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Race and prevalence of large bowel polyps among the low-income and uninsured in South Carolina

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Abstract

Background—Compared to whites, blacks have higher colorectal cancer (CRC) incidence and mortality rates and are at greater risk for early onset disease. The reasons for this racial disparity are poorly understood, but one contributing factor could be differences in access to high quality screening and medical care.

Aims—The present study was carried out to assess whether a racial difference in prevalence of large bowel polyps persists within a poor and uninsured population (n=233, 124 blacks, 91 whites, 18 other) undergoing screening colonoscopy.

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- Research involving Human Participants and/or Animals: The study was approved by the institutional review board at the Medical University of South Carolina.
- Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Methods—Eligible patients were uninsured, asymptomatic, had no personal history of colorectal neoplasia, and were between the ages 45–64 years (blacks) or 50–64 years (whites, other). We examined the prevalence of any adenoma (conventional, serrated) and then difference in adenoma/polyp type by race and age categories.

Results—Prevalence for ≥ 1 adenoma was 37% (95% CI 31%–43%) for all races combined and 36% in blacks < 50 years, 38% in blacks ≥ 50 years, 35% in whites. When stratified by race, blacks had a higher prevalence of large conventional proximal neoplasia (8%) compared to whites (2%) (p-value =0.06) but a lower prevalence of any serrated-like polyp (blacks 18%, whites 32%); p-value=0.02) and sessile serrated adenomas/polyps (blacks 2%, whites 8% chi-square p-value; p=0.05).

Conclusions—Within this uninsured population the overall prevalence of adenomas was high and nearly equal by race, but the racial differences observed between serrated and conventional polyp types emphasizes the importance of taking polyp type into account in future research on this topic.

Keywords

race; colorectal adenomas; serrated polyps; socioeconomic status; screening

Introduction

Colorectal cancer (CRC) is the third most common malignancy in the United States (US) and the second leading cause of cancer death (1). Compared with whites, blacks have higher CRC incidence and mortality rates and are more likely to be diagnosed with late stage disease (2). Lower socioeconomic status is also associated with higher risk of and poorer outcomes from CRC (3–6), which may partially explain the differences observed by race since blacks are more likely to be poor (7) and uninsured (8) than whites. To advance understanding of the racial disparity in colorectal neoplasia, it is therefore important to discern how much of the disparity is attributable to race *per se* (i.e., the combination of biological factors and lifestyle and behavioral CRC risk factors that differ by race) and how much is due to health inequity in access to and utilization of appropriate screening and follow-up care.

Several studies have investigated the prevalence of large bowel polyps, precursors to most CRC, by race. In studies comparing blacks with whites at screening colonoscopy (9–13), nearly half have observed (10–12, 14) a higher risk of one or more adenomas among blacks. A smaller set of studies has identified a higher risk of advanced adenomas in blacks, especially proximal lesions (10, 13, 15). Establishing whether racial differences in prevalence of large bowel polyps persist within a low-income, uninsured population could provide very valuable clues for distinguishing between the influences of race/ethnicity versus socioeconomic status. Only a few investigations have evaluated the association of race and risk of polyps in socioeconomically disadvantaged populations (10, 15–17). Among Medicaid patients, Lebwohl et al. observed a higher risk of adenoma among blacks compared with whites (10), whereas in a population of uninsured patients undergoing screening colonoscopy, Xirasagar and others (17) reported no difference in adenoma

prevalence by race. Schroy et al. (15) using data from a safety net hospital observed a higher risk of advanced proximal adenomas in blacks compared to whites but otherwise no difference by race. In another large screening colonoscopy based study, conducted exclusively in under- and uninsured patients, Lane and colleagues (16) found a higher prevalence of proximal adenomas in blacks compared to whites and Hispanics; they also reported a higher prevalence of advanced adenomas in blacks compared to Hispanics but no difference was observed between whites and blacks.

An important gap in the existing evidence is lack of evaluation of the risk of polyps by race at younger ages, < 65 years. This evaluation is important because 1) up to 10–15% of patients are diagnosed with CRC before the age of 50, and this rate is higher in blacks compared to whites (18, 19); and 2) CRC in younger blacks may be more aggressive compared to younger whites or Hispanics (20, 21). In the few screening studies including blacks as young as 45 years of age, adenoma detection rates have been higher than expected, i.e., equivalent to rates among older whites and blacks (17, 22, 23). Further, no previous studies have examined these relationships according to conventional versus serrated polyps. To specifically address these issues, the present study was carried out within a younger-aged (i.e., < 65 years), racially diverse, poor and uninsured population undergoing screening colonoscopy to assess whether 1) a racial difference in the overall prevalence of large bowel polyps was present; and 2); there was a racial difference in the prevalence of different types of large bowel polyps.

Methods

All patients were recruited at one of five free medical clinics (FMC) in four South Carolina cities (Charleston, Columbia, Anderson, Spartanburg) from November 2011 to August 2013. All were participants in the South Carolina Colon Cancer Prevention Study (PI-Wallace), a research study conducted in collaboration with the South Carolina Colon Cancer Prevention Network (SC-CCPN) screening program. The SC-CCPN provides free screening colonoscopies to poor, uninsured, and asymptomatic patients with no personal history of colorectal neoplasia. Patients were blacks between the ages of 45 and 65 years and patients of all other races/ethnicities were between the ages of 50 to 65 years. Blacks were eligible for screening beginning at age 45 as recommended by the American College of Gastroenterology (24)

Each patient was documented to be uninsured and living at or below 200% poverty level (defined for a household of one from 2011–2013 as an income of $21,780– $22,980). Patients were excluded if they were unable to speak English, cognitively unable to provide informed consent, symptomatic, and/or had a personal history of colorectal neoplasia (polyps and or cancer). The institutional review board at the Medical University of South Carolina approved the study.

Working with the SC-CCPN, patients were recruited by patient navigators in-person at the FMC or through the US mail from patient lists provided by the FMC. Patients received a brochure describing the research study by mail or in-person depending on the recruitment strategy. If a patient was deemed clinically (asymptomatic, average-risk, above-risk of CRC)

and medically eligible (cleared to undergo medical procedure) for screening colonoscopy, the patient naviagtor provided a detailed overview of the CRC screening and research components. Patients were allowed to enroll in the SC-CCPN screening program and not particpate in the research portion. The patient navigator recorded the patient's weight and height, using instruments available at the FMCs. The navigator also administered a brief questionnaire to patients asking about their personal medical and family history of disease, lifestyle factors (e.g. smoking status, alcohol use), physical activity, diet, work, and educational attainment. For a small subset of patients, a few variables (e.g. height, weight, and smoking status) were obtained from the pre-intake colonoscopy record if not available from the patient.

Endoscopy and pathology reports were used to classify each patient's screening outcome. From the endoscopy report, we obtained several measures related to colonoscopy quality, including: visual documentation of the cecum, bowel preparatory quality rating (excellent, good, fair, poor), and whether the colon was clear at the end of exam. Bowel preparatory quality was then grouped into three categories: high-quality (excellent/good), intermediate quality (fair), and low-quality (poor) (25). We also recorded the location and estimated size of each colorectal lesion. Each polyp was categorized according to its location within the colon: proximal (cecum, ascending colon, hepatic flexure, transverse colon), distal (splenic flexure, descending colon, sigmoid colon), or rectal (recto-sigmoid, or rectum). From the pathology reports, we obtained histologic diagnosis and grade. Conventional adenomas (CA) were defined as tubular, tubulovillous, or villous polyps. Advanced CA were defined as adenomas with at least 25% villous component, high-grade dysplasia, or an estimated size of ≥ 1 centimeter. Serrated polyps (SP) included hyperplastic polyps, sessile serrated adenomas/polyps, and traditional serrated adenomas. Serrated lesions with malignant potential were classified into two types: Sessile Serrated Adenoma/Polyps (SSA/P) which included sessile serrated and mixed histology lesions and Traditional Serrated Adenomas (TSA). Large serrated polyps were defined as any SP with estimated size of 1 ≥ cm. All endoscopy and pathology reports were reviewed by study PI and verified by second reviewer.

Data Management and Statistical Analysis

All research data were managed by the Data Coordinating Center at the Medical University of South Carolina's Hollings Cancer Center, Charleston, SC and housed in a secure REDCap database. Clinical screening data were housed in Navigation Tracker®, a web-based virtual navigator tracking system. To assess if there were differences in baseline characteristics by race/ethnic group, we use a chi-square test for categorical variables or the ANOVA for continuous variables. We estimated the overall prevalence (and 95% confidence interval) of large bowel polyps in the total study population and then estimated the overall prevalence (and 95% confidence intervals) of polyps by race. The prevalence of any or advanced neoplasm and any serrated polyp was evaluated in three groups: blacks 45–49 years, blacks 50–64 years, whites 50–64 years, and others 50–64 years. Additionally, we examined race and prevalence of polyps and advanced polyps in the proximal and distal colorectum. To create 95% CIs for the binomial proportions we used the Wilson statistic. To account for the effect of potential confounding variables on the relationship between race

and prevalence of large bowel polyps, we used logistic regression analysis to generate prevalence odds ratios (OR) and 95% Confidence Intervals (CI) adjusting for age, sex, and clinical site. Because of the strong association reported between smoking status and risk of serrated type lesions (26–29), we compared the main of effect of race with and without adjustment for smoking status or pack years of smoking.

Results

Table 1 summarizes sociodemographic and clinical characteristics of the 233 patients who underwent a complete colonoscopy exam; patients which did not have visualization to the cecum were excluded (n=4). Of the patients with documentation of bowel prep quality (n=170), 88% of the colonoscopy exams were rated as high quality, 11% as intermediate quality, and 1% as poor quality. The overall adenoma prevalence among those with high quality exams (n=150), intermediate quality (n=18), and poor (n=2) was 38%, 50%, and 0%, respectively. 99% (n=230) of patients were reported to have a clean colon at the end of the colonoscopy exam.

Mean age of patients was 55.0 years (SD 4.2) and 58.7 % of patients (n=138) were female. Of the 233 patients included in the study, 39% were self-described whites 50–64 years (n= 91), 6% were black 45– 49 years (n=14), 47% were black 50–64 (n= 110), and 8% were other (including Hispanic, mixed raced, American Indian, Asian, other) (n= 18). None of the baseline sociodemographic or clinical characteristics differed significantly by race except working status (p=0.002).

The overall prevalence of adenoma in the total study population was 37% (95% confidence interval 31%–43 %) for ≥ 1 adenomas and 10% (95% CI 7%–15 %) for any advanced adenoma. Table 2 summarizes the polyp prevalence by age, race, and polyp type. When stratified by race, the prevalence of ≥ 1 adenomas (conventional or serrated types) was 36% in blacks < 50 years, 38% in blacks ≥ 50 years, 35% in whites (p-value for difference 0.63); for any advanced adenoma, the prevalence was 14% in blacks < 50 years, 12% in blacks ≥ 50 years, and 9% in whites (p-value 0.37).

When stratified by histologic type and colonic location the percentage distribution in type appears to differ by race for advanced size proximal conventional adenomas and serrated histology type polyps (Table 2). For example, blacks had a higher prevalence of large conventional proximal neoplasia (8%) compared to whites (2%) (p-value =0.06). On the other hand, blacks had a lower prevalence of any serrated polyp (18%) compared to whites (32%) (P-value = 0.02) and a lower prevalence of SSA/P (2% versus 8%) in whites (P-value =0.05). Although we only identified two TSA in our study population, both lesions occurred in the distal colorectum of black patients over 50 years of age.

In the logistic regression models, adjustment for age, sex, and clinical site did not appreciably change the relationship between race and the prevalence odds of different types of colorectal polyps. For any adenoma (conventional, SSA/P, TSA) in blacks (≥ 50 years) compared to whites (≥ 50 years), the adjusted OR was 1.17 (95% CI 0.64–2.15). For any advanced lesion, the adjusted OR for blacks compared to whites was 1.41 (95% CI 0.53–

3.78); Other polyp types comparing blacks to whites adjusted for age, sex, and clinical site follow: any conventional adenoma, the OR was 1.27 (95% CI 0.69–2.37); any advanced conventional adenoma, the OR was 2.39 ((95% CI 0.77–7.44); any proximal large conventional adenoma, the OR was 4.87 (95% CI 0.95–25.1).

For serrated type lesions, we examined the OR for race with and without smoking variables included in the multivariable variable models. In the model adjusted for age, sex, and clinical center the OR for black race was 0.46 (95% CI 0.23–0.91) for any serrated polyp and 0.45 (95% CI 0.22–0.87) in the smoking adjusted model. In the same comparison for SSA/P, the OR for black race was 0.21 (95%CI 0.04–1.17) and 0.20 (95% CI 0.04–1.13) in the smoking status adjusted model. Similar findings were observed for pack years of smoking (data not shown). None of the other variables (listed in Table 1) had a significant impact on the OR but we were statistically underpowered to explore potential interactions or confounders in detail.

Discussion

The present study was carried out to investigate if the racial disparity in the occurrence of colorectal neoplasia persisted in a poor and uninsured population. Regardless of racial/ethnic background, the patients in our population had a 37% prevalence of neoplasia with a lower bound on the 95% confidence interval of 31%, higher than the 20–26% observed in studies of average risk 50–64 year-old patients undergoing screening colonoscopy (13). Endoscopic guidelines suggest that adenomas should be detected at a rate of at least 20% for average risk patients undergoing screening colonoscopy (25% for men, 15% for women) (30). The reasons why our data for males and females of both races exceeded these benchmarks is not known but may reflect the high quality of the bowel preparation among patients in our study, the endoscopic skill of our board certified gastroenterologists and or the high burden of risk factors among our low socioeconomic status population.

When stratified by racial/ethnic group, the overall prevalence of polyps was broadly similar in blacks < 50 (36 %), blacks ≥ 50 (38%) and whites (35%). Within the context of the present study, which is limited to those in poverty, this implies that lower socioeconomic status may be a marker of increased overall risk of polyps. This agrees with prior findings that poor and uninsured whites and blacks have higher CRC incidence and mortality rates compared to others (31–33). High prevalence of CRC risk factors (e.g. obesity, diabetes, sedentary lifestyle, smoking, alcohol intake) among both blacks and whites in our population also potentially contribute to the higher than average adenoma detection rates. To illustrate, the risk factor profile was highly unfavorable for both whites and blacks: 58% of whites and 53% of blacks were obese, 32% of whites and 36% of blacks had diabetes, and 61% of whites and 53% of blacks had high cholesterol. These results point to an unfavorable CRC risk profile among both poor whites and blacks and represent important areas for primary prevention interventions. Nevertheless, future studies with a comparison group will be needed to help tease apart the role of endoscopic performance versus risk factor burden in explaining the reason(s) for the high adenoma prevalence we observed in the present study.

Important differences in adenoma risk by race emerged by race when we stratified by histologic type. Blacks compared to whites had a higher prevalence of advanced size proximal conventional lesions but a lower prevalence of serrated adenomas. Blacks under 50 years of age had a risk of CA similar to whites 50 to 64 years. Racial distinctions by histology are not trivial as adenomas growing within different carcinogenic pathways (e.g. serrated or conventional) may evolve into invasive carcinomas with differing prognostic profiles. For example, MSI-H CRC, which occurs predominantly in the proximal colon, has a superior prognosis compared to microsatellite stable (MSS) CRC in the proximal colon (34, 35). MSI-H sporadic cancers (representing ~ 15% of CRCs) evolve from the precursor lesions of the serrated pathway (36), which we observed to be more common in whites than blacks. In line with this evidence, a population-based study comparing MSI-H cancer by race has shown whites compared to blacks have a higher prevalence (37), which has better prognoses, compared to MSS cancers. Similar to our results, many others (9, 10, 13, 22) have reported a higher prevalence of proximal or advanced proximal disease at screening colonoscopy in blacks compared to whites. Younger blacks appear to have a higher risk of proximal CRC (38), especially MSS (39). The etiology of the higher prevalence of proximal conventional neoplasia in blacks is unknown but CRC in the proximal location appears less influenced by lifestyle variables compared to the distal colon and rectum (3, 40). The fact that we did not observe any differences by race in the distal colorectum may reflect the similar CRC risk profiles in blacks and whites in the study population for the present study.

Age of CRC onset is younger in blacks compared to whites yet the stage of disease at diagnosis is more advanced. As such, the American College of Physicians and the American College of Gastroenterology have recommended that average risk blacks begin CRC screening at age 40 (41) or age 45 (24), respectively, compared to the standard 50 years of age (42). Although there is little published data in average risk patients under 50 years of age undergoing screening colonoscopy, most studies, including ours, reported adenoma prevalence rates in younger blacks similar to that of whites ≥ 50 years of age (22). Friedenberg and colleagues observed a non-significantly higher prevalence of advanced polyps in younger blacks (9%) compared to blacks (6%) or whites (7%) over 50 years of age. Similarly, a study among underserved blacks and whites in SC reported a detection rate of advanced lesions of 7.8% for blacks under 50 compared to 6.4% for blacks 50 and older. In the only study to compare advanced adenoma prevalence in white and black patients under 50 years of age, Lieberman and colleagues (9) did not observe a significant difference by race in the prevalence of large adenomas. However, black women < 50 had a prevalence rate of large adenomas of 5.6% compared to 3.5% for white women: RR 1.66. The dearth of available data on CRC in the young make it difficult to change screening policies; nevertheless, rates of CRC diagnosis in the under 50 is higher is blacks and they also shown poorer survival when diagnosed (38, 43).

In summary, our study had several strengths. All patients received the same screening, the same colonic prep and had access to navigator services. All of the colonoscopies were conducted by board certified gastroenterologists. We had evidence of high quality colonoscopy exams with high adenoma detection rates, good bowel prep, and high rates of completion. We had good geographic representation of the poor population across the state. We had excellent participation rates and availability of endoscopy and pathology reports for

all cases. However, we also had several limitations. We were statistically underpowered to examine the individual impact of potential confounders or effect modifiers on the association race and adenoma prevalence. We did not have standardized pathologic review. We had a very small number of blacks under 50 years of age.

In a study that used screening colonoscopies in an exclusively poor, medically underserved population to see if racial differences in the occurrence of colorectal neoplasia persisted, the overall prevalence was higher previous reports for average risk populations and was high in both whites and blacks, with no appreciable racial difference. However, the distribution of polyps according to histologic type and location revealed a racial difference, with blacks having a higher prevalence of advanced proximal adenomas and lower prevalence of serrated phenotypes than whites, which may indicate a tendency toward more aggressive CRC. This set of circumstances emphasizes the importance of taking polyp type into account in future research on this topic, as the emerging story so far suggests that this may offer an intriguing clue to the racial disparity in the population burden of colorectal cancer.

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Table 1

Characteristics of patients in the South Carolina Colon Cancer Prevention Polyp Study

Characteristic	Whites (n=91)	Blacks < 50 (n= 14)	Blacks 50+ (n= 110)	Other Race or Ethnicity (n=18)	P
Age—yrs. (sd)	56.0 (3.8)	48.0 (1.6)	55.0 (3.8)	55.7 (4.4)	
Education *					
< High school graduate	21 (29)	2 (18)	25 (27)	2 (12)	
High school graduate	24 (33)	6 (55)	40 (43)	7 (44)	
Any college	28 (38)	3 (227)	29 (30)	7 (44)	0.60
Working status *					
Unemployed	59 (81)	9 (88)	52 (55)	9 (56)	
Working	14 (19)	2 (18)	42 (45)	7 (44)	0.003
Male—no. (%)	39 (43)	7 (50)	41 (37)	8 (44)	0.73
Smoker—no. (%)					
Never	37 (41)	9 (64)	50 (45)	5 (28)	
Former	27 (30)	3 (21)	22 (20)	6 (33)	
Current	27 (30)	2 (14)	38 (35)	7 (39)	0.30
Body Mass Index -- no. (%)					
Normal (< 25 kg/m)	15 (17)	2 (15)	16 (15)	2 (11)	
Overweight (25–29 kg/m)	25 (28)	2 (15)	38 (35)	7 (39)	
Obese (30 kg/m –34 kg/m)	28 (31)	1 (8)	21 (19)	5 (28)	
Morbidly Obese (≥ 35 kg/m)	22 (24)	8 (62)	35 (32)	4 (22)	0.17
Waist to Hip Ratio ≥ 1	31 (38)	5 (42)	27 (26)	2 (13)	0.11
Sitting per day (6 hours+) *	36 (51)	4 (36)	52 (57)	8 (50)	0.60
Alcohol -- ≥1 drinks per week *					
Yes— no. (%)	16 (22)	5 (45)	34 (36)	3 (19)	0.11
Diabetes *					
Yes— no. (%)	23 (32)	5 (46)	33 (35)	8 (50)	0.48
High Cholesterol *					
Yes— no. (%)	45 (62)	7 (53)	49 (52)	9 (56)	0.58

Characteristic	Whites (n=91)	Blacks < 50 (n= 14)	Blacks 50+ (n= 110)	Other Race or Ethnicity (n=18)	P
Hypertension *					
Yes— no. (%)	52 (71)	8 (73)	73 (77)	14 (88)	0.55
Family History of CRC					
Yes— no. (%)	6 (7)	1 (7)	1 (1)	0 (0)	0.11

* Indicates that that following measures were only available on a subset of patients. Education, working status (n=194), waist to hip ratio (n=212), physical activity (n=190), alcohol, diabetes, high cholesterol, hypertension (n=195)

Table 2

Association of race and prevalence (95% CI) of conventional adenomas and serrated polyps in patients < 50 and ≥50 years of age

	Blacks < 50 (n=14)	Blacks ≥ 50 (n=110)	Whites ≥ 50 (n=91)	Other (n=18)
Any Adenoma	36 (16–61)	38 (30–48)	35 (26–45)	33 (16–56)
Advanced Adenoma [+]	14 (4–40)	12 (7–19)	9 (5–16)	6 (0–26)
Conventional Histology				
Any	36 (16–61)	36 (28–46)	31 (22–41)	33 (16–56)
Any Advanced	14 (4–40)	11 (6–18)	9 (5–16)	6 (0–26)
Proximal [*]	21 (8–47)	26 (19–35)	22 (9–45)	22 (0–9)
Proximal Large [*1]	7 (1–32)	8 (4–14)	2 (0–8)	0 (0)
Proximal Large Advanced Adenoma [*]	14 (4–40)	9 (5–16)	4 (2–11)	0 (0)
Distal Adenoma [**]	21 (8–48)	20 (13–29)	20 (13–30)	28 (12–51)
Serrated Histology				
Any SP [1]	7 (1–31)	19 (13–27)	32 (23–42)	28 (12–51)
Any SSA/P [1]	0 (0)	2 (0–8)	8 (4–15)	0 (0)
Any TSA	0 (0)	2 (0–6)	(0)	0 (0)
SP Large [#]	0 (0)	2 (0–6)	5 (2–12)	0 (0)
Proximal SP [*]	7 (1–31)	9 (5–16)	11 (6–19)	11 (3–33)
Distal SP [**1]	7 (1–31)	16 (10–24)	25 (17–35)	16 (10–24)

[+] Advanced adenoma included all adenomas that were large ≥ 1 cm, contained > 25% villous histology, and or HGD.

[*] Location was missing in 4 cases for proximal colon.

[**] Location was missing for 8 cases for distal colon/rectum.

[#] Large SP was defined as any lesion with serrated histology measuring ≥ 1 cm

[1] P-value for difference between blacks and whites which were < 0.10 included: conventional proximal large adenoma p=0.06, SP was p=0.02, SSA/P =0.05 and distal SP was p=0.07.