

Exploring the Physiological and Demographic Traits of Cutaneous Melanoma in the Romanian Population: A Six-Year Retrospective Cohort Study of 130 Patients

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AIM: This study evaluates the demographic and clinicopathological characteristics of patients diagnosed with cutaneous melanoma in the Romanian population.

METHODS: This retrospective population-based cohort study analyzed the histopathological parameters of primary cutaneous melanomas in 130 patients treated at the plastic surgery department of our hospital in Bucharest over a six-year period.

RESULTS: The incidence of cutaneous melanoma in the cohort increased by approximately 15.6% annually, with a male predominance and a mean diagnosis age of 59.9 years. The majority (73.1%) of cases were within the 51–80 age group. Superficial spreading melanoma accounted for 52.3% of cases, followed by nodular melanoma at 35.4%. The mean Breslow index was 4.745 mm, and 35.4% of cases were diagnosed at stage T4. Spearman’s rank correlation analysis demonstrated that the Breslow index was positively correlated with patient age ($\rho = 0.327$, $p < 0.001$), indicating that older age is associated with higher Breslow index values. Males presented with higher tumor thickness and were diagnosed later than females, on average by a decade.

CONCLUSIONS: Cutaneous melanoma remains a high-risk malignancy with significant morbidity and mortality. Patients in Romania were diagnosed with thicker tumors compared to Western populations, potentially due to limited awareness and insufficient prevention strategies. These findings underscore the urgent need to improve early detection programs and public education on melanoma in Romania.

Keywords: cutaneous melanoma; histopathological characteristics; incidence and epidemiology; Romania; early detection

Introduction

The skin is the largest organ of the human body, representing 8% of its total mass. Melanocytes are specialized cells in the epidermis that produce melanin, a pigment that offers protection against Ultraviolet (UV) radiation [1]. UV radiation is considered a group 1 carcinogenic agent by the International Agency for Research on Cancer [2].

Skin cancer is the most common type of cancer diagnosed, representing 40–50% of the total cancers diagnosed [3]. Despite being visible, skin cancers are often diagnosed late, posing an important socioeconomic burden [4].

Cutaneous melanoma is considered the most aggressive type of skin cancer, accounting for 90% of deaths caused by skin tumors, even though melanomas represent just 4% of all skin cancers and an estimated 85% of melanomas will not metastasize [5,6]. Carcinogenesis can originate from a preexisting nevus - in approximately 30% of cases, or from the melanocytes in healthy skin [7,8].

Risk factors for melanoma include intrinsic elements such as male sex, age over 50, genetic predisposition (e.g., family history), and phenotypic traits like atypical moles and high mole counts. Environmental factors, including intermittent UV exposure and tanning bed use, also play critical roles [9].

While most cancer types are experiencing a drop in incidence, the incidence of cutaneous melanoma is rising [10]. According to a Dutch study, the incidence of cutaneous melanoma has increased by 4.8% annually in the last four decades [11]. Moreover, cutaneous melanoma disproportionately affects the younger population, as it is the most frequent skin cancer in the 25–29 age group and the second most frequent in the 15–25 age group [12].

In Europe, melanoma incidence varies geographically, with Romania reporting one of the lowest rates, at 11.8/100,000, compared to Northern countries like Denmark, which has an incidence of 31.1/100,000 [13]. However, survival rates in Romania reflect a significant disparity, with fewer than 60% of patients surviving five years, in stark contrast to survival rates exceeding 90% in Northern and Western Europe [14]. This highlights the need for improved early detection and treatment strategies within the Romanian healthcare system.

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This study aimed to evaluate the demographic and clinicopathological characteristics of cutaneous melanoma in the Romanian population through a six-year retrospective review.

Materials and Methods

This retrospective, population-based cohort study analyzed histopathological parameters of primary cutaneous melanomas in the Romanian population. The study included patients diagnosed with cutaneous melanoma at our hospital in Bucharest over a six-year period (1 January 2017–31 December 2022). Ethics approval for this study was granted by the hospital's ("Prof. Dr. Agrippa Ionescu" Clinical Emergency Hospital in Bucharest, Romania) Ethics Commission (Reference No. 21126, dated 17 January 2022), in compliance with the Declaration of Helsinki. All patients provided informed consent to participate in medical research upon admission.

Study Objectives

This study aimed to collect sociodemographic and histopathological data of patients diagnosed with cutaneous melanoma, analyze their relationships, identify the tumor (T) category at diagnosis, and compare the cohort's histopathological characteristics with international data, focusing on the T stage at initial presentation. Patients were organized into T stage categories, as defined by the American Joint Committee on Cancer staging system [15], based on melanoma tumor depth (Breslow index), as follows: tumor *in situ* (Tis) (not applicable), T1 (≤ 1.0 mm), T2 (>1.0 – 2.0 mm), T3 (>2.0 – 4.0 mm), and T4 (>4.0 mm).

We hypothesized that most patients would be diagnosed with locally advanced cutaneous melanoma (Tumor Node Metastasis (TNM) T2+), with a higher proportion in the TNM T4 category compared to TNM T1, due to delayed presentation and late-stage disease progression.

Inclusion and Exclusion Criteria

The inclusion criteria were age ≥ 18 years at diagnosis, histopathological confirmation of cutaneous melanoma after excision in our clinic during the study period, and patient consent for participation in medical research. The exclusion criteria were patients who received treatment for melanoma at other institutions or who were diagnosed outside the study period.

Data Collection and Statistical Analysis

Demographic and histopathological data were organized in Microsoft Excel (version 2405, Microsoft Corporation, Redmond, WA, USA) and analyzed using IBM SPSS Statistics (version 30.0.0.0 (172), IBM Corp, Armonk, NY, USA).

Descriptive statistics were employed to summarize the characteristics of the study cohort. For categorical vari-

ables (i.e., gender, age groups, anatomical distribution, histological types, residence, TNM T classification, ulceration status, sentinel lymph node biopsy results, and metastasis presence), frequencies and corresponding percentages were calculated to provide a clear overview of the distribution within each category. Continuous variables, such as age and Breslow index, were summarized using means, medians, ranges, and standard deviations where appropriate.

Relationships among categorical variables were assessed using *chi-square* tests to determine associations between different demographic and clinical factors. Spearman's rank correlation was utilized to assess the strength and direction of the relationship between continuous variables, as the Breslow index did not conform to a normal distribution. Statistical significance was set at a threshold of $p < 0.05$.

Results

During the six-year study period, 130 patients met the inclusion criteria (Table 1). The annual caseload of cutaneous melanoma increased by approximately 15.6% per year, culminating in a twofold rise in 2022 compared to 2017. However, a slight decrease was observed in 2020 due to CoronaVirus Disease 2019 (COVID-19)-related restrictions (Fig. 1).

A slight predominance of male patients was noted (68 cases, 52.3%). The mean age at diagnosis was approximately 59.9 years (range: 26–93). Notably, 73.1% of patients were between 51 and 80 years of age, subdivided as follows: 27.7% (36 patients) aged 51–60, 25.4% (33 patients) aged 61–70, and 20.0% (26 patients) aged 71–80. To determine whether the distribution of patients across these age groups was random, a *chi-square* goodness-of-fit test was conducted. The analysis revealed a statistically significant difference between the observed and expected distributions (χ^2 (7, N = 130) = 83.169, $p < 0.001$). This suggests that the age distribution among patients was not evenly distributed and that certain age groups were more prevalent than others. Male patients tended to reach peak incidence roughly a decade later than female patients, and gender-specific distributions revealed that males most frequently presented in the 51–80 age range, whereas females were more evenly spread across age brackets (Fig. 2). To examine the relationship between gender and age groups, a *chi-square* test of independence was conducted using data from all 130 cases. The analysis revealed a statistically significant association between gender and age groups (χ^2 (7, N = 130) = 17.436, $p = 0.015$). Most patients resided in urban areas (94 patients, 72.3%), while 27.7% (36 patients) lived in rural areas.

Regarding the anatomic distribution, three sites accounted for the majority (78.5%) of melanomas: the posterior thorax in 42 patients (32.3%), the lower limbs in 37 patients (28.5%), and the head in 23 patients (17.7%). A *chi-square* goodness-of-fit test revealed that the distribution of melanomas across these anatomical sites was statistically significant (χ^2 (6, N = 130) = 82.585, $p < 0.001$). The re-

Table 1. The demographic and clinical characteristics of the study cohort comprising 130 patients diagnosed with cutaneous melanoma within the six-year timeframe.

	Both genders		Male		Female	
	Total	Percentage of total	Total	Percentage of male cases	Total	Percentage of female cases
Year of diagnosis						
2017	15	11.5%	11	16.2%	4	6.5%
2018	17	13.1%	13	19.1%	4	6.5%
2019	24	18.5%	12	17.6%	12	19.4%
2020	18	13.8%	6	8.8%	12	19.4%
2021	25	19.2%	14	20.6%	11	17.7%
2022	31	23.8%	12	17.6%	19	30.6%
Sex						
Male	68	52.3%				
Female	62	47.7%				
Age (years)						
Mean	59.9		62.75		56.76	
Median	60		64.50		55	
Minimum	26		26		27	
Maximum	93		93		86	
Age groups						
21–30	4	3.1%	2	2.9%	2	3.2%
31–40	9	6.9%	0	0.0%	9	14.5%
41–50	17	13.1%	8	11.8%	9	14.5%
51–60	36	27.7%	17	25.0%	19	30.6%
61–70	33	25.4%	23	33.8%	10	16.1%
71–80	26	20%	16	23.5%	10	16.1%
81–90	4	3.1%	1	1.5%	3	4.8%
91–100	1	0.8%	1	1.5%	0	0.0%
Residence						
Rural	36	27.7%	15	22.1%	21	33.9%
Urban	94	72.3%	53	77.9%	41	66.1%
Anatomical distribution						
Head	23	17.7%	11	16.2%	12	19.4%
Neck	4	3.1%	4	5.9%	0	0.0%
Anterior trunk	10	7.7%	6	8.8%	4	6.5%
Posterior trunk	42	32.3%	26	38.2%	16	25.8%
Upper limbs	13	10%	6	8.8%	7	11.3%
Lower limbs	37	28.5%	14	20.6%	23	37.1%
Abdomen	1	0.8%	1	1.5%	0	0.0%
Melanoma histological types						
Superficial spreading melanoma	68	52.3%	27	39.7%	41	66.1%
Nodular melanoma	46	35.4%	33	48.5%	13	21.0%
Acral melanoma	6	4.6%	2	2.9%	4	6.5%
Lentigo maligna melanoma	3	2.3%	2	2.9%	1	1.6%
Naevoid melanoma	3	2.3%	2	2.9%	1	1.6%
Desmoplastic melanoma	2	1.5%	0	0.0%	2	3.2%
Melanoma developed on a dysplastic nevus	1	0.8%	1	1.5%	0	0.0%
Melanoma - no other classification	1	0.8%	1	1.5%	0	0.0%
Breslow index (mm)						
Mean	4.745		5.065		4.394	
Median	2.85		3.150		2.150	
Maximum	32		32		23	
Primary tumor ulceration						
Non-ulcerated	71	54.6%	30	44.1%	41	66.1%
Ulcerated	59	45.4%	38	55.9%	21	33.9%

Table 1. Continued.

	Both genders		Male		Female	
	Total	Percentage of total	Total	Percentage of male cases	Total	Percentage of female cases
TNM T classification						
Tis	7	5.4%	2	2.9%	5	8.1%
T1	26	20%	12	17.6%	14	22.6%
T2	20	15.4%	9	13.2%	11	17.7%
T3	31	23.8%	20	29.4%	11	17.7%
T4	46	35.4%	25	36.8%	21	33.9%
Sentinel lymph node biopsy						
Negative	40	58.8%	14	43.8%	26	72.2%
Positive	28	41.2%	18	56.3%	10	27.8%
Metastases	49	37.7%	25	51%	24	49%

Tis, tumor *in situ*.

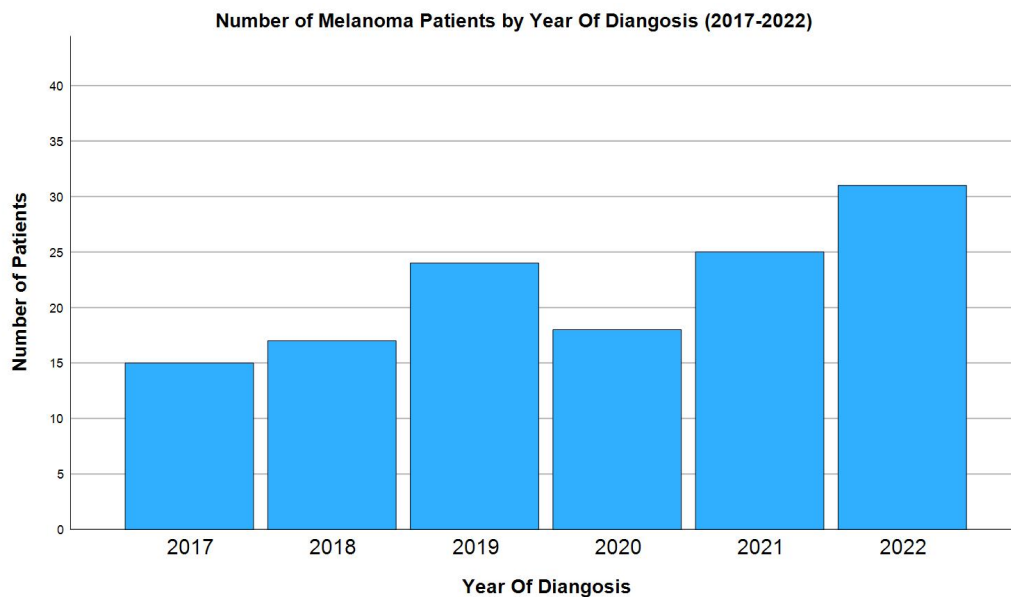


Fig. 1. Bar chart illustrating the annual increase in patients diagnosed with cutaneous melanoma over six consecutive years (2017–2022).

maining 28 tumors were found on the upper limbs (13 patients, 10.0%), anterior thorax (10 patients, 7.7%), neck (4 patients, 3.1%), and abdomen (1 patient, 0.8%).

Superficial spreading melanoma (68 cases, 52.3%) and nodular melanoma (46 cases, 35.4%) were the predominant histological types, collectively representing 87.7% of all melanomas. Other types included acral melanoma (6 cases, 4.6%), lentiginous melanoma (3 cases, 2.3%), naevoid melanoma (3 cases, 2.3%), desmoplastic melanoma (2 cases, 1.5%), melanoma developed on a dysplastic nevus (1 case, 0.8%), and one case (0.8%) classified simply as melanoma with no further subtype specified. A *chi-square* goodness-of-fit test revealed a statistically significant distribution of melanoma histological types (χ^2 (7, N = 130) = 288.462, $p < 0.001$). Among males, nodular melanoma was most frequent (33 cases, 48.5% of male patients), whereas superficial spreading melanoma predomi-

nated among females (41 cases, 66.1% of female patients). Anatomically, males most commonly presented with tumors on the posterior thorax (26 cases, 38.2% of male patients), while females' tumors were most frequently located on the lower limbs (23 cases, 37.1% of female patients).

The Breslow index had a mean value of 4.745 mm and a median of 2.850 mm, with values extending to 32 mm. For normality assessment, both the Kolmogorov-Smirnov and Shapiro-Wilk tests were conducted to evaluate the distribution of the Breslow index and age among patients. The Breslow index significantly deviated from a normal distribution in both tests ($p < 0.001$ for Kolmogorov-Smirnov and $p < 0.001$ for Shapiro-Wilk), indicating a non-normal distribution. In contrast, age did not significantly deviate from normality based on the Shapiro-Wilk test ($p = 0.140$), suggesting that age conformed to a normal distribution. These findings inform the selection of appropriate

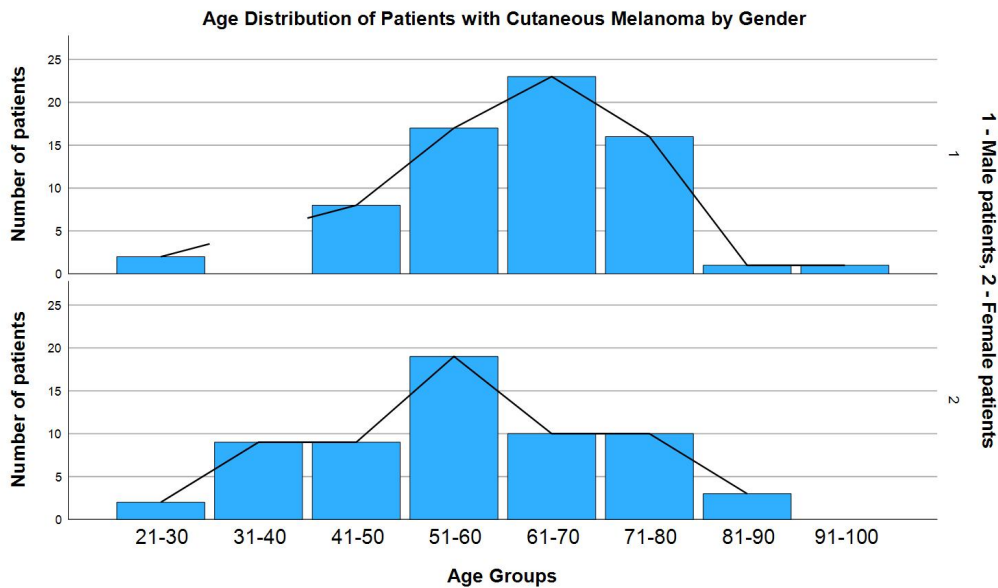


Fig. 2. Bar chart depicting the distribution of male and female patients across various age groups.

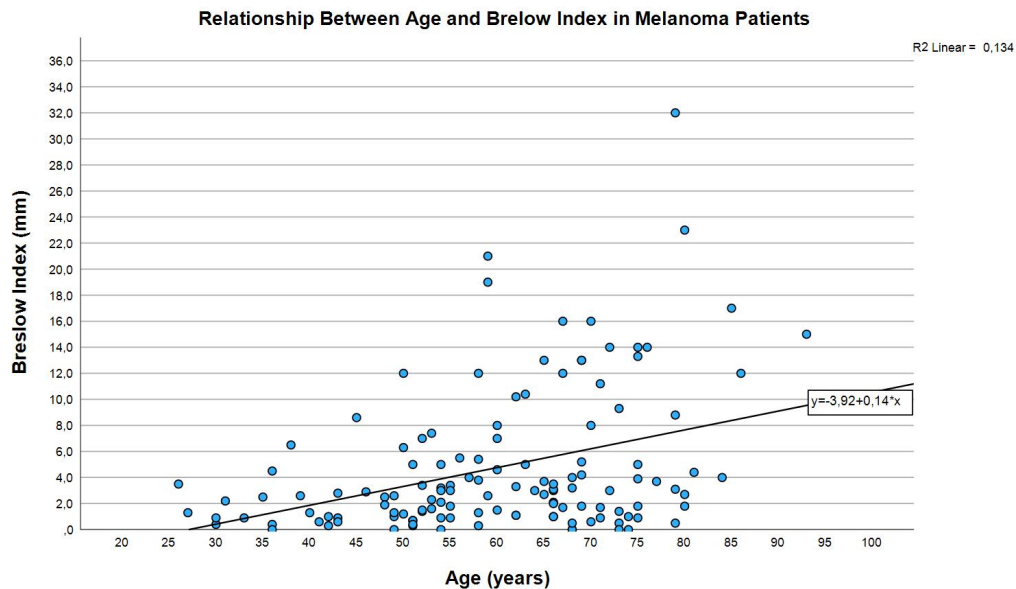


Fig. 3. Scatterplot illustrating the relationship between age and the Breslow index in melanoma patients.

statistical analyses for subsequent tests involving these variables. The Spearman's rank correlation analysis was conducted to investigate the relationship between age and the Breslow index in melanoma patients. The analysis revealed a statistically significant moderate positive correlation ($\rho = 0.327, p < 0.001$), indicating an association between older age and higher Breslow index values (Fig. 3).

The T-staging distribution was as follows: Tis in 7 patients (5.4%), T1 in 26 patients (20.0%), T2 in 20 patients (15.4%), T3 in 31 patients (23.8%), and T4 in 46 patients (35.4%) (Fig. 4). A *chi-square* goodness-of-fit test revealed a statistically significant distribution of T stages ($\chi^2 (4, N = 130) = 31.615, p < 0.001$). This suggests that certain T

stages were more prevalent among patients, deviating significantly from an even distribution.

At diagnosis, most patients of both sexes were staged at T4. Overall, male patients presented with more locally advanced disease: 20.5% of male patients fell into Tis/T1 compared to 30.7% of female patients, while 66.2% of male patients were in T3/T4 compared to 51.6% of female patients (Fig. 5). Ulceration was present in 59 cases (45.4% of the total cohort). Among the 68 patients who underwent sentinel lymph node biopsy, 40 (58.8%) had negative results, and 28 (41.2%) had positive results. Metastatic disease was noted in 49 patients (37.7%).

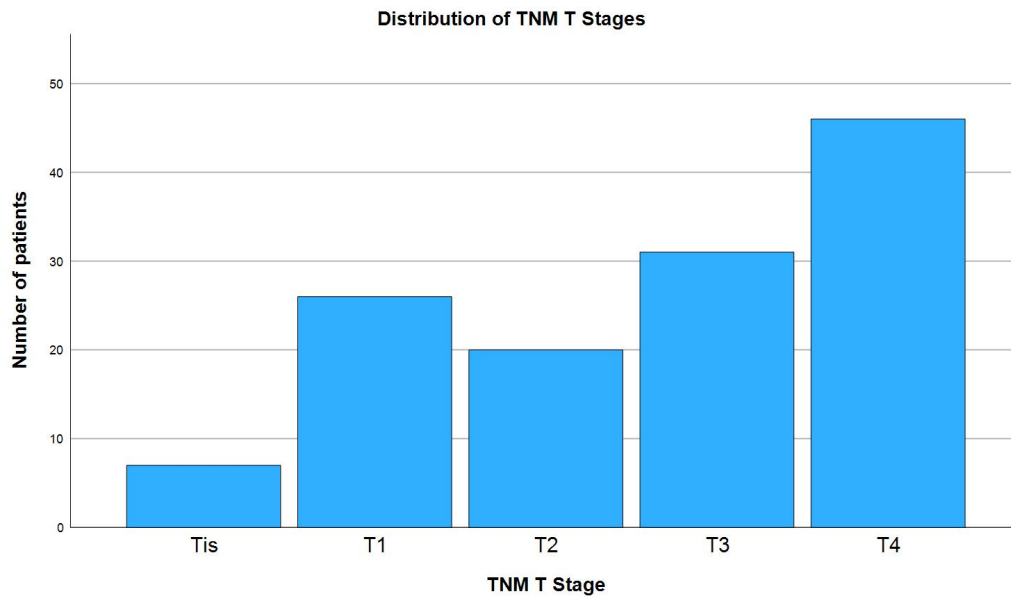


Fig. 4. Bar chart illustrating the distribution of patients across Tumor Node Metastasis (TNM) T categories.

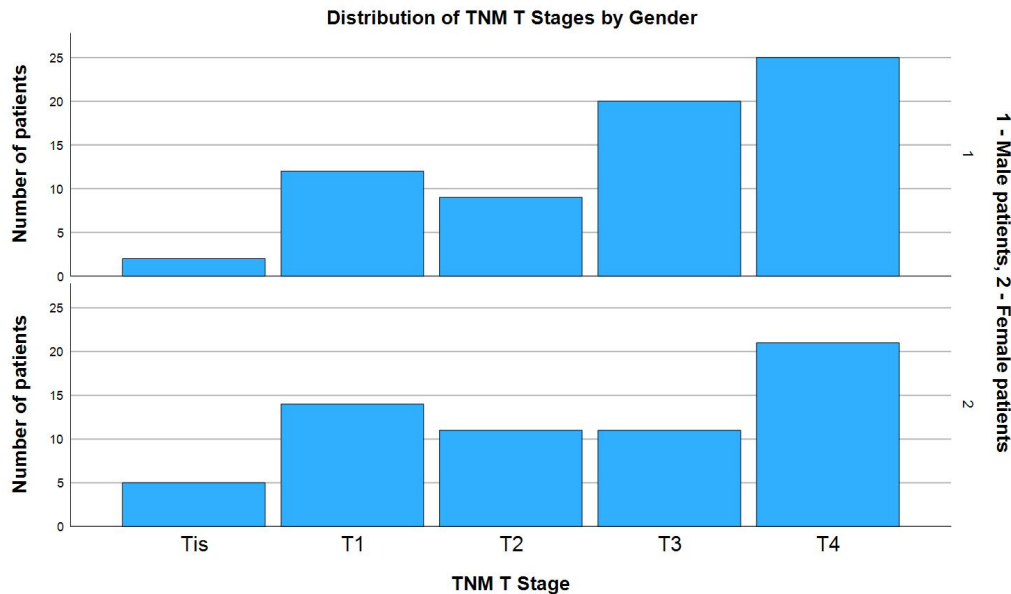


Fig. 5. Bar chart illustrating the distribution of male and female patients across the various TNM T categories.

Discussions

The treatment for cutaneous melanoma is both complex and expensive. Higher survival rates are associated with early tumor diagnosis [16]. Early-stage, thin melanoma can be potentially cured by surgical excision; however, advanced cutaneous melanoma has a poor prognosis. Patients diagnosed in stage I can have a near 100% five-year survival rate, while those diagnosed in stage IV have approximately a 34% three-year survival rate [17]. In a paper on the value of screening for cutaneous melanoma, Stratigos and Katsambas [18] noted that because melanoma is an external tumor, it can often be identified earlier than many other cancer

types.

Over the six-year duration of our study (1 January 2017–31 December 2022), 130 patients were diagnosed with cutaneous melanoma in our clinic, either after excision of a suspicious lesion in our plastic surgery department or via external referral. During this period, the COVID-19 pandemic significantly disrupted global healthcare systems, including oncological services, potentially resulting in a higher incidence of advanced-stage cancers and elevated cancer-related mortality [19,20]. Pandemic-related measures, such as nationwide lockdowns, combined with the fear of nosocomial infection, disrupted the flow of planned medical and

surgical activities. There was a decline in the incidence of oncological patients during the pandemic for all cancer types, most notably for breast cancer, prostate cancer, and melanoma [21]. This dynamic is reflected in our cohort, where the number of cases dropped from 24 in 2019 to 18 in 2020, then climbed to 25 in 2021 and 31 in 2022.

With respect to age distribution, the majority of patients (73.1%) were within the 51–80 age group. Whereas other sources indicate melanoma incidence starting to climb around age 40, our cohort showed a notable surge around age 50 [22]. Gender-related differences were also evident. In the 21–40 age bracket, 11 females (8.46%) were affected, compared to only 2 males (1.54%). This trend may be associated with the use of sunbeds and risky behavior regarding sun tanning hours [23,24]. In addition, exogenous hormone use has been linked to an elevated risk of cutaneous melanoma. This association encompasses oral contraceptive use—particularly prolonged use exceeding five years—as well as hormone replacement therapy and menopausal hormone therapy [25]. By contrast, in the 41–60 group, the incidence was nearly equal between the genders, while in the 61–80 age bracket, males' incidence (30%) was double that of females' (15.38%). Some studies suggest that this reversal may stem from less self-examination and fewer dermatologic check-ups among males [26].

In our cohort, Spearman's rank correlation analysis revealed a statistically significant positive correlation between age and Breslow index ($\rho = 0.327, p < 0.001$), indicating that older patients tended to present with thicker melanomas. This finding aligns with data from a Greek study reporting a 2% annual increase in the thickness of both superficial spreading and nodular melanomas, with age at diagnosis emerging as a significant predictor of thickness for both subtypes [27].

A key prognostic factor in cutaneous melanoma is the Breslow index at initial diagnosis. The mean Breslow index in our cohort was 4.745 mm (median 2.85 mm), aligning with a study in Târgu Mureș, Romania, that reported similarly high values across three time periods: 4.83 mm before the COVID-19 pandemic (April 2018–February 2020), 4.43 mm during the pandemic (March 2020–January 2021), and 5.24 mm afterward (February 2021–January 2023) [28]. In contrast, a study conducted in the United Kingdom involving a cohort of 167 cases of malignant melanoma reported a median Breslow index of 1.20 mm (Interquartile Range (IQR) 2.70) [29].

In our cohort, we observed a predominance of thick melanomas over thin ones. Specifically, 25.4% of patients had thin tumors, with 5.4% (7 patients) classified as Tis and 20% (26 patients) classified as T1. By contrast, 59.2% of patients presented with locally advanced disease (T3+), with 35.4% (46 patients) falling into the T4 category. These observations align with data from another Romanian center in Sibiu, where 49% of patients presented with tumors

thicker than 4 mm, and only 18% with tumors under 1 mm at diagnosis [30]. In both centers, the majority of patients presented in an advanced T stage.

The conclusions of our study are also consistent with findings from an investigation based in Timisoara, Romania, evaluating the impact of the COVID-19 pandemic (January 2018–January 2022). During the pre-pandemic period, Tis lesions accounted for 3.7%, T1 for 19%, T3 for 44.2%, and T4 for 3.1%. In contrast, under pandemic conditions, Tis decreased to 2.2% and T1 decreased to 9.4%, while T3 rose to 56.5% and T4 to 11.6%, suggesting a shift toward more advanced T stage lesions during the pandemic. Across both time frames, most patients were diagnosed with locally advanced cutaneous melanoma; however, unlike our findings, the majority of patients in the Timisoara cohort were classified as T3 rather than T4 [31]. A study conducted in Turkey reported findings that mirror our own, with a mean age at diagnosis of 54.7 years, and superficial spreading melanoma and nodular melanoma being the most frequent histopathological subtypes. Furthermore, a substantial proportion of lesions exhibited a high Breslow thickness (T3 and T4), at 25.5% and 30.7%, respectively [32].

Criscione and Weinstock [33] identified 153,124 cases of cutaneous melanoma in 17 cancer registries from the United States (1988–2006), with 70% of cases under 1.00 mm, 16% measuring 1.01–2.00 mm, 9% measuring 2.01–4.00 mm, and 5% exceeding 4.00 mm. Compared to other nations, cutaneous melanoma in the Romanian population is diagnosed in locally advanced stages, which may negatively impact survival and impose a higher economic burden due to increased treatment complexity.

Thickness and ulceration are also strong predictors of lymph node involvement. In a cohort of 1375 patients from the University of Texas Monroe Dunaway Anderson Cancer Center, sentinel node positivity ranged from 4% for tumors ≤ 1 mm to 44% for those ≥ 4 mm. Ulceration raised the nodal involvement risk to 35%, compared to 12% in non-ulcerated tumors [34]. In our study, 59 (45.4%) tumors were ulcerated at diagnosis, underscoring the aggressive nature of the disease at presentation. The increased severity of melanoma among male patients compared to females is correlated with lower prevention measures, one key area being less frequent application of sunscreen on the face and other exposed areas—as noted in research indicating men are less likely than women to practice regular sun protection, thereby underscoring the importance of medical education and regular skin examinations [35]. Male sex in our cohort was associated with a more locally advanced form of cutaneous melanoma compared to females, as evidenced by higher T stages and a greater frequency of ulceration. Specifically, males were older on average (62.75 vs. 56.76 years) and most frequently fell in the 61–70 and 71–80 age brackets, whereas females peaked in the 51–60 range. Anatomically, males had tumors most commonly on the posterior trunk (38.2%), while females had

tumors on the lower limbs (37.1%). Nodular melanoma predominated among male patients (48.5%), and superficial spreading melanoma was most prevalent in females (66.1%). Male patients also showed higher ulceration rates (55.9% vs. 33.9% in females) and were more frequently diagnosed at T3/T4 (66.2% vs. 51.6% in females). Among those undergoing sentinel lymph node biopsy, males had a higher proportion of positive lymph nodes (56.3% vs. 27.8%), although metastatic disease was reported at similar overall rates in both sexes (25 males vs. 24 females).

Possible shortcomings in preventive measures and health literacy may contribute to delays in diagnosis, as one Romanian study reported that 90% of skin cancer patients never received a warning from a physician and that 65% had not undergone any skin checks before diagnosis [36].

To increase the survival chances of patients with cutaneous melanoma, treatment should be initiated within 30 days of initial diagnosis [37]. According to Tejera-Vaquerizo and Nagore [38], a one-month delay can lead to tumor upstaging in 21% of cases, a figure which increases to 45% if the delay extends to three months. Female sex, higher education level, and skin self-examination have been associated with early diagnosis and increased detection of thinner cutaneous melanomas [39,40].

Screening programs have proven beneficial in diagnosing thinner tumors. A 2017 systematic review by Brunssen *et al.* [41] found that screening initiatives increase the odds of identifying melanomas ≤ 0.75 mm by 38% and reduce the odds of finding tumors > 3 mm by 40%. In 2003, the Association of Dermatological Prevention in Germany launched the SCREEN project in Schleswig-Holstein, inviting 360,288 residents to do whole-body skin examinations over 12 months. Although the incidence of invasive melanoma increased by 34% during the study, a notable five-year decline in melanoma mortality was observed in both genders [42]. Although the claims of this ecological study are not widely accepted and have been challenged [43], separate from the SCREEN project, the first nationwide skin cancer screening program was introduced in Germany on 1 July 2008, offering a preventive examination to all insured individuals over 35 [44].

As populations age, preventive strategies may enhance quality of life and longevity, while also reducing the economic burden of advanced-stage disease [45].

In this retrospective, single-center study, several limitations should be acknowledged. First, the single-institution setting may limit the generalizability of the findings to broader populations. Second, the retrospective design carries an inherent risk of incomplete data and potential selection bias, and the absence of standardized long-term follow-up data precludes definitive conclusions about survival and recurrence. Furthermore, the lack of a national cancer registry in Romania constrains external validity and impedes comparison with national data.

Conclusions

In our cohort, cutaneous melanoma is often diagnosed at a greater thickness than reported in other countries, illustrated by larger Breslow indices and ulceration at initial diagnosis. These trends are likely to heighten mortality, increase treatment complexity, and intensify costs for both patients and healthcare systems. Addressing these issues demands interventions, including heightened public awareness, robust screening programs, and prompt access to surgical and oncological therapies. By improving early detection and reducing diagnostic delays, future efforts can help mitigate the grim outcomes associated with advanced cutaneous melanoma.

Availability of Data and Materials

All experimental data included in this study can be obtained by contacting the corresponding author if needed.

Author Contributions

LSV conceived the idea for the article, performed the research, created and edited the database, and drafted the manuscript. LR reviewed and contributed to the database, assisted in data analysis, and revised the manuscript. CRJ provided critical revisions and validated the data analysis. All authors contributed to important editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

Ethics approval for this study was granted by the hospital's ("Prof. Dr. Agrippa Ionescu" Clinical Emergency Hospital in Bucharest, Romania) Ethics Commission (Reference No. 21126, dated 17 January 2022), in compliance with the Declaration of Helsinki. All patients provided informed consent to participate in medical research upon admission.

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Conflict of Interest

The authors declare no conflict of interest.

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