Prevalence of Indoor Tanning Among Teenagers in Norway Before and After Enforcement of Ban for Ages Under 18 Years

Trude E. ROBSAHM[1], Jo S. STENEHJEM[1,2], Leon A.M. BERGE[1] and Marit B. VEIERØD[2]

[1]Department of Research, Cancer Registry of Norway, Institute of Population Based Cancer Research, PB 5313 Majorstuen, NO-0304 Oslo, and [2]Oslo Centre for Biostatistics and Epidemiology, Department of Biostatistics, Institute of Basic Medical Sciences, University of Oslo, Oslo, Norway. E-mail: trude.eid.robsahm@kreftregisteret.no

Acepted Apr 2, 2020; Epub ahead of print Apr 8, 2020

Cutaneous melanoma (CM) and squamous cell carcinoma (SCC) are among the most rapidly increasing malignancies in fair-skinned populations worldwide (1). Ultraviolet radiation (UVR) from the sun is the major environmental risk factor for skin cancer (2). Indoor tanning is also classified as carcinogenic (2) and its use is associated with increased risk of skin cancer (3–5), particularly when it is started at an early age. Meta-analyses show a 100% increased risk of SCC and a 40% increased risk of basal cell carcinoma if use of indoor tanning started <25 years (6), and 59% increased risk of CM if use started <35 years (4, 7), compared with never users. In addition, users of indoor tanning at ages <30 years have been found to be younger (2.2 years) at CM diagnosis compared with never users (4).

Australia and Brazil have implemented a total ban of indoor tanning, while New Zealand, several European countries and US states have implemented age restrictions (8). A need for stricter regulations in many European countries was highlighted recently (9). In Norway, an access ban for people under 18 years of age was implemented on 1 January 2012, although not law-enforced before 1 January 2017, with regulated systems for age control.

We conducted 2 cross-sectional surveys among first-grade high-school students (mainly 15–17 years of age), a survey before (December 2016) and another survey nearly one year after (December 2017) law enforcement of the age ban in Norway, with the objective of studying differences in the prevalence of indoor tanning. We also studied sunburns after indoor tanning and reasons for use of indoor tanning.

MATERIALS AND METHODS, AND RESULTS

In December 2016, we conducted an anonymous electronic survey (using Kahoot, https://getkahoot.com) about indoor tanning among first-grade high-school students (n=230 students each year) at 1 public high-school in Oslo (the capital city). In Norway, indoor tanning is referred to as solarium use (use of all kinds of indoor tanning devices). We asked about total use of solarium (0, 1-4, 5-9, ≥10 times; categorized as 0, 1-4, ≥5) and sunburns (redness with stinging and/or blistering followed by flare) after solarium use (0, 1, 2, ≥3 times; categorized as 0, 1, ≥2), during the last 12 months. They were presented with a list of reasons for solarium use and asked to agree or disagree (multiple answers were possible: to get a tan, prepare for holiday/travelling, comfort, increase vitamin D levels, treat skin issues, recommendation from a physician). In December 2017, the survey was repeated among that year's first-grade students at the same school.

Descriptive results are presented as frequencies (%), and Pearson χ^2 test (2-sided, significance level 0.05) was used to test differences between sexes and between the 2 years.

In total, 199 students (83%) in 2016 and 193 students (80%) in 2017 completed the survey. The proportion of females was higher in 2016 (59.8%) than in 2017 (50.3%) (p=0.06) (**Table I**). The majority of participants was aged 15–17 years (92.5% in 2016; 91.7% in 2017) (p=0.78). The proportions of solarium users during the past year were similar in 2016 (23.6%) and 2017 (23.3%) (p=0.57). In both years, solarium use was more frequent in girls (31.1% in 2016; 34.1% in 2017) than in boys (12.5% both years)

Table I. Frequency (%) of solarium use, sunburn episodes after solarium use and reasons for solarium use during the past year, among first-grade high-school students before (2016) and nearly one year after (2017) law enforcement of the ban for people under 18 years of age (1 January 2017)

	2016			2017		
Survey	Total n=199 (100) n (%)	Girls n=119 (59.8) n (%)	Boys n=80 (40.2) n (%)	Total n=193 (100) n (%)	Girls n=97 (50.3) n (%)	Boys n=96 (49.7) n (%)
Age						
15–17 years	184 (92.5)	116 (97.5)	68 (85.0)	177 (91.7)	92 (94.8)	85 (88.5)
≥18 years	15 (7.5)	3 (2.5)	12 (15.0)	16 (8.3)	5 (5.2)	11 (11.5)
Have you used solarium during the past 12 months?						
All ages						
No	152 (76.4)	82 (68.9)	70 (87.5)	148 (76.7)	64 (65.9)	84 (87.5)
1–4 times	36 (18.1)	30 (25.2)	6 (7.5)	30 (15.5)	25 (25.8)	5 (5.2)
≥5 times	11 (5.5)	7 (5.9)	4 (5.0)	15 (7.8)	8 (8.3)	7 (7.3)
15–17 years						
No	137 (74.5)	79 (68.1)	58 (85.3)	136 (76.8)	61 (66.3)	75 (88.2)
1–4 times	36 (19.6)	30 (25.9)	6 (8.8)	28 (15.8)	24 (26.1)	4 (4.7)
≥5 times	11 (5.9)	7 (6.0)	4 (5.9)	13 (7.3)	7 (7.6)	6 (7.1)
≥18 years						
No	15 (100)	3 (100)	12 (100)	12 (75.0)	3 (60.0)	9 (81.8)
1–4 times	0	0	0	2 (12.5)	1 (20.0)	1 (9.1)
≥5 times	0	0	0	2 (12.5)	1 (20.0)	1 (9.1)
Have you sunburned[a] after solarium use during the past 12 months?						
All ages						
No	177 (88.9)	108 (90.8)	69 (86.3)	165 (85.5)	82 (84.5)	83 (86.5)
1 time	13 (6.5)	6 (5.0)	7 (8.7)	9 (4.7)	5 (5.2)	4 (4.2)
≥2 times	9 (4.5)	5 (4.2)	4 (5.0)	19 (9.8)	10 (10.3)	9 (9.3)
Reasons for solarium use[b]: I use solarium:						
To get a tan	144 (72.4)	96 (80.7)	48 (60.0)	136 (70.5)	79 (81.4)	57 (59.4)
To prepare for holidays/ travelling	51 (25.6)	38 (31.9)	13 (16.3)	46 (23.8)	24 (24.7)	22 (22.9)
Because it is comfortable	25 (12.6)	14 (11.8)	11 (13.7)	39 (20.2)	19 (19.6)	20 (20.8)
To make vitamin D	40 (20.1)	24 (20.2)	16 (20.0)	34 (17.6)	17 (17.5)	17 (17.7)
Because of skin issues	17 (8.5)	9 (7.6)	8 (10.0)	18 (9.3)	9 (9.3)	9 (9.4)
After recommendation from a medical doctor	12 (6.0)	7 (5.9)	5 (6.3)	19 (9.8)	10 (10.3)	9 (9.4)

[a]Redness with stinging and/or blistering followed by flare. [b]Possible to agree on several claims.

doi: 10.2340/00015555-3482
Acta Derm Venereol 2020; 100: adv00127

($p \leq 0.005$), and 1–4 sessions was more frequent than ≥ 5 sessions. In those aged 15–17 years, a non-significantly lower proportion reported solarium use in 2017 (23.1%) than in 2016 (25.5%) ($p = 0.60$). In 2016, all 47 solarium users were 15–17 years of age, compared with 41 (91%) out of 45 users in 2017. In 2016, 11% reported ≥ 1 episode of sunburn after solarium use during the past year, while this proportion was 14.5% in 2017 ($p = 0.10$) (Table I).

The most frequent reason for solarium use was to get a tan (72.4% in 2016; 70.5% in 2017), with higher proportions in girls than in boys (Table I). Solarium use to prepare for holiday/travelling was more common in girls (31.9%) than in boys (16.3%) in 2016, with smaller differences in 2017 (24.7% in girls and 22.9% in boys). Using a solarium for comfort was reported by 12.6% of the students in 2016, and increased to 20.2% in 2017. A relatively large proportion reported use of solariums to make vitamin D (20.1% in 2016; 17.6% in 2017), and this was similar in both sexes. Finally, < 10% of students reported solarium use for skin issues or after recommendation from a physician, with similar proportions in both sexes.

DISCUSSION

The prevalence of indoor tanning during the past year was similar in first-grade high-school students in 2016 and in 2017, and more frequent in girls. Both the prevalence of use and the higher frequency of use in girls was in line with a survey among Norwegian youths aged 15–24 years in 2016 (10). The prevalence of sunburns after indoor tanning was relatively low (11, 12), but was similar in both years, as were the reasons for indoor tanning.

In some US states, the prevalence of indoor tanning was found to decrease significantly among female teens, with increasing implementation of age restrictions over the period 2009 to 2015 (13). This illustrates the potential of tanning policies in preventing youth access to indoor tanning. Most results, however, indicate a need for more effort when enforcing laws regarding age restriction, in order to more effectively prevent indoor tanning of underage youth, especially among young women (9, 13, 14). Our findings are in line with such an assertion. The time lag between legislation and the evaluation, however, might be of importance. A systematic review found lower mean compliance (20%) in evaluations 1–2 years after legislation than after 11–14 years (70%) (14). Hence, the lack of reduction in the prevalence of indoor tanning in our data may be due to the short time since law enforcement.

"To get a tan" was the most frequent reason for indoor tanning, particularly in girls, followed by "to prepare for holidays". To obtain a tanned skin is a powerful driver for all sunbathing, as it is associated with beauty, fashion, health, affluence and success. As most Norwegians are fair-skinned, teenagers should be informed that pigmentation may not protect against erythema (15). Approximately one-fifth of the students reported vitamin D supply as a reason for indoor tanning. UVR from indoor tanning initiates the formation of vitamin D, but also increases the risk of skin cancer. Therefore, indoor tanning is not a suitable source of vitamin D (8), and health advice should unambiguously focus on safe sources of vitamin D (diet, supplements, outdoor activities with adequate sun protection).

As based on 2 cross-sectional surveys among students from 1 high-school, interpretation of results and generalizations must be made cautiously. We found similar use of indoor tanning in students <18 years of age before and after enforcement of the 18 years age ban in Norway, emphasizing the importance of effective systems for age-control and education of teenagers about risks of indoor tanning.

ACKNOWLEDGEMENTS

All subjects agreed to participate and no further ethical approval was required for this study.

Reporting of anonymous data on the group level, from a Kahoot survey, require no ethical approval. The way the data are reported does not allow individual identification.

The participants were not asked about permission for data sharing, and thus the data will not be available for sharing.

The authors have no conflicts of interest to declare.

REFERENCES

1. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin 2018; 68: 394–424.
2. IARC Working group on the evaluation of carcinogenic risks to humans. Radiation. IARC Monogr Eval Carcinog Risks Hum 2012; 100(Pt D).
3. Christensen GB, Ingvar C, Hartman LW, Olsson H, Nielsen K. Sunbed use and increased cutaneous squamous cell carcinoma risk in women: a large-scale, prospective study in Sweden. Acta Derm Venereol 2019; 99: 878–883.
4. Ghiasvand R, Rueegg CS, Weiderpass E, Green AC, Lund E, Veierød MB. Indoor tanning and melanoma risk: long-term evidence from a prospective population-based cohort study. Am J Epidemiol 2017; 185: 147–156.
5. Wu S, Han J, Qureshi AA. Long-term ultraviolet flux, other potential risk factors, and skin cancer risk: a cohort study. Cancer Epidemiol Biomarkers Prev 2014; 23: 1080–1089.
6. Wehner MR, Shive ML, Chren MM, Han J, Qureshi AA, Linos E. Indoor tanning and non-melanoma skin cancer: systematic review and meta-analysis. BMJ 2012; 345: e5909.
7. Boinol M, Autier P, Boyle P, Gandini S. Cutaneous melanoma attributable to sunbed use: systematic review and meta-analysis. BMJ 2012; 34: e4757. Correction: BMJ 2012; 34: e8503.
8. Artificial tanning devices: public health interventions to manage sunbeds. Geneva: World Health Organization; 2017. Licence: CC BY-NC-SA 3.0 IGO. Reprint at: https://www.who.int/uv/publications/artificial-tanning-devices/en/, May, 2019.
9. Longo MI, Bulliard JL, Correia O, Maier H, Magnússon SM, Konno P, et al. Sunbed use legislation in Europe: assessment of current status. J Eur Acad Dermatol Venereol 2019; 33: 89–96.
10. The Norwegian Cancer Society, Oslo, Norway, 2016 [in Norwegian]. Available at: https://kreftforeningen.no/globalassets/om-kreftforeningen/ressurser-presserom/ungdomsundersokelse-solingsvaner-2016.pdf.
11. Lazovich D, Vogel RI, Berwick M, Weinstock MA, Anderson KE, Warshaw EM. Indoor tanning and risk of melanoma: a case-control study in a highly exposed population. Cancer Epidemiol Biomarkers Prev 2010; 19: 1557–1568.
12. Ferrucci LM, Cartmel B, Molinaro AM, Leffell DJ, Bale AE, Mayne ST. Indoor tanning and risk of early-onset basal cell carcinoma. J Am Acad Dermatol 2012; 67: 552–652.
13. Qin J, Holman DM, Jones SE, Berkowiz Z, Guy GP. State indoor tanning laws and prevalence of indoor tanning among US high school students, 2009–2015. Am J Publ Health Res 2018; 108: 951–956.
14. Reimann J, McWhirter JE, Papadopoulos A, Dewey C. A systematic review of compliance with indoor tanning legislation. BMC Public Health 2018; 18: 1096.
15. de Gruijl FR. UV adaptation: pigmentation and protection against overexposure. Exp Dermatol 2017; 26: 557–562.