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Relationship between sunbed use and melanoma risk in a large case-control study in the United Kingdom

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Dear Editor,

A systematic review of 19 studies reported a 15% increased risk of melanoma (95% confidence interval (CI) 1.00–1.31) associated with ever use of sunbeds.[1] A recent Australian study by Cust *et al.* demonstrated an increased risk of early-onset melanoma (<40 years) associated with ever use of sunbeds (adjusted odds ratio (OR) 1.41, 95% CI 1.01–1.96).[2] Concurrently with the Australian study and using the same questionnaire, we investigated the relationship between sunbed use and melanoma at any age in the United Kingdom. A similar estimate in the UK, which has higher sunbed usage, would imply that sunbed usage is a major etiological factor for melanoma.

Nine hundred and fifty-nine population-ascertained incident melanoma cases diagnosed from September 2000 to December 2005 (age 17–76 years at diagnosis, 22% <40 years at diagnosis), 513 population-ascertained controls and 174 sibling controls were recruited to a case–control study whereby comprehensive sun exposure data, including a life-long residence calendar, were collected as described previously.[3] Participants were asked about sunbed or sunlamp use (ever *versus* never) and about locations they were used. Data were collected on age at first and last use and number of lifetime sessions. Years since first use was calculated and these variables were categorized as presented by Cust *et al.*: never, <25, ≥25 years; none, 1–10, >10 sessions; never, ≤4, >4 and ≤14, >14 years, respectively. A proxy for sun sensitivity phenotype (categorized as sun-sensitive or not sun-sensitive) was derived, as described previously.[3]

As far as possible, we repeated the analyses as reported by Cust *et al.* Spearman correlations, Wilcoxon rank-sum tests and Pearson chi-squared tests were performed for pair-wise associations. ORs and 95% CIs were calculated from unconditional logistic regression models using data from cases and population-ascertained controls to assess the sunbed variables as predictors of melanoma. Population controls were significantly older than cases (median age diagnosis/interview 58 and 53 years, respectively, $p < 0.0001$) and more educated ($\chi^2(3) = 6.9$, $p = 0.03$). Cases were significantly more likely to have family history of melanoma in first or second degree relatives compared with controls ($\chi^2(1) = 8.0$, $p = 0.01$). The primary analyses comparing cases and population controls were therefore adjusted for age (examined as a trend over quartiles), sex, highest educational level (primary/secondary school, sixth form/vocational training, university/post graduate examined as a trend), sun sensitivity phenotype, self-reported family history in 1st or 2nd degree relatives (none, any) and cumulative lifetime total sun exposure (examined as a trend over quartiles). These analyses were repeated in the subset of 157 cases with matched siblings using conditional logistic regression models, adjusted for all of the above-listed factors except family history. We also performed some subgroup analyses stratifying by the factors defined by Cust *et al.* (sex, age at diagnosis/interview, sun sensitivity phenotype, nevi, lifetime total sun exposure) and also average number of sunburns during lifetime. In our case–control study,[3] we found the sun exposure measure most associated with risk was a protective effect of regular weekend sun exposure. We therefore repeated the analyses adjusting for this measure but there was no effect on the results (data not shown).

The locations where sunbeds were used were private home (54%), tanning salons (34%), gyms/spas (32%), hairdressers/beauty salons (13%) and hospital/medical facilities (9%). In analyses considering cases and population controls, younger age was associated with number of sessions (rho = −0.37, $p < 0.0001$) and ever *versus* never use (means 49 and 60 years, respectively, $p < 0.0001$). Females reported a higher number of sessions compared with males ($p < 0.0001$) and 57% of females reported ever use compared with 38% of males ($\chi^2(1) = 52.0$, $p < 0.0001$). Sun sensitivity phenotype and educational level were not associated with sunbed use.

In multiple regression analyses, ever-use of sunbeds was not a significant risk factor for melanoma (adjusted OR 1.06, 95% CI 0.83–1.36, Table 1). Age at first use of sunbeds showed a small non-significant increased risk for use <25 years compared with never use (OR 1.16, 95%CI 0.84–1.62), as did age at last use <25 years (OR 1.49, 95% CI 0.95–2.34). Number of sessions and years since first use did not show an increasing trend effect on melanoma risk.

The secondary analyses comparing cases with sibling controls gave an OR of 1.10 (95% CI 0.63–1.94) for ever *versus* never use (Table 1). Having >10 sessions conferred an OR of 1.27 compared with never use (95% CI 0.63–2.55, p_{trend} 0.54). If we further examine the number of sessions categorized according to our controls distribution (none, 1–20, >20), having >20 sessions conferred an OR of 1.49 compared with never use (95% CI 0.70–3.17, p_{trend} 0.35). Age at

Table 1. Adjusted odds ratios and 95% confidence intervals for melanoma in relation to sunbed use in the Leeds Melanoma Study, comparing the population cases with the population controls and the matched cases and controls

Sunbed use	Controls *N* (%)	Cases *N* (%)	OR (95% CI)[1]	Sibling controls *N* (%)	Matched cases *N* (%)	OR (95% CI)[1]
Ever-use						
Never	258 (53.4)	414 (48.4)	1.0	81 (50.6)	68 (46.9)	1.0
Ever	225 (46.6)	441 (51.6)	1.06 (0.83–1.36)	79 (49.4)	77 (53.1)	1.10 (0.63–1.94)
p_{diff}			0.63			0.73
Age at first use						
Never	258 (53.5)	414 (48.9)	1.0	81 (50.9)	68 (47.2)	1.0
<25 years	88 (18.3)	199 (23.5)	1.16 (0.84–1.62)	33 (20.8)	30 (20.8)	0.96 (0.46–2.02)
≥25 years	136 (28.2)	234 (27.6)	0.98 (0.74–1.29)	45 (28.3)	46 (31.9)	1.20 (0.64–2.24)
p_{het}			0.58			0.80
Age at last use						
Never	258 (53.4)	414 (48.9)	1.0	81 (50.6)	68 (46.9)	1.0
<25 years	32 (6.6)	91 (10.7)	1.49 (0.95–2.34)	17 (10.6)	13 (9.0)	0.81 (0.33–1.97)
≥25 years	193 (40.0)	342 (40.4)	0.97 (0.75–1.25)	62 (38.8)	64 (44.1)	1.19 (0.66–2.15)
p_{het}			0.16			0.63
Number of lifetime sessions						
None	258 (53.9)	414 (49.8)	1.0	81 (51.3)	68 (47.2)	1.0
1–10	89 (18.6)	155 (18.6)	0.97 (0.71–1.34)	28 (17.7)	23 (16.0)	0.98 (0.49–1.96)
>10	132 (27.6)	263 (31.6)	1.06 (0.79–1.42)	49 (31.0)	53 (36.8)	1.27 (0.63–2.55)
p_{trend}			0.71			0.54
Number of lifetime sessions						
None	258 (53.9)	414 (49.8)	1.0	81 (51.3)	68 (47.2)	1.0
1–20	122 (25.5)	229 (27.5)	1.04 (0.78–1.39)	46 (29.1)	38 (26.4)	0.97 (0.52–1.80)
>20	99 (20.7)	189 (22.7)	0.99 (0.72–1.37)	31 (19.6)	38 (26.4)	1.49 (0.70–3.17)
p_{trend}			0.97			0.35
Age at first use/lifetime sessions						
Never	258 (54.0)	414 (50.1)	1.0	81 (51.6)	68 (47.6)	1.0
<25/1–10	24 (5.0)	48 (5.8)	0.96 (0.56–1.65)	8 (5.1)	6 (4.2)	0.77 (0.23–2.62)
<25/>10	61 (12.8)	137 (16.6)	1.19 (0.81–1.74)	24 (15.3)	24 (16.8)	1.17 (0.50–2.73)
≥25/1–10	64 (13.4)	104 (12.6)	0.96 (0.67–1.38)	20 (12.7)	17 (11.9)	1.08 (0.49–2.41)
≥25/>10	71 (14.9)	124 (15.0)	0.95 (0.67–1.36)	24 (15.3)	28 (19.6)	1.33 (0.59–3.00)
p_{het}			0.87			0.93
Years since first use						
Never	258 (53.5)	414 (48.9)	1.0	81 (50.9)	68 (47.2)	1.0
≤4	18 (3.7)	47 (5.6)	1.09 (0.60–1.97)	5 (3.1)	12 (8.3)	2.56 (0.80–8.17)
>4 and ≤14	48 (10.0)	129 (15.2)	1.41 (0.96–2.08)	24 (15.1)	18 (12.5)	0.94 (0.42–2.13)
>14	158 (32.8)	257 (30.3)	0.93 (0.71–1.22)	49 (30.8)	46 (31.9)	1.04 (0.55–1.96)
p_{trend}			0.84			0.88
Years since first use						
Never	258 (53.5)	414 (48.9)	1.0	81 (50.9)	68 (47.2)	1.0
≤15	72 (14.9)	193 (22.8)	1.32 (0.94–1.86)	30 (18.9)	33 (22.9)	1.33 (0.65–2.71)
>15 and ≤23	76 (15.8)	125 (14.8)	0.82 (0.58–1.18)	28 (17.6)	26 (18.1)	0.99 (0.47–2.09)
>23	76 (15.8)	115 (13.6)	0.99 (0.70–1.39)	20 (12.6)	17 (11.8)	0.92 (0.39–2.19)
p_{trend}			0.62			0.87

[1]Adjusted for age, sex, educational level, family history of melanoma (not applicable for the matched analyses), sun sensitivity and cumulative lifetime total sun exposure.p_{diff} is the p value for the OR for ever-used compared to never-used.
p_{trend} is the p value for trend calculated across categories.
p_{het} is the p value for the overall difference between risk categories.

first use and years since first use showed no significant associations with melanoma risk. We found no effects in subgroup analyses, melanoma site-specific analyses or when separating hospital/medical exposures from home exposures (data not shown), though our study had low power to detect these associations.

Therefore, we have not found any evidence of a relationship between sunbed use and melanoma risk (OR 1.06, 95% CI 0.83–1.36 for ever use). Cust *et al.* reported an effect of ever use on early-onset melanomas (OR 1.41, 95% CI 1.01–1.96). A test for the difference between the two ORs was not statistically significant ($p = 0.18$). Cust *et al.* reported a stronger effect for age at first sunbed use <25 years; however, our study was underpowered to address these specific relationships. Our study had 85% power to detect an OR of 1.4 (assuming a binary factor with exposure frequency of 45% amongst controls, 5% significance level) but was underpowered to detect small effects. Two UK studies conducted more than 20 years ago reported significant increased risks for ever sunbed use with relative risks of 2.9 in both studies.[4,5] Three more recent UK studies demonstrated small non-significant increased risks for ever use.[6–8] Our study has a similar finding which could indicate an effect of sunbeds, but could also be due to confounding with other UV exposures. In summary, we have found no evidence for sunbed use as a risk factor for melanoma in the UK; although we cannot exclude a small effect of ever sunbed use, nor risk associated with use early in life, we can exclude a large effect.

Yours sincerely,
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