and psoriasis risk, with MDS_Q4 conferring nearly twice the odds versus MDS_Q1. However, dietary magnesium intake showed no significant protective effect against psoriasis. These findings underscore the complexity of assessing magnesium status. Our dietary findings do not dispute the recognized importance of magnesium intake; rather, they underscore the limitations of depending solely on dietary intake as a proxy for physiologically significant systemic magnesium status. Dietary assessments might overlook critical factors that affect bioavailability, absorption, and utilization. Magnesium is crucial for immune regulation; its deficiency promotes a pro-inflammatory state involving elevated IL-6, TNF-α,

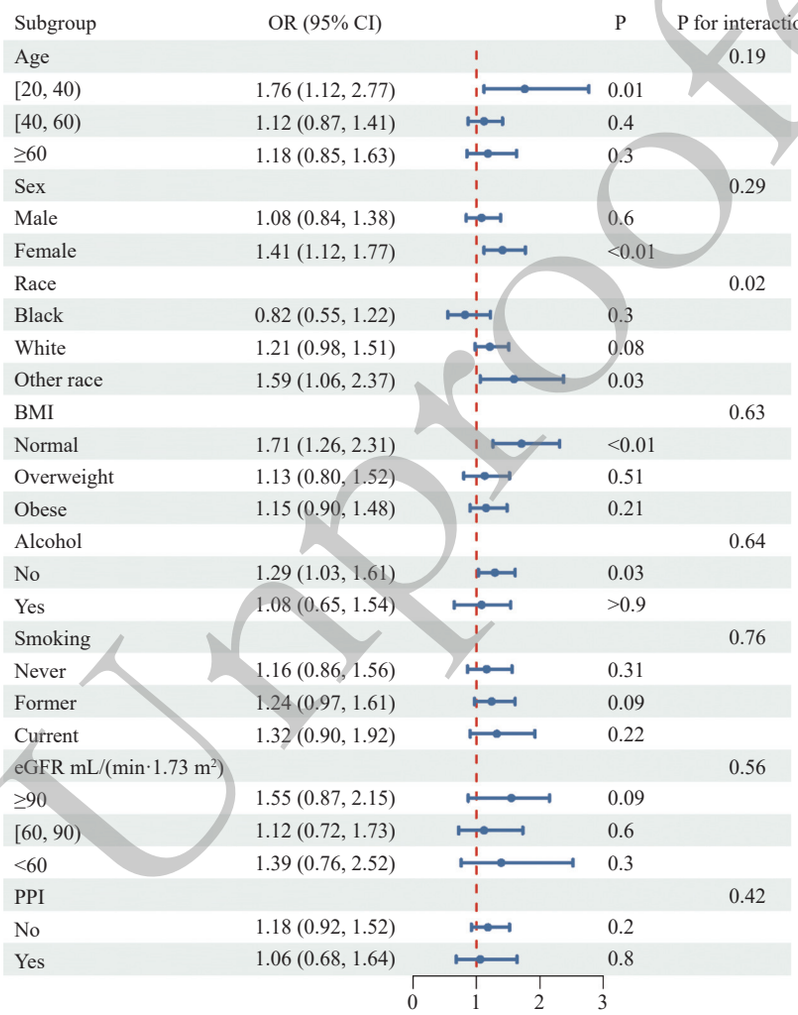

Fig. 2 **Subgroup analyses and interaction effects of the association between MDS and psoriasis risk.** This chart presents the results of subgroup analysis and interaction test, aiming to explore the influence of different factors on the association between MDS and the risk of psoriasis. Abbreviation: MDS, Magnesium depletion score.

and NF-κB activation[7]—key pathways in psoriasis pathogenesis. Additionally, magnesium deficiency may exacerbate oxidative stress, which mediates inflammatory responses in psoriasis[8]. The strong correlation between MDS and psoriasis indicates that MDS could serve as an effective clinical screening tool for identifying individuals at higher risk for psoriasis due to magnesium deficiency. Its comprehensive approach, which integrates dietary, clinical, and metabolic factors, likely provides greater clinical utility than isolated dietary assessment alone. However, several limitations should be acknowledged. First, the cross-sectional design precludes causal inference and cannot establish the direction of observed associations. Reverse causality remains a possibility; for instance, medications commonly used to treat psoriasis (*e.g.*, methotrexate) may themselves alter renal magnesium handling and influence serum levels. Second, dietary magnesium assessment relied on only two 24-hour recalls, which risks recall bias. Third, unmeasured or residual confounding factors cannot be ruled out. Future prospective and intervention studies are warranted to determine if magnesium supplementation mitigates psoriasis development or activity, particularly in individuals identified as deficient through tools like the MDS.

Yours sincerely,

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Additional information

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References

[1] Walter K. Psoriasis[J]. *JAMA*, 2022, 327(19): 1936.

[2] Deng L, Gao Y, Zhang C, et al. Association between serum 25(OH)D and cancer in adults with psoriasis: A cross-sectional study[J]. *J Biomed Res*, 2025: 1–4. **(I searched online and couldn't find the corresponding issue page information. Please confirm)**

[3] Gröber U, Schmidt J, Kisters K. Magnesium in prevention and therapy[J]. *Nutrients*, 2015, 7(9): 8199–8226.

[4] Pickering G, Mazur A, Trousselard M, et al. Magnesium status and stress: The vicious circle concept revisited[J]. *Nutrients*, 2020, 12(12): 3672.

[5] Fan L, Zhu X, Rosanoff A, et al. Magnesium depletion score (MDS) predicts risk of systemic inflammation and cardiovascular mortality among US adults[J]. *J Nutr*, 2021, 151(8): 2226–2235.

[6] Ye L, Zhang C, Duan Q, et al. Association of magnesium depletion score with cardiovascular disease and its association with longitudinal mortality in patients with cardiovascular disease[J]. *J Am Heart Assoc*, 2023, 12(18): e030077.

[7] Laragione T, Harris C, Azizgolshani N, et al. Magnesium increases numbers of Foxp3+ Treg cells and reduces arthritis severity and joint damage in an IL-10-dependent manner mediated by the intestinal microbiome[J]. *eBioMedicine*, 2023, 92: 104603.

[8] Cazzola R, Della Porta M, Piuri G, et al. Magnesium: A defense line to mitigate inflammation and oxidative stress in adipose tissue[J]. *Antioxidants*, 2024, 13(8): 893.