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MELANOMA AND HIGH ALTITUDE: IS THERE A RELATIONSHIP?

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- The authors declare that they have no conflict of interest -

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Introduction and objectives

Multiple studies have demonstrated a direct relationship between background radiation exposure and increased risk of developing skin cancer.[1] However, the specifics of that association are somewhat different for malignant melanoma, basal cell carcinoma, and squamous cell carcinoma, existing a dose-dependent relationship between each type of neoplasm. An environmental factor strongly related to background radiation is altitude. This is secondary to the gradual increase in the flux of cosmic radiation as atmospheric shielding thins with increasing geographic altitude. [2] In this study, we aim to demonstrate the association between high altitude (and a subsequent higher exposure to background radiation) and the apparition of melanoma versus any other type of skin malignancy.

Methods

We conducted a retrospective analysis of patients that assisted a dermatologic clinic from january 2016 to january 2020 in Bogotá, Colombia. Patients were dichotomized taking into account the histopathological diagnosis (melanoma vs non-melanoma skin cancer). Clinical records were systematically reviewed, looking for the geographical altitude of the patient's place of residence. Clinical factors were compared using chi-square test and t-test. Taking into account that the variable geographical altitude did not follow a normal distribution, two-tailed *P*-values were calculated using Mann-Whitney U test (non-parametric). Data are summarised in tables. Statistical analysis was performed using SPSS 26 (SPSS, Chicago, IL, USA)

References

1. Rigel DS. Cutaneous ultraviolet exposure and its relationship to the development of skin cancer. J Am Acad Dermatol. 2008 May;58(5):S129–32.
2. Krain L. Aviation, high altitude, cumulative radiation exposure and their associations with cancer. Med Hypotheses. 1991 Jan;34(1):33–40.

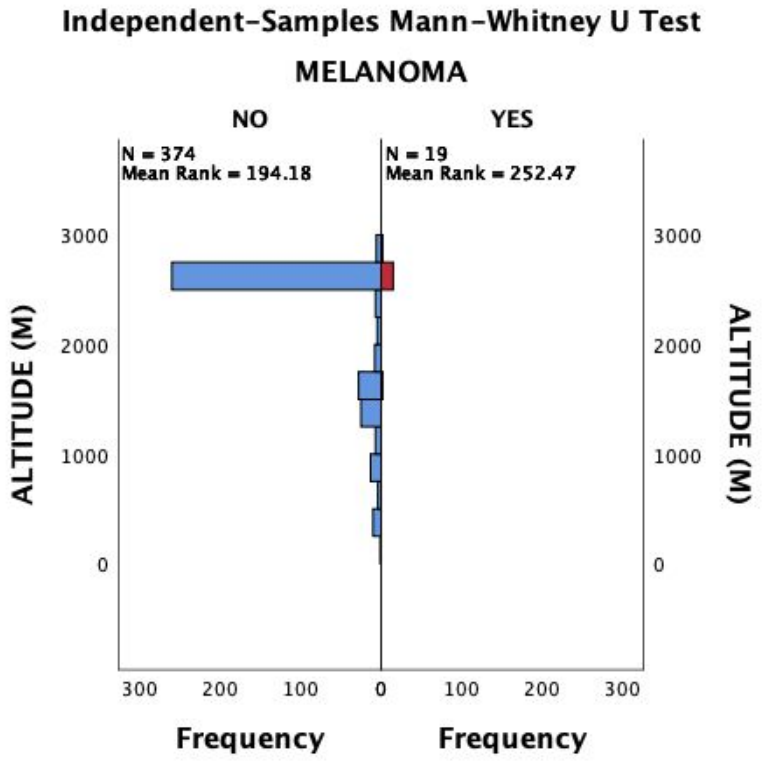
Results

The study population included for analysis, comprised 393 patients with an established diagnosis of skin cancer, from which 75.3% were diagnosed with basocellular carcinoma (n= 296), 19.6% with squamous cell carcinoma (n=77), 4.8% with melanoma (n=19) and 0.3% with cutaneous lymphoma (n=1). Women represented 53.2% of our population. Medium age at diagnosis was 70.41±13.8 (SD). Non-parametric tests showed that in our population, the diagnosis of melanoma was associated with living in higher geographical altitudes (median of 2630 MASL [Interquartile range=46] vs 2606.5 MASL [Interquartile range=703] p=0.021).

Table 1. Melanoma vs. Non-melanoma

		Melanoma	Non-melanoma	P-value
Altitude	MASL	2630 IQR 46	2606.5 IQR 703	**0.021**
Sex	Female	47.4%(n=9)	53.5%(n=200)	0.643
	Male	52.6%(n=10)	46.5%(n=174)	
Age	Mean (±STD)	71.7 (±16.2)	70.34 (±13.7)	0.66
Phototype	II	10.5%(n=2)	3.0%(n=11)	0.199
	III	47.4%(n=9)	69.1%(n=251)	
	IV	42.1%(n=8)	27.5%(n=100)	
	V	0.0%(n=0)	0.3%(n=1)	
Comorbidities	Diabetes	10.5%(n=2)	11.5%(n=43)	0.89
	Hipertension	26.3%(n=5)	44.4%(n=166)	0.12
	Previous history of cancer	21.1%(n=4)	16.1%(n=60)	0.52
	Previous skin cancer	21.1%(n=4)	11.6%(n=43)	0.26
	COPD	0.0%(n=0)	6.4%(n=24)	0.61
	Cardiovascular disease	11.1%(n=2)	8.0%(n=30)	0.44
	Autoimmune disease	5.3%(n=1)	4.5%(n=17)	0.59
	Neurodegenerative disease	10.5%(n=2)	3.5%(n=13)	0.16
	HIV	0.0%(n=0)	1.3%(n=5)	0.78

MASL: meters above sea level, IQR: Interquartile range



Conclusions

As it was previously stated, a higher geographical altitude is strongly related with an increased background radiation exposure, and a subsequent increased risk to develop skin neoplasms. A differential dose-dependent relation exists for each type of cancer, but the specificities of this phenomenon have not been clearly elucidated. As an initial approach for solving this issue, in our study we found that patients with melanoma lived at a statistically significant higher geographical altitude when compared with patients with any other type of skin malignancy.

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