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RESEARCH LETTER

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Racial discrepancies in presentation of hospitalized infantile hemangioma cases using the Kids' Inpatient Database

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To the editor: Infantile hemangioma (IH) is the most common benign tumor in preterm infants (<37-week gestational age), affecting approximately 5% of children. Hemangiomas that are not associated with functional or esthetic problems are followed clinically, but hospitalization is necessary in some cases.[1] Racial differences in IH presentation have been reported; however, there is limited characterization on a national scale.[2–4] Thus, our objectives were to characterize IH cases by race nationally, including comorbidities and hospital outcomes.

The 2016 Kids' Inpatient Database (KID) was queried for IH cases using ICD-10-CM primary diagnosis codes: D1800, D1801, D1802, D1803, and D1809. Confirmatory analyses were performed using the Statistical Package for Social Sciences (IBM SPSS 25). Due to the nature of the data being de-identified, IRB approval was not applicable. Demographics, secondary diagnoses (ICD-10-CM: P07XX, P22X, P28X, P96XX, P61X, P59X, Q21X, H35XX, P29XX, P92X, K21XX, K42X, P002, P70X, P37X, P78XX, where X refers to all existing variations of digits from 0 to 9), and hospital outcomes were collected and compared among racial groups with univariate χ^2 analyses. Age, total charges, length of stay, number of procedures, and mortality were compared among racial groups with two-sided ANOVA analyses. For all statistical comparisons, an α level of 0.05 was used.

There were 10,495 IH cases, with 58.4% White infants, 8.8% Black infants and 32.8% other races. A majority (59.1%, or 5581/10495) were female with average age 1.1 years (SD:3.7) (Appendix: Table 1). Patients most commonly had private insurance (47.9% [4530/10495]) or Medicaid (44.8% [4232/10495]). The most frequent comorbidities were neonatal jaundice (29.3% [2768/10495]) and low birth-weight (23.1% [2182/10495]) (Appendix: Table 1).

Hospitalized Black infants with IH were on average older than White infants (1.8 [SD: 5.1] vs. 1.0 years [SD: 3.7], $p < 0.001$, ANOVA) (Table 1). Hospitalized Black infants with IH had higher prevalence of hematological disorders (17.6% [147/835] vs. 13.9% [768/5525] vs. 14.1% [438/3102], $p = 0.016$, χ^2), retinal disorders (11.5% [96/835] vs. 7.5% [412/5525] vs. 7.5% [234/3102], $p < 0.001$, χ^2), umbilical hernias (4.3% [36/835] vs. 1.8% [98/5525] vs. 2.6% [81/3102], $p < 0.001$, χ^2), and congenital infectious diseases (3.1% [26/835] vs. 2.0% [110/5525] vs. 1.2% [36/3102], $p < 0.001$, χ^2) than White infants or other races (Table 2).

Mean hospitalization length and total charges were 14.2 days (SD: 26.8) and $115,325.90 (SD: $304,776.01), respectively (Table 2). Black infants had the longest hospitalizations (16.4 days [SD: 30.3], $p = 0.031$, ANOVA) and the highest average number of procedures performed compared to White or other races (2.4 (SD: 3.3) vs. 1.9 (SD: 2.8) versus 2.1 (SD: 3.0), $p < 0.001$, χ^2) (Table 2).

In our study, we found that hospitalized Black patients with IH were almost two times older than White infants. This disparity in age of presentation between races is unlikely physiologic, since IH most commonly presents by age 3 months across all races.[5] Black infants with IH being hospitalized at later ages compared to White infants may be due to healthcare disparities, stemming from sociocultural factors such as insurance or socioeconomic status. Notably, in this

TABLE 1 Univariate comparisons of demographic variables among racial groups in infantile hemangioma patients.

Variable	Total—*N* (%)	White—*N* = 5525, % = 58.4	Black—*N* = 835, % = 8.8	Other—*N* = 3102, % = 32.8	*p* Value
Age	Mean: 1.1, SD: 3.7	Mean: 1.0, SD: 3.7	Mean: 1.8, SD: 5.1	Mean: 1.1, SD: 3.7	**<0.001**
Sex					**0.011**
Male	3880 (41.0%)	2200 (39.8%)	342 (41.0%)	1338 (43.1%)	
Female	5581 (59.0%)	3325 (60.2%)	493 (59.0%)	1763 (56.9%)	
Median household Income-quartile					**<0.001**
0%–25%	2422 (25.9%)	1075 (19.6%)	419 (51.0%)	928 (30.4%)	
26%–50%	2168 (23.2%)	1357 (24.8%)	179 (21.8%)	632 (20.7%)	
51%–75%	2396 (25.6%)	1493 (27.3%)	157 (19.1%)	746 (24.4%)	
76%–100%	2366 (25.3%)	1552 (28.3%)	67 (8.2%)	747 (24.5%)	
Primary payer					**<0.001**
Medicare	23 (0.2%)	17 (0.3%)	4 (0.5%)	2 (0.1%)	
Medicaid	4232 (44.8%)	1959 (35.5%)	579 (69.4%)	1694 (54.6%)	
Private insurance	4530 (47.9%)	3208 (58.1%)	201 (24.1%)	1121 (36.2%)	
Self-pay	316 (3.3%)	138 (2.5%)	23 (2.8%)	155 (5.0%)	
No charge	8 (0.1%)	1 (0.0%)	3 (0.4%)	4 (0.1%)	
Other**	346 (3.7%)	198 (3.6%)	24 (2.9%)	124 (4.0%)	

Note: Bold p values are below 0.05, and are thus considered as significant results in our analysis.

**Includes worker's compensation, CHAMPUS, CHAMPVA, Title V, and other government programs.

TABLE 2 Univariate comparison and analysis of outcome measures and comorbidities of patients across racial groups in infantile hemangioma.

Outcome	Total—mean [SD]	White—mean [SD]	Black—mean [SD]	Other—mean [SD]	*p* Value
Total charges	115326 [304776]	101631 [250813]	110971 [249957]	141711 [394242]	**<0.001**
Length of stay	14.2 [26.8]	13.8 [25.6]	16.4 [30.3]	14.4 [27.8]	**0.031**
Number of procedures	2.0 [2.9]	1.9 [2.8]	2.4 [3.3]	2.1 [3.0]	**<0.001**
Mortality	0 [0.1]	0 [0.1]	0.01 [0.1]	0 [0.1]	0.051
Comorbidity	Total—*N* (%)	White—*N* (%)	Black—*N* (%)	Other—*N* (%)	*p* Value
Low birth weight	2182 (23.1%)	1291 (23.4%)	194 (23.2%)	697 (22.5%)	0.632
Respiratory distress	1659 (17.5%)	988 (6.0%)	145 (17.4%)	526 (17.0%)	0.55
Other respiratory conditions	1502 (15.9%)	890 (16.1%)	142 (17.0%)	470 (15.2%)	0.326
Other perinatal conditions	1970 (20.8%)	1135 (20.5%)	171 (20.5%)	664 (21.4%)	0.618
Hematological disorders	1353 (14.3%)	768 (13.9%)	147 (17.6%)	438 (14.1%)	**0.016**
Neonatal jaundice	2768 (29.3%)	1639 (29.7%)	226 (27.1%)	903 (29.1%)	0.299
Septal malfunctions/defects	950 (10.0%)	549 (9.9%)	92 (11.0%)	309 (10.0%)	0.615
Retinal disorders	742 (7.8%)	412 (7.5%)	96 (11.5%)	234 (7.5%)	**<0.001**
Perinatal cardiovascular disorders	958 (10.1%)	574 (10.4%)	87 (10.4%)	297 (9.6%)	0.464
Feeding problems	1222 (12.9%)	758 (13.7%)	109 (13.1%)	355 (11.4%)	**0.010**
Umbilical hernia	215 (2.3%)	98 (1.8%)	36 (4.3%)	81 (2.6%)	**<0.001**
Gastro-esophageal reflux disease	537 (5.7%)	346 (6.3%)	46 (5.5%)	145 (4.7%)	**0.009**

TABLE 2 (Continued).

Outcome	Total—mean [SD]	White—mean [SD]	Black—mean [SD]	Other—mean [SD]	*p* Value
Congenital infectious diseases	172 (1.8%)	110 (2.0%)	26 (3.1%)	36 (1.2%)	**<0.001**
Transitory carbohydrate metabolism disorders	851 (9.0%)	473 (8.6%)	76 (9.1%)	302 (9.7%)	0.186
Perinatal digestive system disorders	339 (3.6%)	198 (3.6%)	30 (3.6%)	111 (3.6%)	1.000

Note: Bold *p* values are below 0.05, and are thus considered as significant results in our analysis.

cohort, Black infants, compared to White infants or other races, were far more commonly in the lowest income quartile (51.0% [419/835] vs. 19.6% [1075/5525] vs. 30.4% [928/3102], respectively, $p < 0.001$, χ^2). Black infants with IH being hospitalized at later ages also suggests lack of access to care and more severe presentations, supported by our findings that Black infants on average had longer hospitalizations and more procedures (such as hemangioma-related surgeries) performed compared to other races.

In addition to racial healthcare disparities, the diagnosis of IH in Black infants may be missed initially due to lack of education on presentation in patients with skin of color, and subsequently more severe IH cases being reported in Black infants.[6] This hypothesis is supported by the significantly fewer numbers of Black infants with IH in this cohort compared to other races; however, since the racial demographics differ from the US population's (White: 58.4%, Black: 8.8%, Other: 32.8%),[7] this data needs further exploration.

We also found that hospitalized Black patients with IH had higher prevalence of retinal disorders, umbilical hernias, hematological diseases, and congenital infectious diseases compared to White infants and other races. While umbilical hernias, hematological diseases, and congenital infectious diseases are more common in Black infants compared to other races,[8–10] the increased prevalence of retinal disorders in Black infants with IH has not been previously reported. The KID database does not have sufficient information to explain this finding. Future studies are necessary to further and properly characterize this association.

Limitations in this study include potential inaccurate reporting of IH in the database, as the average cohort age was higher than IH common presentations, and the lack of hemangioma-specific procedure and treatment information in the database. There were relatively low sample sizes for some comorbidities.

In sum, we found that hospitalized Black infants with IH, on average, were older, had longer lengths of stay, more total procedures performed, and a higher propensity for retinal disorders, compared to other races. Future research efforts should be directed to better explore the reasons for—and potential responses to—these disparities.

AUTHOR CONTRIBUTIONS

Keshav D. Kumar: Conceptualization; data curation; formal analysis; investigation; methodology; project administration; writing – original draft; writing – review & editing. **Amar D. Desai**: Conceptualization; data curation; formal analysis; investigation; methodology; project administration; validation; writing – original draft; writing – review & editing. **Vraj P. Shah**: Conceptualization; data curation; formal analysis; methodology; validation; writing – review & editing. **Shari R. Lipner**: Conceptualization; methodology; project administration; validation; writing – review & editing.

CONFLICT OF INTEREST STATEMENT

Dr. Lipner has served as a consultant for Ortho-Dermatologics, Verrica, Moberg Pharmaceuticals, and Hoth Therapeutics. The remaining authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The primary data set (Kid Inpatient Database) is available publicly through the Agency for Healthcare Research and Quality (https://www.hcup-us.ahrq.gov/db/nation/kid/kiddbdocumentation.jsp). The data sets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

TRANSPARENCY STATEMENT

The lead author Shari R. Lipner affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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APPENDIX

TABLE A1 Demographic characteristics and comorbidities of included patients.

Variable	Frequency (*n* =)	% of total
Age	Mean: 1.1	STD DEV: 3.7 (Range: 0–20)
Sex		
Male	4287	40.8
Female	6207	59.1
Race		
White	5525	58.4
Black	835	8.8
Hispanic	1862	19.7
Asian-American Pacific Islander	501	5.3
Native American	91	1.0
Other[a]	648	6.8
Median household income quartile		
0%–25%	2611	24.9
26%–50%	2409	23.0
51%–75%	2673	25.5
76%–100%	2682	25.6
Primary payer		
Medicare	28	0.3
Medicaid	4624	44.1
Private insurance	5096	48.6
Self-pay	342	3.3
No charge	8	0.1
Other[b]	388	3.7
Comorbidities		
Neonatal jaundice	3082	29.4
Low birth weight	2470	23.5
Other perinatal conditions	2212	21.1
Respiratory distress	1875	17.9
Other respiratory conditions	1710	16.3
Hematological disorders	1532	14.6
Feeding problems	1396	13.3
Perinatal cardiovascular disorders	1063	10.1
Septal malfunctions/defects	1055	10.1
Transitory carbohydrate metabolism disorders	970	9.2
Retinal disorders	825	7.9
Gastro-esophageal reflux disease	614	5.9
Perinatal digestive system disorders	386	3.7
Umbilical hernia	249	2.4
Congenital infectious diseases	205	2.0

[a]Other race or multiple races.

[b]Includes Worker's Compensation, CHAMPUS, CHAMPVA, Title V, and other government programs.