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Risk of colorectal adenomas and advanced neoplasia in Hispanic, black and white patients undergoing screening colonoscopy

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SUMMARY

Background—Racial and ethnic differences in the risk of premalignant colorectal neoplasia have not been extensively studied.

Aim—To measure adenoma prevalence among asymptomatic white, black and Hispanic patients undergoing screening colonoscopy.

Methods—In this cross sectional cohort study, data from individuals 50 years undergoing first-time colonoscopy since 2006 at a single tertiary-care medical centre were obtained from the electronic medical record. Adenoma prevalence among whites, blacks and Hispanics was calculated; multivariate Poisson and logistic regression were used to identify factors independently associated with adenoma rates and the presence of advanced adenomas.

Results—We identified 5075 eligible subjects: 3542 (70%) whites, 942 (18%) Hispanics and 591 (12%) blacks. The mean age was 62.2 years with 58% women. At least one adenoma was detected in 19%, 22% and 26% of whites, Hispanics and blacks respectively (Hispanics vs. whites $P=0.09$; blacks vs. whites $P=0.0001$). Isolated proximal adenomas were present in 9% of whites, 11% of Hispanics ($P=0.03$) and 11% of blacks ($P=0.03$). In multivariate analyses, a higher rate of adenomas was present in Hispanics (RR: 1.37, 95% CI: 1.20–1.57) and blacks (RR: 1.76, 95% CI: 1.52–2.04) than whites. Hispanics and blacks also had an increased risk of advanced adenomas compared to whites (OR_{Hispanics}: 2.25, 95% CI: 1.62–3.11; OR_{blacks}: 1.91, 95% CI: 1.27–2.86).

Conclusions—Adenoma prevalence was higher in blacks and Hispanics than in whites. Both groups were at greater risk of having proximal adenomas in the absence of any distal pathology than whites, where these lesions would have only been detected by colonoscopy. Efforts to promote screening are necessary among diverse, under-represented populations.

INTRODUCTION

Colorectal cancer (CRC) remains a major source of morbidity and mortality in the US, causing an estimated 51 370 deaths in 2010.¹ CRC incidence and mortality is increased in

black individuals relative to whites and blacks are often a younger age at the time of diagnosis. The difference in CRC rates has been further elucidated by the report of a higher prevalence of large polyps in blacks compared to whites, as shown in an analysis of a multicentre endoscopy database.²

There is paucity of data regarding the prevalence of adenomas among Hispanics living in the US. Hispanics comprise the largest growing ethnicity in the US, and are estimated to reach a population of greater than 100 million individuals by 2050.³ There is emerging evidence that colorectal neoplasia rates among Hispanics are similar to or possibly greater than those of whites, although studies to date have been limited to sigmoidoscopy,⁴ did not include whites as a comparison group,⁵ did not include histology⁶ or were limited to symptomatic individuals.⁷

We aimed to compare the prevalence of histologically confirmed adenomas and advanced colorectal neoplasia among Hispanics and blacks as compared to whites among individuals undergoing screening colonoscopy at an urban medical centre that serves a racially and ethnically diverse patient population.

MATERIALS AND METHODS

This hospital-based cross sectional cohort study was conducted at Columbia University Medical Center, a tertiary-care institution located in upper Manhattan, New York City. The surrounding neighbourhood is racially and ethnically diverse and has a large Hispanic population that is predominantly of Dominican and other Caribbean descent.

Record Abstraction

Data were obtained from the Columbia University Medical Center's electronic medical record systems. All patients 50 years undergoing colonoscopy at Columbia University Medical Center's endoscopy unit between March 2006 and June 2010 were identified through the electronic endoscopic database. Examinations in which the colonoscopy was incomplete (i.e. caecum was not reached) were excluded. Patients with a bowel preparation quality deemed poor by the performing endoscopist were excluded from this analysis to minimise the potentially confounding effect of bowel preparation quality. As the goal of this analysis was to restrict the population to those individuals undergoing first-time colonoscopy, we excluded those patients with a prior colonoscopy in the electronic endoscopic database or those with a listed indication of personal history of polyps. We also excluded diagnostic procedures with an indication of overt or occult gastrointestinal blood loss; anaemia; surveillance due to a history of colorectal neoplasia; a history of inflammatory bowel disease; or a syndrome associated with an increased risk of colorectal neoplasia, such as familial adenomatous polyposis or hereditary non-polyposis CRC.

Patient demographic data including gender and age were recorded. Race/ethnicity was self-identified and exported from the electronic medical record, which includes an optional field with this information. The medical record allows entry for only one race/ethnicity category for each individual; this study was limited to those subjects identified as white, Hispanic or black. Patients whose race/ethnicity was not listed in the medical record were excluded from this analysis. All histology reports for colonoscopy cases performed with polypectomy were reviewed. Only those procedures with polyps confirmed to be adenomatous were eligible. The corresponding colonoscopy reports were individually reviewed to obtain data pertaining to adenoma size, number and location. If multiple polyps were submitted in one fixative jar for histological review and adenomatous tissue was identified, this was counted conservatively as one adenoma. Adenoma size was obtained from the endoscopy report or in those few cases in which the size was not specified, the histology report was used to

approximate size. The location of each adenoma was documented as proximal or distal: proximal location was defined as those polyps found proximal to the splenic flexure and distal lesions included polyps in the descending colon, sigmoid colon and rectum. Advanced adenomas were defined as those adenomas ≥ 10 mm in greatest diameter or exhibiting advanced histology such as villous, tubulovillous or high grade dysplasia.

Statistical analysis

We compared the prevalence of adenomas in whites, Hispanics and in blacks, stratifying by age and gender. This was measured as prevalence of subjects with ≥ 1 adenoma as well as the rate of adenomas as defined by the total number of adenomas divided by the total number of patients. We used the chi square and Fisher exact tests to compare proportions, and the student's *t* test to compare continuous variables. We used multivariate Poisson regression to identify factors independently associated with adenoma rates and logistic regression to determine variables independently associated with the presence of advanced adenomas. We determined *a priori* that the following covariates would be included in the multivariate analyses: patient age and gender, and family history of colorectal neoplasia. As socioeconomic status (SES) and trainee participation may be potential confounders in the association between race and adenoma rates, we used type of insurance as a surrogate for SES and adjusted the analyses by insurance status (Medicaid vs. other), as well as participation of a trainee.

Statistical calculations were performed using SAS version 9.2 (Cary, NC, USA). The institutional review board of Columbia University Medical Center approved this study. The requirement of informed consent was waived since no patient contact was required and due to the retrospective nature of this analysis.

RESULTS

A total of 7459 asymptomatic individuals underwent complete screening colonoscopy during the study period. Due to missing data pertaining to race or ethnicity, 2197 (29%) subjects were excluded. In addition, 187 (3%) reported race other than white, black or Hispanic and were also excluded. In total, 5075 subjects were eligible for analysis and baseline characteristics of the cohort are shown in Table 1.

Of the 5075 eligible subjects, 3542 (70%) were white, 942 (19%) were Hispanic and 591 (12%) were black (Table 1). Fifty eight per cent of subjects were women. The mean age for the entire cohort was 62.2 years (s.d.: ± 9.1), where whites were slightly older than Hispanics, 62.9 vs. 60.0 years ($P < 0.0001$) and blacks (61.4 years, $P = 0.0005$). Eleven per cent of whites reported a family history of colorectal neoplasia compared to only 5% of Hispanics ($P < 0.0001$) and blacks ($P < 0.0001$).

The adenoma prevalence among all subjects was 20% (Table 2). At least one colorectal adenoma was present in 19% of whites, 22% of Hispanics ($P = 0.09$) and 26% of blacks ($P = 0.0001$). Among men, adenomas were present in 23% of whites, 26% of Hispanics ($P = 0.14$) and 32% of blacks ($P = 0.002$). Among women, adenomas were present in 16% of whites, 19% of Hispanics ($P = 0.21$) and 23% of blacks ($P = 0.002$). Overall, the risk of adenoma was higher in men compared with women in all three groups.

Differences in adenoma prevalence among white, Hispanic and black men and women were age-dependent (Figure 1). Among those subjects between 50 and 59 years, neither men nor women demonstrated a statistically significant difference in the prevalence of adenomas among the three groups. In the remaining age strata, the differences among whites, Hispanics and blacks were either significant (men ages 60–69, women ages ≥ 70), or

demonstrated a trend towards statistical significance (men ages ≥ 70 $P = 0.18$, women ages 60–69 $P = 0.10$). The consistent gradient of adenoma prevalence, where whites had the lowest prevalence and blacks had the highest prevalence, illustrates a lack of effect modification of age and gender on the relative differences among these three groups.

The number, size, location and histology of adenomas are shown in Table 3. The number of adenomas per patient was fewer in whites (0.26) than in Hispanics (0.30, $P = 0.11$) and blacks (0.39, $P < 0.0001$). Blacks were more likely to have ≥ 3 adenomas (4.1%) as compared to Hispanics (1.2%, $P = 0.0003$) or whites (1.6%, $P < 0.0001$).

Advanced lesions based on increased polyp size and/or advanced histology were present in 3.7% of whites, 6.5% of Hispanics ($P = 0.0002$) and 5.4% of blacks ($P = 0.05$). Isolated proximal adenomas, as defined by proximal adenomas in the absence of any distal adenoma, were present in 9% of whites, 11% of Hispanics ($P = 0.03$) and 11% of blacks ($P = 0.03$). Similarly, isolated proximal advanced adenomas, was present in 1.3% of whites, 2.4% of Hispanics ($P = 0.009$) and 2.4% of blacks ($P = 0.04$).

On multivariate analysis, Hispanic ethnicity and black race were associated with an increased risk of adenomas and advanced adenomas, once adjusting for age, gender and presence of a family history of colorectal neoplasia (Table 4). Increasing age, male gender and family history were associated with an increased adenoma rate and the presence of an advanced adenoma. Compared to whites, adenoma rate was highest in blacks (RR: 1.76, 95% CI: 1.52–2.04) but was also elevated in Hispanics (RR: 1.37, 95% CI: 1.20–1.57). The odds of an advanced adenoma were greatest among Hispanics (OR compared to whites 2.25, 95% CI: 1.62–3.11) but were also increased among blacks (OR: 1.91, 95% CI: 1.27–2.86). When adjusting for medical insurance status as a surrogate for SES (Medicaid insurance vs. other), the adenoma rates remained similarly elevated in Hispanics (RR: 1.35, 95% CI: 1.12–1.63, $P = 0.002$) and blacks (RR: 1.76, 95% CI: 1.51–2.04, $P < 0.0001$) as compared to whites. Similarly, when adjusting for the participation of a trainee in the colonoscopy, the adenoma rates remained elevated in Hispanics (RR: 1.21, 95% CI: 1.05–1.40, $P = 0.01$) and blacks (RR: 1.70, 95% CI: 1.46–1.97, $P < 0.0001$).

DISCUSSION

This study is the first to describe the comparative prevalence of histologically confirmed colorectal adenomas among asymptomatic white, Hispanic and black individuals undergoing screening colonoscopy in the US. We found that the prevalence of adenomas among Hispanics and blacks exceeds that of whites and this difference is similar between men and women. Hispanics had the highest prevalence of large adenomas ≥ 10 mm and blacks had multiple (≥ 3) adenomas which represent advanced colorectal neoplasia that require more frequent endoscopic surveillance for CRC prevention. Most notably, Hispanics and blacks had an increased prevalence of proximal neoplasms in the absence of any distal pathology compared to whites. These lesions can only be detected if colonoscopy is the chosen screening modality.

To date, the issue of racial and ethnic disparities in the prevalence of colorectal adenomas has focused predominantly on comparisons drawn from studies involving only whites and blacks. Using data from the Clinical Outcomes Research Initiative (CORI), Lieberman and colleagues found that blacks had a higher prevalence of polyps >9 mm compared to whites (7.7% vs. 6.2%), although polyp histology was not available. This difference was more pronounced among women and individuals older than 60 years.² Our study, which provides histological review to include only adenomatous lesions, confirms the aforementioned

findings of an increased risk of colorectal neoplasia among blacks as compared to whites, especially after the age of 60 years but equally among men and women.

Similar studies assessing the risk of adenomas in whites as compared to Hispanics in the US are sparse. A recent report on 647 patients in Puerto Rico undergoing screening colonoscopy found an overall adenoma prevalence of 25.1%, similar to the reported prevalence of 22% in the present study.⁵ In a CORI-based study ascertaining the prevalence of large (>9 mm) neoplasia among individuals receiving colonoscopy for screening, surveillance or evaluation of symptoms, Hispanics undergoing colonoscopy for any reason had a similar risk of large polyps compared to whites (RR: 1.03, 95% CI: 0.94–1.12), although histological confirmation of adenomatous polyps was unavailable.⁸ A recent study using the same database but limiting the analyses to only those asymptomatic individuals undergoing screening colonoscopy, found no difference in the prevalence of large polyps between Hispanics and whites. However, these results should be interpreted with caution as histological confirmation of adenomatous polyps was not conducted.⁶

The CRC incidence and mortality is currently reported to be lower in Hispanics as compared to whites and blacks.¹ However, there is emerging evidence that the risk of CRC among Hispanics may be increasing with acculturation⁹ and some studies report increased rates of CRC among some Hispanic subpopulations in the US compared with their countries of origin.^{10, 11} It is not unexpected for immigrants to gradually acquire the disease profile of the host population with increased risks seen in subsequent generations.^{11, 12} Our study may support the impact of acculturation over time among Hispanics who have relocated to the US, as the prevalence of adenomas and advanced lesions exceeded that of whites, particularly in individuals over the age of 60 years. However, the number of colonic adenocarcinomas in this study was highest among whites (1%) and was similar among blacks (0.3%) and Hispanics (0.2%). Given the overall small number of CRCs among the three groups, we cannot interpret this data in a meaningful way. We suspect that additional CRC cases among blacks and Hispanics were likely excluded by the indication for colonoscopy where these patients may have presented for diagnostic colonoscopy to evaluate for signs or symptoms associated with CRC. Whether or not our findings represent differences in a biological predisposition to colorectal neoplasia among blacks and Hispanics is not known. Future collaborative studies are necessary to also explore the possibility of an interaction between race and acculturation as well as socio-economic status.

This study has a number of strengths. The practice setting is unique for this comparative study given the diverse racial and ethnic makeup of the patient population. In addition, the endoscopy unit at Columbia University Medical Center employs a patient navigator programme that has resulted in increased screening rates among traditionally underserved minority groups.¹³ Furthermore, this is the first study of histologically confirmed data on adenoma prevalence and advanced lesions to include Hispanics as well as whites and blacks, so as to yield comparative data. In previous studies, polyp size was used as a surrogate for advanced histology; however, size estimates during colonoscopy are subject to inter-observer variability and advanced histology can occur in small polyps.¹⁴

There are several limitations to this study. It is possible that some examinations may have been misclassified as first-time screening procedures where patients included in this analysis may have had a previous colonoscopy. To minimise this, all patients in which the indication included a personal history of colorectal polyps were excluded, as were diagnostic examinations such as those with an indication of gastrointestinal bleeding or anaemia. It is unlikely that any residual misclassification would have been differentially distributed among whites, Hispanics and blacks.

Second, race or ethnicity was available as a single-entry field in the medical record where 2197 patients were excluded from analysis due to a missing entry for race/ethnicity. The exclusion of such patients may limit the generalisability of our findings. It is possible that the excluded subjects may have been systematically different from those subjects included in the analysis. However, the overall prevalence of ≥ 1 adenoma in the excluded patients was 23%, which falls in between the adenoma prevalence of whites (who had the lowest prevalence) and blacks (who had the highest prevalence). This suggests that the excluded subjects were likely of various races/ethnicities and that they were not especially high or low-risk for colorectal neoplasia. In addition, categorisation of race and ethnicity may have been misclassified. Our institution does not conform to the NIH Policy on Reporting Race and Ethnicity Data, where both race and ethnicity are assigned to each patient. However, this variable was self-identified and significant misclassification would bias the results towards the null; the consistent disparity of adenoma prevalence among multiple age groups and both genders suggests that such misclassification was minor and lends credence to the association found between race/ethnicity and risk of colorectal neoplasia.

Another potential limitation is that the results of this study, as they pertain to Hispanics, may not be generalisable. The Hispanic population in the US is genetically heterogeneous and the results reported on the Hispanic population residing in Northern Manhattan, which is composed primarily of individuals of Dominican and other Caribbean descent, may not necessarily be applicable to all Hispanics. Lastly, there are several potential confounders for which we were unable to adjust in our analyses. Information on medication use (including aspirin and non-steroidal inflammatory drugs), smoking status, body mass index and history of diabetes, which are all associated with variable risk on colorectal neoplasia, were unavailable and may have been differentially distributed between the three patient populations. Similarly, SES, which may not have been comparable among the three groups, may be associated with risk factors for colorectal neoplasia independent of race or ethnicity. For this reason, we included Medicaid enrolment as a surrogate for SES in the multivariate analysis.

The findings of this study may have important implications for determining the preferred CRC screening modality among black and Hispanic individuals. Given the increased number of isolated right-sided neoplasia, including adenomas greater than 10 mm, among both Hispanics and blacks as compared with whites, a full structural endoscopic examination using colonoscopy may be favoured over other CRC screening tests. In addition, our findings may support the development of programmes that will educate patients on the importance of endoscopic surveillance in those individuals with previously detected adenomas. To date, there are no studies that examine adherence to endoscopic surveillance for colorectal neoplasia in either black or Hispanic individuals. This study's findings may also impact the overall utilisation of colonoscopy and the capacity needed once factoring in the increased need of endoscopic surveillance among diverse patient populations at increased risk for advanced adenomas.

In conclusion, asymptomatic black and Hispanic individuals who undergo age-appropriate CRC screening have a higher risk of colorectal adenomas. Hispanics appear to have a greater prevalence of large (≥ 10 mm) adenomas, while blacks are at greater risk for multiple adenomas. Both patient populations had an equally high risk of having proximal advanced neoplasia in the absence of distal lesions, as compared to whites. Upon validation of these results, the use of colonoscopy may be the preferred screening modality among Hispanics as well as blacks for CRC prevention and control. Presently, continued efforts to improve the uptake of CRC screening are necessary among both black and Hispanic patients.

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Figure 1.
Prevalence of adenomas in white, Hispanic and black patients stratified by age and gender.

Table 1

Patient characteristics by race/ethnicity

	All (n = 5075)	White (n = 3542)	Hispanic (n = 942)	P value *	Black (n = 591)	P value *
Age (mean, years)	62.2	62.9	60.0	<0.0001	61.4	0.0005
Age distribution						
50–59	2288 (45)	1494 (42)	506 (54)	<0.0001	288 (49)	0.0047
60–69	1660 (33)	1168 (33)	306 (32)		186 (31)	
70	1127 (22)	880 (25)	130 (14)	117 (20)		
Female gender	2948 (58)	1980 (56)	571 (61)	0.0094	397 (67)	<0.0001
Indication						
Average risk	4606 (91)	3151 (89)	894 (95)	<0.0001	561 (95)	<0.0001
Family history	469 (9)	391 (11)	48 (5)		30 (5)	

Values are expressed as n (%).
* P value as compared to whites.

Table 2

Prevalence of adenomas by race/ethnicity

	White (n = 3542)	Hispanic (n = 942)	P value *	Black (n = 591)	P value *
Overall prevalence	675 (19)	203 (22)	0.09	153 (26)	0.0001
Men	352/1562 (23)	97/371 (26)	0.14	63/194 (32)	0.0021
Women	323/1980 (16)	106/571 (19)	0.21	90/397 (23)	0.0023
Age					
50–59	250/1494 (17)	91/506 (18)	0.52	56/288 (19)	0.26
60–69	206/1168 (18)	75/306 (25)	0.0064	52/186 (28)	0.0009
70	219/880 (25)	37/130 (28)	0.38	45/117 (38)	0.0018
Indication					
Average risk	501/3110 (16)	191/891 (21)	0.0002	144/556 (26)	<0.0001
Family history	151/391 (39)	12/48 (25)	0.07	6/30 (20)	0.0421

* P value as compared to whites.

Table 3

Adenoma size, location and histology in white, Hispanic and black patients

	White (n = 3542)	Hispanic (n = 942)	P value*	Black (n = 591)	P value*
Number of adenomas per patient	0.26	0.30	0.11	0.39	<0.0001
Number with 1 adenoma	675 (19)	203 (22)	0.09	153 (26)	0.0001
Advanced adenomas [†]					
10 mm	96 (2.7)	55 (5.8)	<0.0001	24 (4.1)	0.07
Villous, tubulovillous, or HGD	74 (2.1)	16 (1.7)	0.45	17 (2.9)	0.23
Any advanced features	132 (3.7)	61 (6.5)	0.0002	32 (5.4)	0.05
3 adenomas	57 (1.6)	11 (1.2)	0.32	24 (4.1)	<0.0001
Isolated proximal adenomas	301 (9)	101 (11)	0.03	66 (11)	0.03
Isolated proximal advanced adenomas [†]					
10 mm	31 (0.9)	20 (2.1)	0.0013	10 (1.7)	0.09
Villous, tubulovillous, or HGD	22 (0.6)	9 (1.0)	0.27	6 (1.0)	0.28
Any advanced features	45 (1.3)	23 (2.4)	0.009	14 (2.4)	0.04

HGD, high grade dysplasia.

* P value as compared to whites.

[†] Advanced adenomas are defined as those 10 mm in diameter and/or exhibiting advanced histology such as villous, tubulovillous features or high grade dysplasia.

Table 4

Multivariate analysis of factors independently associated with adenoma rate and the presence of an advanced adenoma

	Rate Ratio for adenoma (95% CI)	P value	Odds Ratio for advanced adenoma (95% CI)	P value
Age				
50–59	1.0	–	1.0	–
60–69	1.27 (1.12–1.44)	0.0002	1.01 (0.72–1.40)	0.98
70	1.70 (1.50–1.94)	<0.0001	1.62 (1.16–2.25)	0.0046
Male gender	1.58 (1.42–1.75)	<0.0001	2.04 (1.55–2.69)	<0.0001
Indication				
Average risk	1.0	–	1.0	–
Family history	2.08 (1.81–2.40)	<0.0001	2.87 (2.02–4.10)	<0.0001
Ethnicity				
White	1.0	–	1.0	–
Hispanic	1.37 (1.20–1.57)	<0.0001	2.25 (1.62–3.11)	<0.0001
Black	1.76 (1.52–2.04)	<0.0001	1.91 (1.27–2.86)	0.0019