Published in final edited form as:

Int J Dermatol. 2015 November ; 54(11): e492–e495. doi:10.1111/ijd.12904.

Sleep Duration and Sleep Disordered Breathing and the Risk of Melanoma Among US Women and Men

J.M. Cohen, B.A.¹, Y.T. Li, M.S.², S. Wu, Ph.D.³, J. Han, Ph.D.^{2,4,5,6}, A.A. Qureshi, M.D., M.P.H.^{2,3}, and E. Cho, Sc.D.^{2,3}

¹Harvard Medical School, Boston, MA

²The Channing Division of Network Medicine, Department of Medicine, Brigham and Women's Hospital, Boston, MA

³Department of Dermatology, Warren Alpert Medical School, Brown University, Providence, RI

⁴Department of Epidemiology, Richard M. Fairbanks School of Public Health, Indiana University, Indianapolis, IN

⁵Melvin and Bren Simon Cancer Center, Indiana University, Indianapolis, IN

⁶Department of Dermatology, School of Medicine, Indiana University, Indianapolis, IN

Melanoma is among the leading causes of cancer incidence and mortality, and death rates are rising ^{1,2}. Long and short sleep duration and sleep disordered breathing (SDB)—snoring and obstructive sleep apnea (OSA)—have been shown to negatively impact health ³⁻¹². In this study, we evaluated the association between sleep duration and SDB and the risk of incident melanoma in three prospective cohorts of US women (Nurses' Health Study (NHS) and NHS II) and men (Health Professionals Follow-Up Study (HPFS)).

The NHS is a study of female registered nurses that started in 1976 ¹⁴. The NHS II is a study of younger women that began in 1989 ⁶. The HPFS is a study of male health professionals that started in 1986 ¹³. Participants receive questionnaires every two years. Average sleep duration in a 24 hour period, snoring, and physician-diagnosed melanoma were asked multiple times in the studies. Physician-diagnosed OSA was asked in the NHS in 2008. Sleep duration and snoring data from the NHS and NHS II were pooled together. HPFS data was analyzed separately, as estrogen may be involved in melanoma pathogenesis ¹⁴.

Relative risks (RRs) and 95% confidence intervals of incident melanoma associated with sleep duration and SDB were estimated using Cox proportional hazards models adjusting for age, hair color, number of moles, reaction to the sun, tanning, UV flux, snoring, and history of night shift work. This study was approved by the Institutional Review Boards of Partners Health Care and Harvard School of Public Health.

Address Correspondence To: Eunyoung Cho, Sc.D., Associate Professor, Department of Dermatology, Warren Alpert Medical School, Brown University, 339 Eddy Street, Providence, RI 02903, Associate Epidemiologist, Channing Division of Network Medicine, Department of Medicine, Brigham and Women's Hospital, 181 Longwood Avenue, Boston, MA 02115, eunyoung.cho@channing.harvard.edu, Phone: 617-525-2089, Fax: 617-525-2008.

Conflict of Interest Disclosures: Dr. Qureshi serves as a consultant for Abbvie, Amgen, the Centers for Disease Control, Janssen, Merck, Novartis, and Pfizer and is an investigator for Amgen. Mr. Cohen, Dr. Cho, Ms. Li, and Dr. Wu have no financial disclosures.

During 2,301,445 person-years of follow-up, we documented 880 incident invasive melanoma cases. In the NHS, shift workers were more likely to sleep 6 hours per night and in the NHS and NHS II there were more snorers in the sleep category of 9 hours than any of the other categories. Otherwise, there were no notable trends among different sleep duration categories (Table 1).

In the three cohorts, there was no apparent clear relationship between sleep duration and risk of melanoma (Table 2). In the NHS and NHS II, the multivariate RRs for incident melanoma were 0.90 (0.67-1.20) for women sleeping 6 hours, 1.30 (1.08-1.56) for 8 hours, and 0.76 (0.51-1.12) for 9 hours (p trend=0.09). In the HPFS, the multivariate RRs were 1.08 (0.77-1.51) for men sleeping 6 hours, 0.95 (0.69-1.30) for 8 hours, and 1.06 (0.68-1.67) for 9 hours (p trend=0.71). There was no association between melanoma and OSA in the NHS or snoring in the three cohorts (Tables S1, S2).

Melatonin, an indolamine regulator of circadian rhythms, has anticancer effects and has been found to have antitumor effects in melanoma cell lines^{15,16}. In normal skin, melatonin has antioxidant properties¹⁶. In melanoma, melatonin can potentiate the oncostatic effects of interleukin-2¹⁶. Our results suggest that dysregulation of melatonin associated with long and short sleep duration and SDB either have no effect on melanoma risk or have an effect that we were not able to detect, possibly due to a limited number of melanoma cases, especially among those with 9 hours of sleep.

Our study is limited by the possibility of misclassification of self-reported sleep duration and snoring information. However, previous studies using the same data on sleep duration and snoring found associations with other diseases^{12,13,18}. Also, our study population was comprised of Caucasian women, which may limit the generalizability of our findings¹⁹.

In conclusion, in the evaluation of three large cohort studies to prospectively assess the association between sleep duration and SDB and risk of melanoma, we found no relationship between sleep duration and SDB and melanoma risk.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

We are deeply indebted to the participants and staff of the Nurses' Health Study, Nurses' Health Study II, and Health Professionals Follow-Up Study for their valuable contributions. This work was funded by the American Skin Association Medical Student Grant Targeting Melanoma and Skin Cancer Research (JMC), the Department of Dermatology, Brigham and Women's Hospital, Boston, Massachusetts and NIH grants CA87969 (NHS), CA50385 (NHS II), and CA167552 (HPFS).

References

1. Siegel R, Ma J, Zou Z, Jemal A. Cancer statistics, 2014. *CA Cancer J Clin.* 2014; 64:9–29. [PubMed: 24399786]
2. Jemal A, Simard EP, Dorell C, et al. Annual Report to the Nation on the Status of Cancer, 1975-2009, featuring the burden and trends in human papillomavirus(HPV)-associated cancers and HPV vaccination coverage levels. *J Natl Cancer Inst.* 2013; 105:175–201. [PubMed: 23297039]

3. Ayas NT, White DP, Al-Delaimy WK, et al. A prospective study of self-reported sleep duration and incident diabetes in women. *Diabetes Care*. 2003; 26:380–384. [PubMed: 12547866]
4. Ayas NT, White DP, Manson JE, et al. A prospective study of sleep duration and coronary heart disease in women. *Arch Intern Med*. 2003; 163:205–209. [PubMed: 12546611]
5. Patel SR, Ayas NT, Malhotra MR, et al. A prospective study of sleep duration and mortality risk in women. *Sleep*. 2004; 27:440–444. [PubMed: 15164896]
6. Patel SR, Malhotra A, Gottlieb DJ, et al. Correlates of long sleep duration. *Sleep*. 2006; 29:881–889. [PubMed: 16895254]
7. von Ruesten A, Weikert C, Fietze I, Boeing H. Association of sleep duration with chronic diseases in the European Prospective Investigation into Cancer and Nutrition (EPIC)-Potsdam study. *PLoS One*. 2012; 7:e30972. [PubMed: 22295122]
8. Yeo Y, Ma SH, Park SK, et al. A prospective cohort study on the relationship of sleep duration with all-cause and disease-specific mortality in the Korean Multi-center Cancer Cohort study. *J Prev Med Public Health*. 2013; 46:271–281. [PubMed: 24137529]
9. Zhang X, Giovannucci EL, Wu K, et al. Associations of self-reported sleep duration and snoring with colorectal cancer risk in men and women. *Sleep*. 2013; 36:681–688. [PubMed: 23633750]
10. Calvin AD, Albuquerque FN, Lopez-Jimenez F, Somers VK. Obstructive sleep apnea, inflammation, and the metabolic syndrome. *Metab Syndr Relat Disord*. 2009; 7:271–278. [PubMed: 19344228]
11. Hu FB, Willett WC, Colditz GA, et al. Prospective study of snoring and risk of hypertension in women. *Am J Epidemiol*. 1999; 150:806–816. [PubMed: 10522651]
12. Hu FB, Willett WC, Manson JE, et al. Snoring and risk of cardiovascular disease in women. *J Am Coll Cardiol*. 2000; 35:308–313. [PubMed: 10676674]
13. Zhang X, Giovannucci EL, Wu K, et al. Associations of self-reported sleep duration and snoring with colorectal cancer risk in men and women. *Sleep*. 2013; 36:681–688. [PubMed: 23633750]
14. de Giorgi V, Mavilia C, Massi D, et al. Estrogen receptor expression in cutaneous melanoma: a real-time reverse transcriptase-polymerase chain reaction and immunohistochemical study. *Arch Dermatol*. 2009; 145:30–36. [PubMed: 19153340]
15. Schernhammer ES, Schulmeister K. Melatonin and cancer risk: does light at night compromise physiologic cancer protection by lowering serum melatonin levels? *Br J Cancer*. 2004; 90:941–943. [PubMed: 14997186]
16. Srinivasan V, Pandi-Perumal SR, Brzezinski A, et al. Melatonin, immune function and cancer. *Recent Pat Endocr Metab Immune Drug Discov*. 2011; 5:109–123. [PubMed: 22074586]
17. Cabrera J, Negrin G, Estevez F, et al. Melatonin decreases cell proliferation and induces melanogenesis in human melanoma SK-MEL-1 cells. *J Pineal Res*. 2010; 49:45–54. [PubMed: 20459460]
18. Al-Delaimy WK, Manson JE, Willett WC, et al. Snoring as a risk factor for type II diabetes mellitus: a prospective study. *Am J Epidemiol*. 2002; 155:387–393. [PubMed: 11867347]
19. Rigel DS, Russak J, Friedman R. The evolution of melanoma diagnosis: 25 years beyond the ABCDs. *CA Cancer J Clin*. 2010; 60:301–316. [PubMed: 20671054]

Table 1
Age-Standardized characteristics of individuals by average hours of sleep per 24 hour period in Nurses' Health Study (NHS) in 2000, Nurses' Health Study II (NHS II) in 2001, and Health Professionals Follow-Up Study (HPFS) in 2000

	Average Hours of Sleep Per 24 Hour Period			
	6	7	8	9
NHS	(N=19,873)	(N=28,228)	(N=19,249)	(N=3,178)
Age, mean (SD), years	52.4 (7.0)	51.9 (7.1)	52.5 (7.3)	52.8 (7.4)
Regular Snorer (%)	10.19	8.72	9.85	11.70
Shift Worker (%)	4.6	2.7	2.3	2.9
History of Sun Burn (%)	37.0	36.6	35.6	38.2
6 Moles (%)	4.7	4.5	4.5	5.0
Red or Blond Hair (%)	15.2	15.5	15.9	14.2
Painful Reaction to Sun (%)	37.2	35.8	36.3	36.4
Tan When in the Sun (%)	24.7	23.1	23.1	22.9
Family History of Melanoma (%)	10.4	10.5	10.3	10.7
NHS II	(N=22,243)	(N=32,140)	(N=17,753)	(N=4,040)
Age, mean (SD), years	46.4 (4.6)	46.1 (4.7)	45.9 (4.7)	46.0 (4.7)
Regular Snorer (%)	25.7	23.2	22.7	28.0
Shift Worker (%)	14.7	9.2	8.3	9.4
Ultraviolet B Flux, mean (SD)	124.0 (24.3)	124.9 (24.6)	126.3 (25.1)	127.5 (25.7)
History of Sun Burn (%)	67.6	66.1	65.7	67.5
5 Moles (%)	20.0	21.7	21.4	21.4
Red or Blond Hair (%)	19.8	20.2	20.4	21.7
Painful Reaction to the Sun (%)	49.1	47.5	46.6	49.7
Family History of Melanoma (%)	12.5	11.9	11.9	13.4
HPFS	(N=6,826)	(N=12,922)	(N=9,106)	(N=3,075)
Age, mean (SD), years	65.3 (9.1)	65.0 (8.8)	68.1 (9.1)	71.7 (8.9)
Regular Snorer (%)	45.3	46.4	46.9	46.4
Ultraviolet B Flux, mean (SD)	131.4 (28.2)	131.5 (28.1)	131.9 (28.3)	133.32 (28.25)
History of Sun Burn (%)	84.3	84.0	84.1	85.5
6 Moles	5.7	5.2	5.1	6.1

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

	Average Hours of Sleep Per 24 Hour Period			
	6	7	8	9
Red or Blond Hair (%)	13.2	13.2	14.2	16.7
Painful Reaction to the Sun (%)	71.0	70.6	70.2	70.6
Family History of Melanoma (%)	4.8	5.0	4.9	4.9

Table 2
Average Sleep Duration (Hours) and Melanoma Risk in the Nurses' Health Study, Nurses' Health Study II, and Health Professionals' Follow-Up Study

	No of Cases	Person-years	Age-Adjusted RR (95% CI)	MV RR (95% CI)
NHS (1986-2012) and NHS II (2001-2009)				
6	162	577,857	0.87 (0.62-1.21)	0.90 (0.67-1.20)
7	253	821,794	1	1
8	199	499,318	1.29 (1.07-1.55)	1.30 (1.08-1.56)
9	28	120,130	0.76 (0.51-1.12)	0.76 (0.51-1.12)
P for Trend			0.08	0.09
HPFS (2000-2012)				
6	54	61,125	1.08 (0.77-1.15)	1.08 (0.77-1.51)
7	94	115,257	1	1
8	65	79,876	0.94 (0.68-1.29)	0.95 (0.69-1.30)
9	25	26,088	1.06 (0.68-1.67)	1.06 (0.68-1.67)
P For Trend			0.69	0.71

Multivariate model was adjusted for age (continuous), number of sun burns (none, 1-2, 3-5, 6+), moles (none, 1-2, 3-5, 6+), hair color (red, blonde, light brown, dark brown, black), family history of melanoma (yes, no), reaction to the sun (no reaction, tan, burn), tanning (only in NHS, none, light, average and deep tan), Caucasian ethnicity (European/Mediterranean, Scandinavian, Native American, other Caucasian), UV flux (quintiles), snoring (never, occasionally, few nights, most nights, every night).