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Racial differences in time to treatment for melanoma

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Background: Longer time from diagnosis to definitive surgery (TTDS) is associated with increased melanoma-specific mortality. Although black patients present with later-stage melanoma and have worse survival than non-Hispanic white patients, the association between race and TTDS is unknown.

Objective: To investigate racial differences in time to melanoma treatment.

Methods: Retrospective review of the National Cancer Database (2004-2015). Multivariable logistic regression was used to evaluate the association of race with TTDS, controlling for sociodemographic/disease characteristics.

Results: Of the 233,982 patients with melanoma identified, 1221 (0.52%) were black. Black patients had longer TTDS for stage I to III melanoma ($P < .001$) and time to immunotherapy ($P = .01$), but not for TTDS for stage IV melanoma or time to chemotherapy ($P > .05$ for both). When sociodemographic characteristics were controlled for, black patients had over twice the odds of having a TTDS between 41 and 60 days, over 3 times the odds of having a TTDS between 61 and 90 days, and over 5 times the odds of having a TTDS over 90 days. Racial differences in TTDS persisted within each insurance type. Patients with Medicaid had the longest TTDS (mean, 60.4 days), and those with private insurance had the shortest TTDS (mean, 44.6 days; $P < .001$ for both).

Conclusions: Targeted approaches to improve TTDS for black patients are integral in reducing racial disparities in melanoma outcomes. (J Am Acad Dermatol 2020;83:854-9.)

Key words: black; chemotherapy; disparities; immunotherapy; insurance; melanoma; mortality; National Cancer Database; non-Hispanic white; racial; stage; survival; time to definitive surgery; time to treatment.

An estimated 2.3% of Americans are diagnosed with cutaneous melanoma annually, and the national incidence of cutaneous melanoma has continued to rise over the past decade.[1] It has been shown that dermatology visits reduce adverse events, mortality, and unnecessary hospitalizations for patients with melanoma.[2,3] However, substantial disparities in access to and use of dermatologic care for patients with melanoma have been shown for a myriad of clinical and sociodemographic factors, including age, sex, rurality, provider supply, distance to dermatologic care, and poverty rate.[4,5]

Specifically, race and insurance status are associated with differences in disease-specific mortality for patients with melanoma.[6-8] Black patients present with later-stage melanoma, and later-stage melanoma at diagnosis and increased time to treatment for stage I melanoma have each independently been

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associated with increased melanoma-specific mortality.[6,8-10] Despite this, the association between race and time from diagnosis to definitive surgery (TTDS) is unknown.

As such, our primary goal was to investigate differences in TTDS between black and non-Hispanic white (NHW) patients with melanoma. Our secondary goals were to determine differences in TTDS between black and NHW patients by melanoma stage and insurance type and to examine racial differences in stage at presentation, distance from the hospital, and time to medical treatment (immunotherapy and chemotherapy).

CAPSULE SUMMARY

- Longer time from diagnosis to definitive surgery (TTDS) is associated with increased melanoma-specific mortality; in this study, black patients had longer TTDSs for melanoma after sociodemographic factors were controlled for, and these differences persist for each insurance, stage I to III melanoma, and time to immunotherapy.
- Targeted interventions to improve TTDS for black patients with melanoma are important in improving outcomes.

METHODS

Patients with cutaneous melanoma were identified using the National Cancer Database (NCDB) from 2004 to 2015. The NCDB, produced by the American Cancer Society and the American College of Surgeons, contains data from more than 1500 accredited hospitals and more than 70% of all newly diagnosed cancer cases in the United States. Patients with American Joint Committee on Cancer pathologic stage I to IV cutaneous melanoma were included in this study. TTDS was calculated as the number of days between initial diagnosis and definitive surgical resection of the primary tumor. Patients with missing data for covariates, unknown stage, or excisional biopsy as definitive treatment (TTDS of 0 days) were excluded.

Descriptive analyses were performed for initial univariate comparison of sociodemographic characteristics between racial groups using the Pearson chi-square and analysis of variance (ANOVA). The Student *t* test (pooled) was initially used for univariate comparison of time to immunotherapy and chemotherapy, as well as for TTDS stratified by stage and insurance type between racial groups. Multivariable logistic regression was used to evaluate the association of race with TTDS, controlling for sex, age, median household income, and insurance type. In the multivariable model, adjusted odds ratios were calculated for black patients (reference group: NHW patients). Institutional review board approval was not required for the use of this publicly available, deidentified database. All analyses were performed in the statistical software R (R Foundation, Vienna, Austria), and *P* less than .05 was considered significant.[11]

RESULTS

Our sample included 233,982 patients with cutaneous melanoma, of which 1221 (0.52%) were black and 232,761 were NHW (99.5%) (Table I). Black and NHW patients did not differ by age ($P = .07$). Compared with NHW patients, black patients were more often female ($P < .001$) and presented with later-stage melanoma ($P < .001$). Median household income differed significantly by race ($P < .001$). Most NHW patients had a median household income of $63,000 or greater (41.9%), whereas most black patients had a median household income of less than $38,000 (32.9%). Insurance status also differed by race, with a greater proportion of black patients having Medicaid or no insurance than NHW patients (7.0% vs 2.1% and 5.7% vs 2.3%, respectively; $P < .001$). On average, black patients lived closer to the hospital than NHW patients (70.0% vs 61.6% living less than 20 miles from the hospital; $P < .001$).

Most black (70.2%) and NHW (85.1%) patients had a TTDS between 0 and 30 days. Compared to NHW patients, black patients had an increased average TTDS (23.4 days vs 11.7 days; $P < .001$) and increased average time to immunotherapy (129.8 days vs 108.3 days) ($P = .01$). There was no significant difference in time to chemotherapy between black and NHW patients (123.4 days vs 100.4 days, $P = .10$).

Stratified by stage, black patients had an increased average TTDS for stage I, II, and III melanoma ($P < .001$) but not stage IV melanoma ($P = .55$) (Table II). Black patients also had an increased average TTDS when stratified by insurance type (Table III). After sex, age, income, and insurance status were controlled for, black patients were significantly more likely than NHW patients to have a TTDS between 31 and 60 days (adjusted odds ratio [aOR], 2.10; 95% confidence interval [CI], 1.74-2.34), 61 to 90 days (aOR, 3.15; 95% CI, 2.42-4.02), or more than 90 days (aOR, 5.16; 95% CI, 3.84-6.80) ($P < .001$ for all) (Table IV).

DISCUSSION

In this study, black patients had a longer TTDS for stages I to III melanoma and greater time to

Abbreviations used:

ALM: acral lentiginous melanoma
aOR: adjusted odds ratio
CI: confidence interval
NCDB: National Cancer Database
NHW: non-Hispanic white
TTDS: time from diagnosis to definitive surgery

immunotherapy compared with NHW patients, and the racial differences in TTDS persisted within each insurance type. There were no racial differences in TTDS for stage IV melanoma or time to chemotherapy. Additionally, compared with NHW patients, black patients had over twice the odds of having a TTDS between 41 and 60 days, over 3 times the odds of having a TTDS between 61 and 90 days, and over 5 times the odds of having a TTDS over 90 days.

Table I. Sample demographics*

Characteristics	NHW, n (%)	Black, n (%)	*P* value
Total number of patients	232,761	1221	
Age, y, n (%)			
<30	9609 (4.1)	37 (3.0)	.072
30-39	17,358 (7.5)	94 (7.7)	
40-49	31,729 (13.6)	141 (11.5)	
50-59	48,272 (20.7)	273 (22.4)	
60-69	52,387 (22.5)	291 (23.8)	
70-79	44,031 (18.9)	243 (19.9)	
80+	29,375 (12.6)	142 (11.6)	
Sex, n (%)			
Male	134,164 (57.6)	530 (43.4)	<.001
Female	98,597 (42.4)	691 (56.6)	<.001
Stage of melanoma, n (%)			
Stage I	154,781 (66.5)	438 (35.9)	<.001
Stage II	43,644 (18.8)	385 (31.5)	
Stage III	27,255 (11.7)	294 (24.1)	
Stage IV	7081 (3.0)	104 (8.5)	
Time to treatment, days, mean (SD)			
Time to definitive surgery	11.72 (24.61)	23.42 (37.43)	<.001
Time to chemotherapy	100.41 (100.57)	123.36 (135.55)	.100
Time to immunotherapy	108.31 (83.82)	129.79 (79.31)	.012
Time to definitive surgery, days, n (%)			
0-30	198,054 (85.1)	857 (70.2)	<.001
31-60	27,782 (11.9)	241 (19.7)	
61-90	4775 (2.1)	70 (5.7)	
>90	2150 (0.9)	53 (4.3)	
Insurance status, n (%)			
Not insured	5275 (2.3)	69 (5.7)	<.001
Private insurance	126,858 (54.5)	533 (43.7)	<.001
Medicaid	4973 (2.1)	85 (7.0)	<.001
Medicare	88,760 (38.1)	484 (39.6)	.280
Other government	2410 (1.0)	14 (1.1)	.702
Unknown	4485 (1.9)	36 (2.9)	.010
Median household income, n (%)			
<$38,000	24,273 (10.5)	399 (32.9)	<.001
$38,000-$47,999	47,061 (20.4)	272 (22.4)	
$48,000-$62,999	62,747 (27.2)	287 (23.7)	
$63,000+	96,540 (41.9)	255 (21.0)	
Distance to hospital, miles, n (%)			
<20	142,166 (61.6)	847 (70.0)	<.001
20-39	43,934 (19.0)	170 (14.0)	
40-59	17,205 (7.5)	79 (6.5)	
>60	27,408 (11.9)	114 (9.4)	

NHW, Non-Hispanic white; *SD,* standard deviation.
*Pearson chi-square for categorical variables and *t* test for continuous variables.

Table II. Comparison of time to definitive surgical treatment of melanoma between racial groups by stage

Melanoma stage	Race	Mean TTDS, days	SD	*P* value
Stage I	NHW	34.59	33.69	<.001
	Black	45.84	42.88	
Stage II	NHW	37.71	37.52	<.001
	Black	46.25	39.87	
Stage III	NHW	38.80	34.38	<.001
	Black	50.78	52.34	
Stage IV	NHW	41.74	42.48	.548
	Black	45.76	39.92	

NHW, Non-Hispanic white; *SD,* standard deviation; *TTDS,* time to definitive surgical treatment.

Table III. Comparison of time to definitive surgical treatment of melanoma between racial groups by insurance type

Insurance	Race	Mean TTDS (days)	SD	*P* value
None	NHW	39.33	37.917	.027
	Black	54.8	45.835	
Private	NHW	34.29	32.002	<.001
	Black	44.63	46.132	
Medicaid	NHW	42.55	35.968	.046
	Black	60.41	72.707	
Medicare	NHW	35.77	23.269	<.001
	Black	44.53	29.239	

NHW, Non-Hispanic white; *SD,* standard deviation; *TTDS,* time to definitive surgical treatment.

Table IV. Multivariable logistic regression for time to definitive surgery of melanoma

Patient demographics	Adjusted odds ratio* (95% CI)	*P* value
Sex		
Male	Reference	—
Female	1.85 (1.65-2.08)	<.001
Age, years		
<30	Reference	—
30-49	1.39 (0.99-2)	.066
50-69	1.81 (1.31-2.58)	.001
>70	1.51 (1.06-2.22)	.029
Median household income		
<$38,000	Reference	—
$38,000-$47,999	0.34 (0.29-0.4)	<.001
$48,000-$62,999	0.26 (0.22-0.3)	<.001
$63,000+	0.15 (0.12-0.17)	<.001
Insurance		
Not insured	Reference	—
Private insurance	0.43 (0.33-0.56)	<.001
Medicaid	1.14 (0.83-1.58)	.433
Medicare	0.5 (0.38-0.67)	.002
Other government	0.58 (0.31-1)	.927
Unknown	0.8 (0.53-1.2)	.1338
Time to definitive surgical treatment, days		
0-30	Reference	—
31-60	2.01 (1.74-2.34)	<.001
61-90	3.15 (2.42-4.02)	<.001
More than 90	5.16 (3.84-6.8)	<.001

CI, Confidence interval.
*Adjusted odds ratios are for black patients (reference: non-Hispanic white race).

These findings add to the literature by showing increased TTDSs for black patients with melanoma after sex, age, income, and insurance type were controlled for. Our data suggest that increased TTDSs in black patients with melanoma may be an independent explanatory factor for racial differences in melanoma survival, alongside factors such as later stage at presentation, biological differences in melanoma characteristics, and differences in health care use.[6,9,12]

Multiple unfavorable socioeconomic factors may exacerbate overall health status more than the additive effects of each of the individual factors.[13] Racial differences in TTDS persisted within each insurance group, implying that insurance status does not fully account for racial TTDS disparities. We found that black patients also had increased TTDSs despite living closer to hospitals, suggesting that physical distance from the hospital is not as much of a contributor to TTDS for melanoma as for other cancers (eg, colorectal).[14] A recent study of 3 high-risk surgical procedures showed that black patients lived closer to high-quality hospitals but were 25% to 58% more likely to receive surgery at low-quality hospitals than NHW patients; it is possible that a similar phenomenon exists in TTDS for melanoma.[15] The quality and availability of melanoma treatment may thus be significantly different between racial groups for reasons other than travel burden.[15] Efforts to geographically centralize care for melanoma should consider that disparities may be driven by other extrinsic and intrinsic patient-level factors. Creation of a model delineating interactions between the myriad components underlying worse outcomes for black patients with melanoma, including race and insurance status, is critical in identifying targeted avenues for intervention.

Difference in disease characteristics by race may also affect time to treatment for melanoma. Black patients more often present with acral lentiginous melanoma (ALM) on the lower extremities and have increased Breslow depth and stage at diagnosis for other melanoma subtypes, which portends worse prognosis.[16] Several controversies exist in the

treatment of ALM that are not present in the treatment of other melanoma subtypes (such as superficial spreading melanoma), including appropriate excision margins, difficulty of primary closure, efficacy of secondary intention healing, and the use of flaps and grafts.[17-20] Furthermore, ALM may have less susceptibility to immunotherapy because of poor immunogenicity and infrequent BRAF mutation.[18] These controversies and challenges in the treatment of ALM may necessitate further planning and coordination and, thus, increase TTDS and time to treatment for melanoma in black patients; ultimately, this may further exacerbate disparities in outcomes.

For a variety of cancers, including breast and colorectal, stage at presentation plays a stronger independent role in survival than race.[21,22] When stratified by stage, black patients had increased TTDS for stages I to III melanoma but not stage IV melanoma. Racial disparities in time to treatment may thus be less prominent for melanoma that has metastasized. Immunotherapy and targeted therapy are increasingly becoming the standard of care for patients with metastatic melanoma.[23] It has been shown that black patients are less likely to receive immunotherapy for metastatic melanoma and various other cancers after other sociodemographic factors are controlled for.[23,24] Our research also adds to the growing knowledge base regarding disparities in immunotherapy by showing that black patients receive immunotherapy an average of 21.5 days later than NHW patients. As the use of immunotherapy for melanoma continues to grow, it is important to better understand and address these underlying racial disparities.

Strengths of this study include the use of one of the largest cancer registries in the world with rigorous quality assurance measures, variability in geography and hospital type, and availability of several nuances of treatment and staging that are not present in state-based registries. One limitation is that patients were matched by broader age group and stage categories rather than smaller age intervals and stage subcategories. Additionally, limited information was available to further characterize the heterogeneity of chemotherapy and immunotherapy. Finally, in 2005, 48.4% of all melanomas in the United States were included in NCDB; the NCDB may not be generalizable to the entire US population given that it is a hospital-based registry, and there may be disproportionate representation of certain groups.[25]

CONCLUSION

This study investigated racial differences in time to treatment for melanoma using a large hospital-based administrative health care database. Black patients had longer TTDS for melanoma than NHW patients after other sociodemographic factors were controlled for, and racial differences in TTDS persisted after stratification by insurance type and melanoma stage. Ultimately, it is important to better understand the various components underlying worse outcomes for black patients with melanoma. Targeted approaches to improve TTDSs for black patients with melanoma are integral in reducing racial disparities in melanoma outcomes.

Raghav Tripathi had full access to all data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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