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Rotating night shift work and risk of psoriasis in US women

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Keywords

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Rotating night shift work causes chronic circadian misalignment between endogenous circadian timing system and behavioral cycles and suppresses the secretion of melatonin (James et al., 2007; Scheer et al., 2009). Melatonin has been found to regulate inflammatory response and have anti-oxidant effects (Bonnefont-Rousselot and Collin, 2010; Ochoa et al., 2011), which may thereby protect against psoriasis. One prior study showed that psoriatics had reduced plasma melatonin (Mozzanica et al., 1988). A growing body of literature provides evidence linking night shift work with various health conditions, including psoriasis co-morbidities such as coronary heart disease and type 2 diabetes (Gelfand et al., 2006; Kawachi et al., 1995; Li et al., 2012a; Pan et al., 2011). However, no direct evidence of an association between night shift work and psoriasis is available. Here we evaluated the association between rotating night shift work and incident risk of psoriasis in two large, prospective cohort studies, the Nurses' Health study (NHS) (1988–2008) and NHS II (1989–2005).

Details on the cohorts and ascertainment of psoriasis have been described previously (Li et al., 2012a). Participants responded to clinician-diagnosed psoriasis in the 2008 (NHS) or 2005 (NHS II) questionnaires with high validity. Participants were asked about lifetime years working rotating night shifts in the 1988 (NHS) and 1989 (NHS II) questionnaires. We classified participants into two major categories: never or ever working rotating night shifts. The participants were further categorized by the duration of shift work: 1–2, 3–9, or ≥10 years. Information on covariates was collected from the questionnaires biennially. From the responders to the follow-up beginning and ending questionnaires, we excluded psoriasis incidentcases, unknown diagnosis date, and unknown status of night shift work: 62,487 in NHS and 95,561 in NHS II remained in the analysis.

We calculated person-years of follow-up for each participant from the return date of 1988 (NHS) or 1989 (NHS II) questionnaire to the date of diagnosis of psoriasis, or the end of follow-up (June 2008 for NHS and June 2005 for NHS II), whichever came first. Time-dependent Cox proportional hazards models adjusting for 2-year time intervals were used to estimate the hazard ratios (HR) and 95% confidence interval (CI) of developing psoriasis in

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night shift workers, adjusting for age, body mass index (BMI), smoking, alcohol intake, and physical activity. The time-varying covariates were updated in the analysis. For the combined analysis, we tested the between-studies heterogeneity and estimated the overall association using meta-analysis. The institutional review board of Brigham and Women's Hospital approved this study.

In NHS, 58.8% reported ever working rotating night shifts for at least one year, with 10.9% reporting ≥10 years of rotating night shift work. In NHS II, 61.6% reported ever working rotating night shifts, with 4.5% for ≥10 years. In both cohorts, those ever working rotating night shifts tended to have a higher BMI and were more likely to be physically active or current smokers (Table 1). Overall 1,887 incident psoriasis cases were identified during follow-up. Compared with those who reported no night shift work, those ever working rotating night shifts at baseline had a significantly increased risk of psoriasis. The multivariate-adjusted HR (95% CI) was 1.26 (1.09–1.47) in NHS, 1.14 (1.01–1.28) in NHS II, and 1.19 (1.07–1.32) in combined cohorts. We evaluated the risk of psoriasis by duration of rotating night shift work, and the multivariate-adjusted HRs (95% CIs) in the combined cohorts were 1.20 (1.07–1.34), 1.17 (1.00–1.38), and 1.23 (1.03–1.47) for 1–2, 3–9, and ≥10 years of working rotating night shifts, respectively (Table 2). Further adjustments by parity, postmenopausal hormone use, depression, personal history of psoriasis co-morbidities, as well as sleep and snore frequency (only for NHS) did not appreciably change the results.

Night shift work has been associated with an increased risk of psoriasis co-morbidities, with the major underlying mechanism postulated to be exposure to light during the night leading to disrupted circadian rhythm and decreased melatonin synthesis (Scheer et al., 2009). Melatonin also has potent antioxidant properties (Bonnefont-Rousselot and Collin, 2010; Ochoa et al., 2011). Night shift workers may therefore have increased risk of psoriasis via the diminished ability of the pineal gland to produce melatonin. Another potential explanation may point to vitamin D deficiencies in night workers, with a prior study demonstrating a significantly lower vitamin D levels associated with night work (Ward et al., 2011), while vitamin D derivatives are part of standard treatment in psoriasis as well as psoriatic arthritis (Bailey et al., 2011). Because we were unable to control for exposure to sunlight or vitamin D levels, confounding by vitamin D cannot be ruled out.

An increased risk of psoriasis associated with working shifts may also be partly due to other behavioral risk factors. Those working with a rotating night shift schedule tended to have a higher BMI and were more likely to smoke. Results remained significant, however, after adjusting for these two major psoriasis risk factors (Li et al., 2012b; Setty et al., 2007). Given the strong associations among obesity, weight gain, and psoriasis (Setty et al., 2007), a healthy diet could have beneficial effects on psoriasis. The temporal distribution of eating may be affected by shift work (Lowden et al., 2010), but one recent study did not support differences in total energy intake and dietary score between daytime and shift workers (Pan et al., 2011). We did not observe marked changes in the effect estimation after additional adjustments to the sensitivity analysis. Nonetheless, an observational study cannot rule out the role of other unfavorable changes in health behaviors among rotating night shift workers in explaining the observed association.

Approximately 8.6 million Americans perform shift work. Our prospective analysis identified an association between rotating night shift work and an increased risk of psoriasis, indicating a long-term effect of the baseline -working night shifts, which may help to increase the awareness of psoriasis risk among people who work rotating shifts. Our participants are overwhelmingly white female nurses; therefore any extrapolation to other populations should be made with caution

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Abbreviation

BMI	body mass index
CI	confidence interval
NHS	Nurses' Health Study
NHS II	Nurses' Health Study II
RR	relative risk

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Table 1

Age-standardized baseline characteristics of the study participants by status of working rotating night shifts: Nurses' Health Study (1988) and Nurses' Health Study II (1989)[1].

Characteristics	Nurses' Health Study working rotating night shifts			Nurses' Health Study II working rotating night shifts		
	Never n=25,765	Ever n=36,722	*P*[3]	Never n=36,660	Ever n=58,901	*P*[3]
Age [2], mean (SD), year	52.8 (6.9)	53.5 (6.9)	<0.0001	34.4 (4.7)	34.5 (4.6)	0.45
Body mass index, kg/m^2, mean (SD)	25.1 (4.6)	25.6 (4.8)	<0.0001	23.8 (4.8)	24.1 (5.0)	<0.0001
Current smokers (yes, %)	14.5	16.2	<0.0001	12.6	14.2	<0.0001
Alcohol intake, g/d, mean (SD)	6.0 (10.1)	6.0 (10.3)	0.43	3.0 (6.1)	3.2 (6.1)	<0.0001
Physical activity, metabolic equivalent hours/wk, mean (SD)	14.9 (21.0)	16.3 (22.5)	<0.0001	19.4 (25.1)	21.6 (27.7)	<0.0001

[1] Values are means (SD) or percentages and are standardized to the age distribution of the study population.

[2] Value is not age adjusted.

[3] *P* values are calculated by t-test or χ^2 test.

Table 2

Relative risk of psoriasis by baseline status of working rotating night shifts: Nurses' Health Study (1988–2008) and Nurses' Health Study II (1989–2005)

	Cases	Person-years	Age-adjusted HR (95% CI)	Multivariate-adjusted HR [1] (95% CI)
Nurses' Health Study	743	1,237,934		
Never	258	510,681	1.00	1.00
Ever	485	727,253	1.32 (1.13–1.53)	1.26 (1.09–1.47)
1–2 years	193	307,126	1.24 (1.03–1.50)	1.24 (1.03–1.49)
3–9 years	195	285,560	1.35 (1.12–1.62)	1.28 (1.07–1.55)
≥10 years	97	134,567	1.41 (1.12–1.79)	1.29 (1.02–1.64)
P for trend			0.0009	0.01
Nurses' Health Study II	1,144	1,483,567		
Never	397	569,814	1.00	1.00
Ever	747	913,753	1.17 (1.04–1.32)	1.14 (1.01–1.28)
1–2 years	357	432,809	1.18 (1.02–1.36)	1.18 (1.02–1.36)
3–9 years	328	414,435	1.14 (0.98–1.32)	1.09 (0.94–1.26)
≥10 years	62	66,509	1.30 (0.99–1.70)	1.14 (0.87–1.50)
P for trend			0.067	0.42
Nurses' Health Study/Nurses' Health Study II				
Never	655	1,080,495	1.00	1.00
Ever	1,232	1,641,006	1.23 (1.10–1.38)	1.19 (1.07–1.32)
1–2 years	550	739,935	1.20 (1.07–1.35)	1.20 (1.07–1.34)
3–9 years	523	699,995	1.23 (1.04–1.45)	1.17 (1.00–1.38)
≥10 years	159	201,076	1.29 (1.08–1.53)	1.23 (1.03–1.47)
P for trend			0.001	0.049

Abbreviations: CI, confidence interval; HR, Hazard ratio.

[1]Adjusted for age (in continuous variable), body mass index (<21, 21–22.9, 23–24.9, 25–26.9, 27.0–29.9, 30.0–32.9, 33–34.9, ≥35 kg/m^2), smoking (never, past, current with 1–14, 15–24, ≥25 cigs/day), alcohol intake (no, <4.9, 5.0–9.9, or ≥10.0 g/d), and physical activity (<3, 3.0–8.9, 9.0–17.9, 18.0–26.9 or ≥27.0 metabolic equivalent hours/wk). The covariates were time varying and updated in the analysis.