

# Dyschromia in Skin of Color

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## ABSTRACT

**Background:** Dyschromias are becoming a more common concern among patients, particularly among persons of color. There are a variety of treatments, including more novel agents for dyschromias. Evaluating common agents prescribed among various races may prompt efforts to enhance care for dyschromias in patients of color.

**Objective:** To determine whether racial or ethnic groups are treated differently for dyschromia. The secondary objective is to discover the main treatments used and determine trends over time in demographics.

**Methods:** We searched the 1993-2010 National Ambulatory Medical Care Survey (NAMCS) for visits associated with a diagnosis of dyschromia (ICD-9 codes 709.00 or 709.09). The demographics and leading treatments were tabulated, and trends over time were assessed by linear regression.

**Results:** There were about 24.7 million visits for dyschromia over the 18-year period. Among 5,531,000 patients with the sole diagnosis of dyschromia, there were 2,800 visits from females and 1,200 visits from males per 100,000 population. Females were more likely to receive prescription combination therapy for dyschromia than males by a ratio of 10 to 1. Leading treatments overall prescribed by dermatologists included hydroquinone, topical corticosteroids, and retinoids. Asians were 27% more likely to receive a combination therapy than non-Asians. African Americans and Hispanics were less likely to have a procedure performed for dyschromia.

**Limitations:** Data are based on a number of ambulatory care visits, which does not allow direct estimation of prevalence.

**Conclusions:** Dyschromia is a significant concern for many patients, and this is especially true among patients of color. Treatment for dyschromia is influenced by skin type, and thus ethnic or racial groups are treated differently. Studies have shown that combination therapy may offer better results than a single medication for hyperpigmentation disorders. Combination agents may be underutilized in African Americans and Hispanics for dyschromia.

*J Drugs Dermatol.* 2014;13(4):401-406.

## INTRODUCTION

Dyschromias, including melasma, post-inflammatory hyperpigmentation, and hypopigmentation, are a common concern especially among women and persons of color. Dyschromia is one of the most common diagnoses in black patients.<sup>1</sup> Dyschromia can cause a significant psychological impact on a patient's quality of life. Dyschromias can decrease social functioning, cause lower workplace productivity, and reduce self-esteem.<sup>2</sup> There are various therapies for hyperpigmentation, including depigmentation agents such as hydroquinone, topical corticosteroids, tretinoin, and other agents that act via tyrosinase-mediated pathways. Treatment modalities are often individualized, depending on a patient's skin type.

For decades, hydroquinone has been the gold standard for treatment of hyperpigmentation disorders such as melasma, lentigines, and post-inflammatory hyperpigmentation.<sup>3</sup> However, there are many options for the treatment of dyschromias, including various topical agents, oral medication, chemical peels, or lasers.<sup>4</sup> More recent studies show that several non-hydroquinone agents, eg, arbutin, kojic acid, azelaic acid, licorice, vitamin C, retinoic acid, may also play an important role in therapy for

hyperpigmentation.<sup>5,6</sup> Cestari et al, compared two groups with Fitzpatrick skin type II-V; group B applied HQ 4% twice daily and sunscreen SPF 30+ and group A applied a combination of HQ 4%, retinoic acid 0.05%, and fluocinolone acetone 0.01% daily.<sup>7</sup> The combination therapy was more efficacious than monotherapy according to the Melasma Severity Scale.

The primary objective of our study is to determine whether ethnic or racial groups are treated differently for dyschromia by analyzing the top treatments that are prescribed for various ethnic/racial groups. This study also aims to identify if one demographic group is more or less likely to receive treatment or procedure performed for dyschromias. Some demographic populations may seek treatment for hyper or hypopigmentation more often than other groups. In this study, we analyze trends in demographics seeking treatment for dyschromias and determine how treatments and procedures may differ according to race.

## METHODS

This study was approved by our Institutional Review Board and was conducted using the National Ambulatory Medical

Care Survey (NAMCS). The NAMCS collects data based on outpatient visits to nonfederally employed office-based physicians involved directly in patient care. Data is collected from the physician, instead of the patient in order to provide more analytic information, which is expanded from other surveys. Each physician is assigned randomly to a 1-week reporting period, during which data from a systematic random sample of visits are recorded. Data recorded by the physician are patient symptoms, diagnoses, and medications prescribed, as well as demographics of patients, procedures, and current or future treatment plan.

We analyzed data from the NAMCS during an 18-year period of data collected from 1993 to 2010. Data analysis was performed via SAS (SAS Institute, Cary, NC). Other demographic analyses included gender, age groups, physician specialties, and patient payment type. Medications prescribed to patients with dyschromia (ICD-9 codes 709.00 or 709.09) were analyzed and compared among the different races. Combination therapy was defined as a depigmentation agent and a sunscreen or a depigmentation agent plus a retinoid and a steroid and/or sunscreen. A chi square analysis was performed to determine whether or not each ethnic group was more or less likely to receive medication or a procedure.

## RESULTS

There were approximately 24.7 million outpatient visits for dyschromia during an 18-year period from 1993 to 2010. Of 5,510,000 people with the sole diagnosis of dyschromia, 76% were seen by a dermatologist and more than half the population was female. The number of visits for dyschromia seen by a dermatologist increased only by 1.1% over time ( $P=0.0004$ ). The percentage of visits for dyschromia that were made by African-Americans or Hispanics did not significantly increase over time ( $P=0.3$ ,  $P=0.4$ ). The most common age group was 45-54 years old and the second most common was 55-64 years of age (Table 1). The average age of patients being seen by a physician for dyschromia is increasing over time ( $P=0.01$ ). Caucasians comprised 75% of the total visits for dyschromia. Considering the number of visits per 100,000 population, Caucasian patients consisted of 1,800, African Americans comprised 1,600, Asian/Pacific Islander/Native Hawaiian made 3,800, and Hispanic patients consisted of 1,400 visits (Table 1). Over half of the population had private insurance (62%), while others had Medicare (9%) or self-pay (17%).

Top medications prescribed by dermatologists for the sole diagnosis of dyschromia include hydroquinone, topical corticosteroids, and retinoids (Table 2). Treatments were somewhat similar in the white, black and Asian groups, in which topical corticosteroids were either first or second most common across all groups. In blacks, topical corticosteroid was prescribed 93 % of the time and in white and Asian groups, it was prescribed over

**TABLE 1.**

### Dyschromia Demographics

Characteristic	% of Patients With Sole dx of Dyschromia from 1993-2010	Visits per 100,000 Population
<b>Gender</b>		
Female	70%	2,800
Male	30%	1,200
<b>Race</b>		
White	75%	1,800
Black	11%	1,600
Asian/Pacific Islander/ Native Hawaiian	7%	3,800
<b>Ethnicity</b>		
Hispanic	9%	1,400
Non-Hispanic	78%	1,800
<b>Age in years</b>		
0-4	1%	900
5-14	5%	600
15-24	9%	1,300
25-34	14%	2,100
35-44	15%	1,800
45-54	23%	3,400
55-64	16%	3,600
65-74	10%	3,100
75+	5%	2,000
<b>Physician specialty</b>		
Dermatology	76%	
Internal Medicine	4%	
Family Practice	4%	
Pediatrics	4%	
General Surgery	2%	
All other specialties combined	10%	

\*Frequency for gender was calculated by dividing the number of females or males with the sole diagnosis of dyschromia by the number of females or males in the US population calculated by the US Census Bureau 2000. Frequency for ethnic/races were calculated by dividing the number of ethnic/racial group with the sole diagnosis of dyschromia by the total number of people in each demographic category using the US Census Bureau 2000. Age was also calculated in the same way.

50% of the time (Tables 3-5). Hydroquinone was also a common treatment among all groups. In whites, blacks, and Asians, hydroquinone was prescribed 950,000, 270,000, and 130,000 times, respectively (Tables 3-5). Topical retinoid was the most common treatment for dyschromia in Asians, which was prescribed 75 % of the time (Table 5). Treatment differed in the frequency of sunscreen given to whites compared with black or Asian patients. Sunscreen was the third most common treatment for dyschromia in whites (32%), the sixth most common treatment in blacks (17 %), and the tenth most common treatments in Asians (7%).

**TABLE 2.****Top 10 Medications Prescribed by Dermatologists for Dyschromia**

Medication prescribed	Number of visits	Percentage of visits
Hydroquinone monotherapy	480,000	12%
Topical corticosteroids	380,000	9%
Retinoids	280,000	7%
Combination therapy*	260,000	6%
Other	250,000	6%
Sunscreen	210,000	5%
Liquid Nitrogen	130,000	3%
Antibiotics	70,000	2%
Tacrolimus/Pimecrolimus	60,000	1%
Glycolic Acid	60,000	1%

The percentage was calculated by dividing the number of times each medication was prescribed by the total number of patients with a sole diagnosis of dyschromia by dermatologists (4,169,792). \*Combination therapy- fluocinolone/hydroquinone/tretinoin or hydroquinone and sunscreen.

**TABLE 3.****Top 10 Medications Prescribed by All Providers for Dyschromia in White Patients**

Medication prescribed	Number of visits	Percentage of visits
Topical Corticosteroids	2,110,000	51%
Retinoids	1,350,000	33%
Sunscreen	1,320,000	32%
Liquid Nitrogen	1,270,000	31%
Antibiotics	960,000	23%
Hydroquinone	950,000	23%
Combination therapy*	860,000	21%
Moisturizer/Emollient	770,000	19%
Other	670,000	16%
Antifungals	500,000	12%

The percentage was calculated by dividing the number of times each medication was prescribed for white patients divided by the total number of white patients diagnosed with dyschromia by all providers (4,133,489). \*Combination therapy- fluocinolone/hydroquinone/tretinoin or hydroquinone/sunscreen.

**TABLE 4.****Top 10 Medications Prescribed by All Providers for Dyschromia in Black Patients**

Medication prescribed	Number of visits	Percentage of visits
Topical Corticosteroid	540,000	93%
Hydroquinone	270,000	47%
Antifungal	150,000	26%
Retinoid	150,000	26%
Clotrimazole/Betamethasone	100,000	17%
Sunscreen	100,000	17%
Moisturizer/Emollient	100,000	17%
Combination therapy*	80,000	14%
Glycolic acid	80,000	13%
Benzoyl Peroxide	60,000	10%

Percentages were calculated by dividing the number of times each medication was prescribed for black patients divided by the total number of black patients seen for dyschromia by all providers (584,606).

\*Combination therapy- fluocinolone/hydroquinone/tretinoin or hydroquinone/sunscreen.

**TABLE 5.****Top 10 Medications Prescribed by All Providers for Dyschromia in Asian/Pacific Islander/Native Hawaiian Patients**

Medication prescribed	Number of visits	Percentage of visits
Retinoid	300,000	75%
Topical Corticosteroids	210,000	52%
Moisturizer/Emollient	140,000	34%
Hydroquinone	130,000	33%
Combination therapy*	120,000	29%
Antibiotic	90,000	23%
Tacrolimus	50,000	12%
Other	50,000	12%
Antifungal	50,000	11%
Sunscreen	30,000	7%

Percentage was calculated by dividing the number of times each medication was prescribed for Asian patients by the total number of Asian patients seen for dyschromia by all providers (399,592).

\*Combination therapy- fluocinonolone/hydroquinone/tretinoin or hydroquinone/sunscreen.

Combination therapy was among the top 10 medications in the overall group seen by dermatologists, as well as in the white and black and Asian groups (Table 2-5). While combination therapy was overall remarkably low in both genders, females were 10 times more likely to receive combination therapy than males ( $P=0.002$ ). There was no statistically significant difference in combination therapy between those who identified themselves as African Americans and non-African Americans ( $P=0.73$ ) and those who identified themselves as Hispanic and non-Hispanic individuals ( $P=0.44$ ). Both African Americans and Hispanics are less likely to have a procedure performed in the office. African Americans were almost three times less likely to receive a procedure for dyschromia (14%) compared with non-African Americans (36%) ( $P=0.0007$ ). 17% of Hispanics received a procedure for dyschromia compared with 35% of non-Hispanic individuals ( $P=0.007$ ). In Asians, 27% received combination treatment compared to 6% of non-Asian counterparts ( $P=0.004$ ).

## DISCUSSION

As the number of ethnic persons in the US continues to grow, dyschromia may become a more common diagnosis in patients with darker skin types. Dyschromia is the fifth most common diagnosis in African Americans and the tenth leading diagnosis in Hispanic patients seen by dermatologists.<sup>1</sup> Hyperpigmentation is also a common concern among the Asian/Pacific Islander/Native Hawaiian population.<sup>8</sup> Asians had 3,800 visits per 100,000, which was the highest among the races. Perhaps this is because melasma is common in Fitzpatrick skin type 4-6 and is also special concern among Asians.<sup>5,9</sup> The average age of patients seen for dyschromia is increasing over time, consistent with the general trend of increasing median age in the US population. People 55-64 years old made the most dyschromia visits per 100,000 population, and the median age of the US population according to the US Census Bureau is over 40 years old.<sup>10</sup>

Treatment for hyper or hypopigmentation is individualized for certain skin types. Thus proper diagnosis and treatment is important for a successful outcome, and expert recommendation from a dermatologist is needed. Various methods for treatment include topical corticosteroid agents, tretinoin, hydroquinone, chemical peels, and a wide array of lasers.<sup>11,12</sup> Prevention of hyperpigmentation, eg, post-inflammatory hyperpigmentation, in darker skin types is crucial.<sup>13,14</sup> Persons of color are more prone to post inflammatory hyperpigmentation from trauma, acne, or inflammatory disorders, such as pseudofolliculitis barbae.<sup>15</sup> There are various topical agents to treat and prevent hyperpigmentation, including more novel ingredients such as soy extracts, kojic acid, licorice, mulberry, rucinol, niacinamide, arbutinin, resveratrol, and dioic acid.<sup>16</sup> The tendency for darker skin to develop certain hyperpigmented disorders is high compared to Caucasians, thus treatment may differ in individuals with darker skin.<sup>17</sup> For example, in darker skin, topical retinoids are typically the first line treatment for acne for prevention of its associated post-inflammatory hyperpigmentation.<sup>15</sup> African Americans and Hispanics were both less likely to have a procedure performed in the office. Procedures such as cryotherapy, electrodesiccation and curettage, or chemical peels may be avoided because of the risk of hypopigmentation and scarring. Chemical peels in darker skinned individuals must be performed with caution, as darker skin persons may have unpredictable reaction to the chemicals.<sup>18</sup> Laser must also be performed with caution in darker skin types for risk of dyspigmentation, texture changes, epidermal blistering, and scarring.<sup>19</sup> Although there are various laser treatment options for darker skin individuals, the potential for these adverse effects may account for a reason why African Americans and Hispanics are less likely to have a procedure performed for dyschromias.<sup>20</sup>

The use of sunscreen is a vital component of therapy for hyperpigmentation in all skin types. It is well known that UV

light exposure can exacerbate melasma.<sup>21</sup> Photoprotective agents, including sunblock, are effective in preventing new lesions of hyperpigmentation.<sup>22</sup> However, sunscreen was not as frequently prescribed in persons of color than in white patients. Sunscreen was prescribed 17% of the time in blacks and 7% in Asians and 32% of the time in whites. The melanocytic activity as well as the total melanin content is higher in darker skin.<sup>23</sup> Melanin has an inherent photoprotective role from its physical shielding effect that scatters the UV rays and reduces UV penetration through the epidermis.<sup>24</sup> Also, lighter skin has the tendency to burn more than darker skin. Perhaps these are some of the reasons why dermatologists may not recommend sunscreen as frequently in African American and Asian populations than in Caucasians. Nonetheless, sunscreen is effective in treating and preventing hyperpigmentation, and should be recognized as a vital therapy, particularly in persons of color.

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Combination therapy may be underutilized in black patients compared to white individuals. Blacks were given combination treatment 14% of the time compared to whites who were prescribed a combination agent 21% of the time. However, Asians were prescribed a combination agent 29% of the time and were 26% more likely than their non-Asian counterparts to receive combination therapy. It may be possible that Asians seek treatment for hyperpigmentation disorders more than other races. This may correspond to our data, which demonstrates Asians with the highest number of visits per 100,000 population for dyschromia. Studies show that combination treatment for hyperpigmentation yields better results than monotherapy.<sup>25-27</sup> In combination therapy, tretinoin reduces the atrophy of the corticosteroid and facilitates the epidermal penetration of hydroquinone.<sup>28</sup> In one study, a triple combination cream of tretinoin, hydroquinone, and fluocinonide acetate for melasma had a better response than double combination or monotherapy.<sup>29</sup> The Kligman's formula, which consisted of a tretinoin 0.1%, hydroquinone 5% and dexamethasone 0.1% demonstrated significant improvement compared with single or double medications for hyperpigmentation.<sup>30</sup> Combination agents may be underutilized in darker skin types because of the risk of unwanted side effects,

such as exogenous ochronosis, irritation, hypopigmentation of the surrounding skin (halo effect), contact dermatitis, and leukoderma.<sup>31</sup> The safety profile of hydroquinone may be questionable due to untoward side effects.<sup>32</sup> However, it is suggested that the first line therapy for hyperpigmentation in persons of color be a combination of hydroquinone and sunscreen to prevent further darkening of the dermatoses.<sup>31</sup> Due to potential risks of hydroquinone as stated above, the use of novel agents have been prompted and may be a good alternative for hyperpigmentation therapy.

Limitations include that the NAMCS unit of analysis is the patient visit, which does not allow direct estimation of prevalence. Specific pigmentary disorders could not be distinguished from our database. The diagnosis of dyschromia (ICD-9 codes 709.00 and 709.09) is a non-specific condition that includes various pigmentary disorders. Various ethnicities or races may have differing causes of dyschromia and thus, the treatment may differ among races depending on the cause of the dyschromia.

Dyschromia can be distressing to an individual and skin type is taken into account when considering the proper treatment. Combination therapy has been shown to offer best results compared with other medications alone.<sup>9,30,33</sup> Patients with darker skin may be more prone to hyperpigmentation from inflammatory disorders such as acne or pseudofolliculitis barbae, and thus prevention should be addressed with sunscreen and combination therapy.<sup>34</sup> Newer agents are becoming more popular in treatment of melasma and other hyperpigmentary disorders; however hydroquinone, topical steroids, and retinoic acid are still among the top 10 medications prescribed across all racial/ethnic groups. Treatment for dyschromia is likely influenced by skin type, and thus different ethnic or racial groups are taken into account when prescribing an agent. Combination therapy, which offers the best results for dyschromia, may be underutilized in certain racial groups, such as blacks and Hispanics, and thus a combination regimen should be considered when treating various conditions of hyperpigmentation.

## DISCLOSURES

The Center for Dermatology Research is supported by an unrestricted educational grant from Galderma Laboratories, LP. Dr. Feldman is a consultant and speaker for Galderma, Connetics, Abbott Labs, Warner Chilcott, Centocor, Amgen, Photomedex, Genentech, BiogenIdec, and Bristol Myers Squibb. Dr. Feldman has received grants from Galderma, Connetics, Astellas, Abbott Labs, Warner Chilcott, Centocor, Amgen, Photomedex, Genentech, BiogenIdec, Coria, Pharmaderm, Ortho Pharmaceuticals, Aventis Pharmaceuticals, Roche Dermatology, 3M, Bristol Myers Squibb, Stiefel, GlaxoSmithKline, and Novartis and has received stock options from Photomedex. Dr. McMichael is a consultant for Johnson and Johnson, Proctor and Gamble, Galderma, and Gunthly-Renker. Dr. McMichael is an investigator for



Intendis. Dr. McMichael has received honoraria from Proctor and Gamble and Gunthly Renker. She has received grants from Galderma and other financial benefits from Intendis. Dr. Kang and Mr. Davis have no conflicts to disclose.

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