

## Research

# Recurrent dental caries in posterior teeth and tooth loss in black versus white adults in a setting that minimizes the effects of socioeconomic status

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**ABSTRACT**

Recurrent dental decay (caries) is one of the most common reasons for replacement of restorations. One of the cited factors that underlies risk for recurrent decay is ethnicity. This study aimed at comparing the frequency of recurrent caries in posterior teeth between Blacks and Whites. 4,906 subjects were accessed for clinical findings of recurrent dental caries. Selection considered subjects within ages 20-80 years with fully erupted posterior teeth. Black and White subjects who satisfied the above-mentioned criterion were included in the study. Recurrent dental caries frequency was evaluated based on age, sex, ethnicity, restorative material used, and surfaces restored. Black to White ratios of the study group was 1:3.7, number of restorations for both groups was 1:4.7, amalgam restorations ratio was 1: 4.06, composite resin restorations ratio was 1:7.8, recurrent caries in amalgam restorations ratio was 1:4.4, and recurrent caries in composite resin restorations ratio was 1:7.02. Recurrent caries in amalgam was higher in Blacks age groups 20-60 years. The data showed twice the frequency of recurrent caries in amalgam restorations and a two-fold increase in recurrent decay in one surface and two surface composite resin restorations in Whites 60-80 years of age in comparison to Blacks of the same age range. Data showed that recurrent decay is directly proportional to the number of restorations placed irrespective of the material. Differences between Blacks and Whites in the amount of recurrent decay, particularly at age group 60-80 years, should be further investigated.

**KEY WORDS:** African American; Caucasian; Dental restorations; Dental caries; Tooth loss.

**ABBREVIATIONS:** DNA: Deoxyribonucleic Acid; DMFT: Decayed, Missing due to Caries, Filled Teeth; DMFS: Decayed, Missing due to Caries, Filled Dental Surfaces.

**INTRODUCTION**

There is general consensus that in the U.S., Blacks have worse oral health outcomes than their White counterparts.<sup>1,2</sup> Outcomes such as dental caries experience and periodontal diseases are consistently reported to be worse in Blacks in comparison to other groups and socioeconomic status is typically cited as the reason for such differences. Therefore, we can make the assumption that if Blacks and Whites were either equally rich, or equally poor, their oral health outcomes would be similar. We know that is not the case for periodontal diseases. Individuals with African heritage have a higher risk of having periodontitis (both chronic and aggressive types) in comparison to people with distinct geographic origins.<sup>3,4</sup> Dental caries, since any biological protection can be overwhelmed by the environment,<sup>5</sup> possibly fits our assumption.

In this study, we took advantage of a setting in which individuals have some of the worse health outcomes in the U.S. and similar socioeconomic status<sup>6</sup> to test the hypothesis that Black individu-

als do not have worse levels of recurrent caries than their White counterparts when everyone comes from a lower socioeconomic stratum.

**MATERIALS AND METHODS**

Data included in this study was extracted from the University of Pittsburgh School of Dental Medicine Dental Registry and DNA Repository Project [University of Pittsburgh Institutional Review Board (IRB) approval # 0606091].<sup>6-8</sup> Starting in September of 2006, all individuals that seek treatment at the University of Pittsburgh School of Dental Medicine have been invited to be part of the registry. These individuals give written informed consent authorizing the extraction of information from their dental records. Pittsburgh is the largest city in the Appalachian region of the United States and one of the poorest in the country. Despite the fact that Pittsburgh has had fluoridated water since 1953, nearly half of the children in Pittsburgh between 6 and 8 years old have had cavitated carious lesions.<sup>9</sup> More than 70% of 15-year-olds in the city have had cavitated carious lesions, the highest percentage in the state. Close to 30% of the city’s children have untreated cavitated carious lesions. That is more than double the state average of 14%.

At the time of this analysis, 4,906 individual records were available in the registry. We selected all individuals between 20 and 80 years of age that self-report as either Black or White and defined a sample of 3,796 subjects, 800 Black and 2,996 White. The records of these individuals were evaluated by the presence of two outcomes: (1) recurrent dental caries lesions and previous dental restorations that failed in posterior teeth and (2) tooth loss. We compared the frequency of recurrent caries and tooth loss between Blacks and Whites and used chi-square or Fisher’s exact tests with an alpha of 0.05 to determine if differences were statistically significant.

**RESULTS**

Among the 800 Black individuals studied, 478 were females and 350 had recurrent caries lesions. Of the 2,996 White individuals studied, 1,515 were females and 1,324 had recurrent caries lesions. Table 1 describes the comparisons between these two groups and show that between the ages of 20 and 39 years, more Black females have recurrent caries lesions. Between 40 to 59 years of age, White males have more recurrent caries lesions, and above 60 years, Whites have more recurrent caries. Tables 2 and 3 show recurrent caries lesions frequency depending on the restorative material (amalgam or composite resin). Between ages 20 to 39 years, Blacks have more recurrent caries in amalgam than Whites. The opposite is true for individuals older than 60 years, Whites have more recurrent caries lesions than Blacks. For composite resin, Whites have more recurrent caries than Blacks in all ages. Regarding tooth loss (Table 4), Blacks have lost more teeth between ages of 40 and 59 than Whites.

**DISCUSSION**

We performed comparisons on the frequency of recurrent caries and tooth loss based on the assumption that Black and White individuals treated in our clinics have similar socioeconomic status. These analyses suggest an unexpected trend: when socioeconomic status is similar, Whites tend to have more recurrent caries lesions than Blacks with the exception of younger adults (Table 1). But, is this really true? The available literature suggests Blacks have higher levels of dental caries experience than Whites.<sup>1,2</sup> Could it be the case, similar to periodontitis, that Blacks have increased susceptibility to dental caries in comparison to other groups due to some specific inherited predisposition? This hypothesis cannot be tested with the available data we have, but one alternative possibility is that Black individuals are not keeping their teeth throughout life at the same rate as their White counterparts. Tooth loss levels are higher in older Blacks

Age Group (years)	Recurrent Caries	Blacks (N=800)		Whites (N=2,996)		Comparison	p-values	Comments
		Females	Males	Females	Males			
20-39	Yes	81	31	210	188	Blacks vs. Whites	0.02	Black females have more recurrent caries
	No	96	73	401	414	Female Blacks vs. Female Whites	0.005	
	Total	177	104	611	602	Male Blacks vs. Male Whites	0.77	
40-59	Yes	58	53	212	275	Blacks vs. Whites	0.009	White males have more recurrent caries
	No	106	90	353	256	Female Blacks vs. Female Whites	0.61	
	Total	164	143	565	531	Male Blacks vs. Male Whites	0.001	
60-80	Yes	23	14	183	176	Blacks vs. Whites	1.0E-7	Whites (both females and males) have more recurrent caries
	No	114	61	156	172	Female Blacks vs. Female Whites	1.0E-7	
	Total	137	75	339	348	Male Blacks vs. Male Whites	1.0E-7	

**Table 1:** Blacks and Whites Frequency of Total Recurrent Caries Lesions by Age Group and Sex.

Age Group (years)		All Restorations	1 Surface Restorations	2 Surface Restorations	3 Surface Restorations	4 Surface Restorations
20-39	Black (N=281)	91	40	30	18	3
	White (N=1,213)	256	84	82	67	23
	<i>p</i> -values	5.5E-5	1.6E-5	0.006	0.27	0.49
Comment	Blacks have more recurrent caries in amalgam than Whites					
40-59	Black (N=307)	96	27	36	26	7
	White (N=1,096)	366	90	129	102	45
	<i>p</i> -values	0.48	0.87	0.86	0.59	0.13
Comment	No statistical differences between Blacks and Whites					
60-80	Black (N=212)	24	6	7	9	2
	White (N=687)	194	43	58	69	24
	<i>p</i> -values	1.0E-6	0.02	0.003	0.002	0.02
Comment	Whites have more recurrent caries in amalgam than Blacks					

**Table 2:** Blacks and Whites Frequency of Recurrent Caries Lesions in Amalgam Restorations by Age Group.

Age Group (years)		All Restorations	1 Surface Restorations	2 Surface Restorations	3 Surface Restorations	4 Surface Restorations
20-39	Black (N=281)	21	12	8	1	0
	White (N=1,213)	123	48	45	24	6
	<i>p</i> -values	0.17	1.0	0.44	0.03	0.1
Comment	Whites have more recurrent caries in 3 surface composite resin than Blacks					
40-59	Black (N=307)	17	7	5	2	2
	White (N=1,096)	102	39	24	25	14
	<i>p</i> -values	0.04	0.24	0.49	0.03	0.33
Comment	Whites have more recurrent caries in composite resin than Blacks, particularly in 3 surface restorations					
60-80	Black (N=212)	5	0	1	2	2
	White (N=687)	73	35	13	17	8
	<i>p</i> -values	3.0E-5	5.0E-5	0.08	0.08	0.28
Comment	Whites have more recurrent caries in composite resin than Blacks					

**Table 3:** Blacks and Whites Frequency of Recurrent Caries Lesions in Composite Resin Restorations by Age Group.

Age Groups (years)		Tooth Loss		Comments
20-39		Yes	No	No statistical differences between Blacks and Whites
	Black (N=281)	42	239	
	White (N=1,213)	162	1,051	
		<i>p</i> =0.48		
40-59	Black (N=307)	145	162	Blacks have more tooth loss when compared to Whites
	White (N=1,096)	366	730	
		<i>p</i> =8.0E-6		
60-80	Black (N=212)	82	130	No statistical differences between Blacks and Whites
	White (N=687)	243	444	
		<i>p</i> =0.38		

**Table 4:** Frequency of Tooth Loss between Blacks and Whites.

in comparison to older Whites.<sup>10</sup> When we looked at the data based on tooth loss, there was a hint that Blacks may lose more teeth than Whites (Table 4). We can speculate that Blacks have less recurrent dental caries lesions just because they have less teeth to begin with.

Another interesting finding came to light when analysis was done by restorative material (amalgam versus composite resin, Tables 2 and 3). Whites consistently have more recurrent dental caries in composite resin. Looking at the amalgam data, younger Blacks have more recurrent dental caries than younger Whites, but older Whites have more recurrent dental caries than older Blacks. But here, what is possibly happening is that Blacks receive less composite resin restorations in comparison to their White counterparts. We believe that despite socioeconomic levels being similar between Black and White patients treated in the setting of our study, there are still enough differences that cause Black individuals to be treated more often with the less expensive alternative (dental amalgam), whereas White individuals are possibly more often considered for restorations with composite resins. Caries experience between these two groups are historically similar, and we have reported decayed, missing due to caries, filled teeth (DMFT) and decayed, missing due to caries, filled dental surfaces (DMFS) scores of 18.31 and 61.46 for Whites, respectively, and 16.79 and 56.91 for Blacks, respectively.<sup>8</sup> The distribution of individuals based on geographic origin in our study matches quite well the demographics reported for the city of Pittsburgh, which is comprised of approximately 65% Whites, 26% Blacks, and the remaining consisting of the other groups.

Although, our data does not directly support any conclusions regarding bias, it is probably good practice to implement an effort to minimize unconscious bias when it comes to treatment plan our patients. In general, we should present to all patients all options of treatment, and frankly explain their differences based on costs and based on safety, quality, and longevity. We should not assume, based on any demographic trait, that certain patient may be unable to afford certain treatment, or upfront decide not to offer certain type of treatment with the assumption a patient cannot afford it. Not only this strategy is probably the ideal way to teach our students but also likely will impact the potential effects of unconscious bias. Despite our patient pool reflecting well the demographic breakdown of the city of Pittsburgh, PA, USA, both our student and faculty body do not, and are comprised mostly by Whites. We can assume, a certain level of unconscious bias should exist in our clinics.

In summary, our results at first glance suggest Blacks have in general less recurrent caries than Whites in our university hospital-based setting at Pittsburgh. However, we speculate if these results mean that less recurrent caries in Blacks is just the consequence of higher levels of tooth loss. Furthermore, differences in materials used for the procedures performed (restorations in amalgam *versus* composite resin) may be the result of undetected differences in the way treatments are planned at the individual level.

## PRACTICAL IMPLICATIONS

Differences between Blacks and Whites that cannot be explained by socioeconomic factors may include a higher likelihood of offering affordable treatments to certain patient demographics.

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## CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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