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ORIGINAL PAPER

Aspirin Use for Cardiovascular Disease Prevention in an African American Population: Prevalence and Associations with Health Behavior Beliefs

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Abstract

Cardiovascular disease (CVD) is a leading cause of morbidity and mortality in the United States, disproportionately affecting African Americans. Aspirin is an effective, low cost option to reduce cardiovascular events. This study sought to describe the use of aspirin for CVD prevention in African Americans and evaluate associations with demographics, cardiovascular risk factors and health behaviors and beliefs. A total of 684 African Americans adults ages 45–79 years completed surveys and were included in this analysis. Proportions of aspirin use were stratified by primary and secondary prevention and by number of CVD risk factors in the primary prevention population. Logistic regression was used to evaluate associations with aspirin use. Secondary prevention aspirin use was 62%. Primary prevention aspirin use was 32% overall and increased to 54% in those with > 2 CVD risk factors. A history of diabetes [adjusted odds ratio (aOR) 3.42, 95% CI 2.18–5.35] and hypertension (aOR 2.25, 95% CI 1.39–3.65) were strongly associated with primary prevention aspirin use, but a conversation with a health care provider was even stronger (aOR 6.41, 95% CI 4.07–10.08). Participants who answered positively to statements about people similar to them taking aspirin or that close contacts think they should take aspirin, were much more likely to take aspirin (aOR 4.80; 95% CI 2.58–8.93 and aOR 7.45; 95% CI 4.70–11.79 respectively). These findings support a hypothesis that aspirin use may increase by encouraging conversations with health care providers and creating a supportive social environment for aspirin use. Further studies need to be done to test this hypothesis.

Keywords Aspirin · Prevention · Cardiovascular disease · African Americans · Health behavior

Background

Cardiovascular disease (CVD) is the leading cause of disability and death in the United States [1]. African Americans are disproportionally affected by CVD with a higher incidence of disease and increased mortality compared to Whites [1, 2]. While substantial progress has been made to reduce mortality from heart disease and stroke, improvement has begun to plateau. The annual rate of decline in mortality for non-Hispanic Blacks has slowed from 3.71% in 2000–2011 to 1.29% in 2011–2014 [3]. There remains considerable opportunity to address disparities in cardiovascular outcomes. The most effective approach is to prevent the onset and progression of disease. One prevention strategy that has been used for years is low dose aspirin.

The benefits of aspirin after a heart attack or stroke are well proven [4, 5], and aspirin use for secondary prevention has increased over time in the general public [6]. Several

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well-designed clinical trials have demonstrated a reduction in a first myocardial infarction (MI) or stroke in participants taking low dose aspirin, at the expense of increased bleeding events [7–13]. This evidence has led multiple organizations to publish recommendations on primary and secondary prevention aspirin use. In 2009, the United States Preventive Services Task Force (USPSTF) published aspirin recommendations based on age and risk level. A positive recommendation was made for women ages 55–79 and for men ages 45–79 with elevated risk for CVD and a risk reduction benefit that outweighed bleeding risk [14]. These recommendations were updated in 2016 after completion of this study.

There is evidence of suboptimal primary prevention aspirin use in moderate to high risk individuals [15]. Contemporary preventive aspirin use rates among African Americans are limited but historically have been lower than aspirin use in Whites for both primary and secondary prevention [16–21]. Guidelines for aspirin do little to influence use [15], likely related in part to the difficulty in changing both provider and patient patterns of behavior. Behavior change techniques are an area of interest not only for treatment adherence but for many healthy lifestyle adjustments [22]. Beliefs about health behavior—such as self-efficacy, intention to modify a behavior, perceived social norms—have been associated with prevalence and control of CVD risk factors, and interventions targeting behavior change can be effective in improving smoking cessation, physical activity, blood pressure control and medication adherence [22–25]. However, there is little information regarding the effect of health behavior beliefs on aspirin use in an African American population at risk for a cardiovascular event.

The present study was designed to describe contemporary aspirin use for CVD prevention in African American adults, and to evaluate associations of use with demographics, socioeconomic status, CVD risk factors and health behavior beliefs.

Methods

Population and Setting

This study was conducted between April and August 2015 within the Minneapolis-Saint Paul metropolitan area. We recruited men ages 45–79 years and women 55–79 years by collaborating with community health workers with previous experience working in communities of color. Recruitment sites included churches, gyms, public events (community and health fairs), senior housing and community centers. A total of 784 individuals were enrolled. For this study, we only included individuals who self-identified as Black or African American and had complete information for sex and CVD risk factors (diabetes mellitus, current smoking, hypertension and hyperlipidemia). Participants were excluded if their main residence was outside of Minnesota. This resulted in a total of 684 surveys included in the final analysis (74 excluded for race; 22 excluded for missing data; four excluded for residence). All participants were offered a $10 gift card to participate. The requirement for written informed consent was waived by the University of Minnesota IRB due to the minimal risk of the study.

Data Collection

A 10-min, in-person survey was administered by trained community health workers. Survey questions addressed demographics and self-reported history of CVD to identify primary and secondary prevention populations as well as risk factors for CVD. CVD risk factors included diabetes mellitus, current smoking, hypertension and hyperlipidemia. Positive CVD history was defined as a history of heart attack, stroke or peripheral artery disease; or history of an endovascular or surgical procedure to revascularize coronary, carotid or limb arteries. Individuals with no history of CVD or revascularization procedures were considered the primary prevention sample. The survey examined aspirin use, other antithrombotic medication use, CVD risk perceptions, past aspirin-related discussions with a health care provider and health behavior beliefs and social norms related to aspirin use. Positive aspirin use was defined as daily or every other day use of low dose aspirin. Other antithrombotic medications specified in the survey included warfarin and clopidogrel. Nine questions related to health behavior beliefs and social norms were formulated based on the theory of planned behavior [26], which has been used in prior studies to evaluate health behaviors related to CVD [23, 24]. The questions are displayed in Supplemental Table 1.

Statistical Analysis

Descriptive data were stratified by primary and secondary prevention populations. Within the primary prevention sample, individuals were further stratified by number of risk factors. Categorical data are reported as n (%) and continuous data as mean [standard deviation (SD)].

For primary prevention individuals, logistic regression was used to examine the association of aspirin use with demographics and cardiovascular risk factors. Adjustments were made for age, sex and CVD risk factors. Health behavior beliefs including CVD risk perceptions and aspirin-related health beliefs and social norms were evaluated using a 4-point Likert scale (strongly disagree, disagree, agree and strongly agree). If agree or strongly agree was chosen, this was considered a positive response to the question. Logistic regression was used to evaluate the association of aspirin

use with a positive response to individual questions and with the number of positive responses modeled as a continuous variable. Interaction testing was done for prevention status and number of positive responses. This was non-significant, so primary and secondary prevention individuals were combined in the analysis of health behavior beliefs. We included an unadjusted model, a model with adjustment for age, sex and prevention status and a fully adjusted model that added CVD risk factors. Results are presented as adjusted odds ratios (aOR) with 95% confidence intervals (CI). All analyses were conducted using Stata version 15 (Stata Corp, College Station, Texas, USA).

The study was reviewed and approved by the University of Minnesota Institutional Review Board.

Results

Participant characteristics are described in Table 1. The mean age was 61.4 years with an older female population (64.2 ± 6.5 years) compared to males (58.4 ± 8.0 years). Fifty-two percent of participants were female, and 1% identified as Hispanic. Over 30% achieved a minimum of a college degree. CVD risk factors were common in this sample and higher in the secondary prevention population. Nearly all participants identified a primary care provider (94%), which was a similar finding in primary and secondary prevention populations. Over 60% exhibited past prevention behavior indicated by a recent history of vaccination for influenza. Discussions about aspirin use were more common in the secondary prevention population, as was the use of non-aspirin antithrombotic medications.

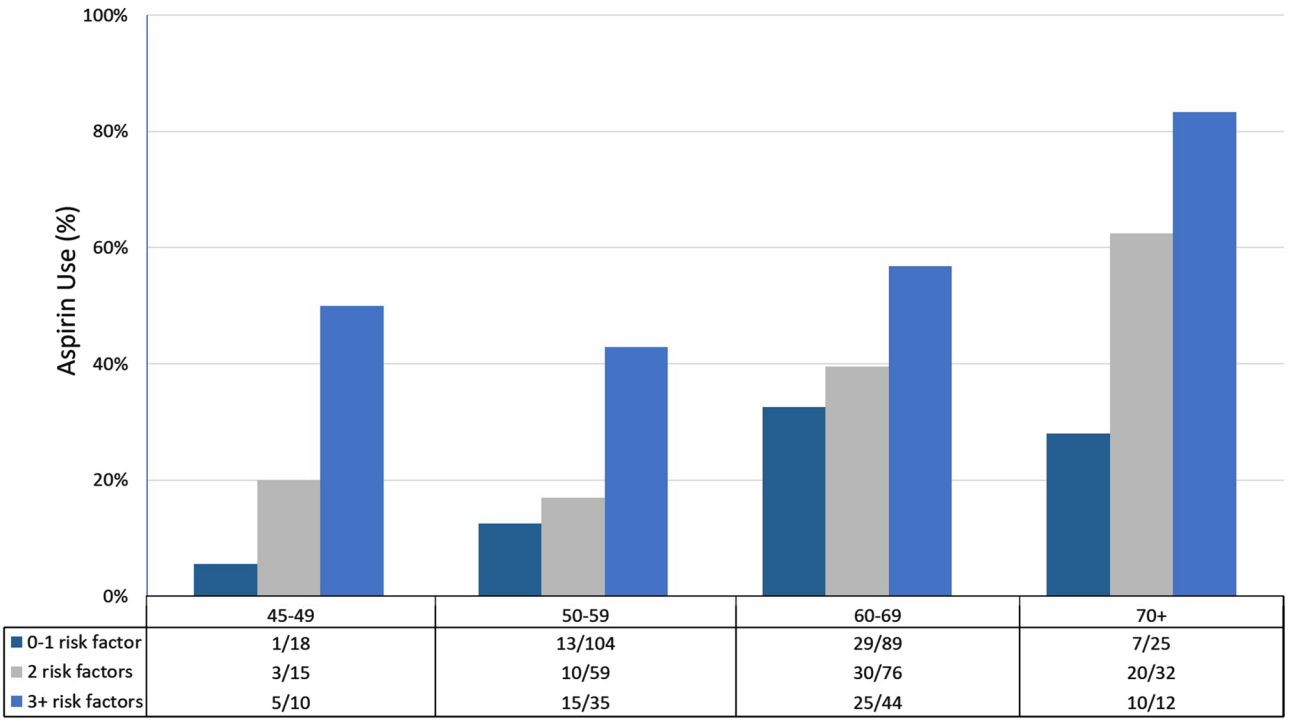
Secondary prevention aspirin use was 62% overall while 75% of participants used either aspirin or another form of antithrombotic medication. Total primary prevention aspirin use was lower (32%) and varied by age and number of risk factors (Fig. 1). Primary prevention aspirin use increased as the number of CVD risk factors increased (p for trend < 0.0001) regardless of age (p for interaction = 0.73). Of participants with 0–1 risk factor, 21% were taking aspirin. In contrast, 54% of those with > 2 risk factors were taking the medication (Fig. 1).

There were several factors associated with primary prevention aspirin use (Table 2). When modeled as a continuous

Table 1 Participant characteristics by cardiovascular disease (CVD) status and sex

	Total population		Primary prevention		Secondary prevention	
	Women (n = 358)	Men (n = 326)	Women (n = 265)	Men (n = 254)	Women (n = 93)	Men (n = 72)
Age (years)	64.2 ± 6.5	58.4 ± 8.0	63.8 ± 6.4	57.5 ± 7.8	65.3 ± 6.5	61.5 ± 7.7
45–49	0 (0)	45 (13.8)	0 (0)	43 (16.9)	0 (0)	2 (2.8)
50–59	103 (28.8)	146 (44.8)	84 (31.7)	114 (44.9)	19 (20.4)	32 (44.4)
60–69	180 (50.3)	102 (31.3)	132 (49.8)	77 (30.3)	48 (51.6)	25 (34.7)
70–79	75 (20.9)	33 (10.1)	49 (18.5)	20 (7.9)	26 (28.0)	13 (18.1)
Ethnicity						
Hispanic	1 (0.3)	9 (2.8)	1 (0.4)	7 (2.8)	0 (0)	2 (2.8)
Non-Hispanic	355 (99.2)	314 (96.3)	262 (98.9)	245 (96.5)	93 (100)	69 (95.8)
Education						
< High school graduate	45 (12.6)	51 (15.6)	29 (10.9)	33 (13.0)	16 (17.2)	18 (25.0)
High school graduate	96 (26.8)	102 (31.3)	75 (28.3)	84 (33.1)	21 (22.6)	18 (25.0)
Some college	90 (25.1)	77 (23.6)	63 (23.8)	56 (22.1)	27 (29.0)	21 (29.2)
College degree/graduate school	125 (34.9)	94 (28.8)	97 (36.6)	79 (31.1)	28 (30.1)	15 (20.8)
CVD risk factors						
Current smoker	60 (16.8)	129 (39.6)	41 (15.5)	98 (38.6)	19 (20.4)	31 (43.1)
Diabetes	110 (30.7)	93 (28.5)	71 (26.8)	61 (24.0)	39 (41.9)	32 (44.4)
Hyperlipidemia	180 (50.3)	150 (46.0)	124 (46.8)	104 (40.9)	56 (60.2)	46 (63.9)
Hypertension	253 (70.7)	223 (68.4)	181 (68.3)	161 (63.4)	72 (77.4)	62 (86.1)
Other antithrombotic use	36 (10.1)	43 (13.2)	9 (3.4)	19 (7.5)	27 (29.0)	24 (33.3)
Identify a regular health care provider	343 (95.8)	300 (92.0)	252 (95.1)	231 (90.9)	91 (97.9)	69 (95.8)
Received flu vaccine	237 (66.2)	205 (62.9)	170 (64.2)	154 (60.6)	67 (72.0)	51 (70.8)
Discussed aspirin with provider	188 (52.5)	154 (47.2)	122 (46.0)	105 (41.3)	66 (71.0)	49 (68.1)

All values are presented as n (%) except for age which is shown as mean ± standard deviation



	45-49	50-59	60-69	70+
0-1 risk factor	1/18	13/104	29/89	7/25
2 risk factors	3/15	10/59	30/76	20/32
3+ risk factors	5/10	15/35	25/44	10/12

Fig. 1 Primary prevention aspirin use by age and number of cardiovascular disease risk factors. Primary prevention aspirin use increased as the number of cardiovascular risk factors (current smoker, diabetes mellitus, hyperlipidemia and hypertension) increased (p for trend < 0.0001) regardless of age (p for interaction = 0.73)

variable, age was associated with a 7% increase per year after multivariable adjustment (aOR 1.07, 95% CI 1.03–1.10). Sex and level of education were not significantly associated with aspirin use. In the unadjusted analysis, participants with a history of diabetes, hypertension or hyperlipidemia were more likely to use aspirin, but smokers were less likely. However, after adjustment for age, sex and CVD risk factors, only a history of diabetes (aOR 3.42, 95% CI 2.18–5.35) and hypertension (aOR 2.25, 95% CI 1.39–3.65) remained associated with aspirin use. The strongest predictor was a history of a conversation about aspirin with a healthcare provider (aOR 6.41, 95% CI 4.07–10.08).

After adjustment for age, sex, CVD risk factors and prevention status (primary vs. secondary), several health behavior beliefs were associated with increased aspirin use (Fig. 2). Participants were more likely to take aspirin if they answered positively compared with those who responded negatively to statements regarding trust in their doctor (aOR 1.85, 95% CI 1.03–3.31); higher risk of future heart attack or stroke (aOR 1.51, 95% CI 1.05–2.17); safety of aspirin (aOR 26.89, 95% CI 11.69–61.87); and ease of aspirin use (aOR 20.89, 95% CI 9.02–48.38). As well, aspirin use was more likely when perceived positively in a social context. Participants who answered positively to the statement that people similar to them take aspirin were 4.80 times more likely to take aspirin (95% CI 2.58–8.93). When close contacts thought they should be taking aspirin, respondents were 7.45 times more likely to take the medication than those who responded to the question negatively (95% CI 4.70–11.79). In the fully adjusted model, the likelihood of aspirin use doubled with each positive response when the total number of positive responses were modeled as a continuous variable (aOR 2.12, 95% CI 1.83–2.45, p < 0.0001).

Discussion

This study provides data on primary and secondary prevention aspirin use in a contemporary, urban sample of African American adults and may help identify opportunities to improve appropriate aspirin use. It highlights the positive association between aspirin use, recognized CVD risk factors and conversations with primary care providers about medication use. Multiple health behavior beliefs were also associated with aspirin use including statements related to social context and social norms.

Prevalence of Preventive Aspirin Use

This study demonstrates a prevalence of secondary prevention aspirin similar to that reported in other African American and multi-racial populations [20, 21, 27, 28],

Table 2 Associations of regular aspirin use with demographics and CVD risk factors in primary prevention individuals (n = 519)

	N	Aspirin use n (%)	Unadjusted OR (95% CI)	Multivariable* OR (95% CI)	p Value
Age (years)			1.08 (1.05–1.11)	1.07 (1.03–1.10)	< 0.0001
45–49	43	9 (21%)	1 (Reference)	1 (Reference)	
50–59	198	38 (19%)	0.90 (0.40–2.03)	0.80 (0.33–1.98)	0.64
60–69	209	84 (40%)	2.54 (1.16–5.57)	1.85 (0.75–4.57)	0.18
70–79	69	37 (54%)	4.37 (1.82–10.47)	2.95 (1.08–8.08)	0.04
Sex					
Women	265	100 (38%)	1.66 (1.14–2.41)	1.07 (0.69–1.67)	0.75
Men	254	68 (27%)	1 (Reference)	1 (Reference)	
Education					
< HS graduate	62	17 (27%)	0.73 (0.39–1.38)	0.72 (0.35–1.49)	0.38
HS graduate	159	58 (36%)	1.11 (0.71–1.74)	1.03 (0.62–1.72)	0.90
Some college	119	33 (28%)	0.74 (0.45–1.23)	0.69 (0.39–1.22)	0.20
College degree	176	60 (34%)	1 (Reference)	1 (Reference)	
Current smoking					
Yes	139	32 (23%)	0.54 (0.34–0.84)	0.78 (0.47–1.29)	0.33
No	380	136 (36%)	1 (Reference)	1 (Reference)	
Diabetes					
Yes	132	75 (57%)	4.16 (2.74–6.30)	3.42 (2.18–5.35)	< 0.0001
No	387	93 (24%)	1 (Reference)	1 (Reference)	
Hyperlipidemia					
Yes	228	91 (40%)	1.85 (1.27–2.68)	1.13 (0.74–1.73)	0.58
No	291	77 (26%)	1 (Reference)	1 (Reference)	
Hypertension					
Yes	342	137 (40%)	3.15 (2.02–4.91)	2.25 (1.39–3.65)	0.001
No	177	31 (18%)	1 (Reference)	1 (Reference)	
Identify a regular health care provider					
Yes	483	165 (34%)	7.52 (1.77–31.92)	6.14 (1.35–27.89)	0.02
No	31	2 (6%)	1 (Reference)	1 (Reference)	
Discussed aspirin with a health provider					
Yes	227	126 (56%)	7.43 (4.89–11.29)	6.41 (4.07–10.08)	< 0.0001
No	292	42 (14%)	1 (Reference)	1 (Reference)	
Flu shot					
Yes	324	121 (37%)	1.88 (1.26–2.81)	1.43 (0.92–2.23)	0.11
No	191	46 (24%)	1 (Reference)	1 (Reference)	

CVD cardiovascular disease, *HS* high school, *OR* odds ratio, *CI* confidence interval

*Covariates for multivariable logistic regression adjustment: age (as a continuous variable), sex, smoking, diabetes, hyperlipidemia, hypertension

but aspirin use in African Americans has historically been lower than use in Whites. For example, Gu et al. reported a 68% prevalence of secondary prevention aspirin use among non-Hispanic Blacks versus 77% for non-Hispanic Whites using data from the 2011–2012 National Health and Nutrition Survey (NHANES) [28]. However, aspirin use among African Americans has increased over time. In 1987–1989, Atherosclerosis Risk in Communities (ARIC) Study investigators found aspirin use in Black men and women after a heart attack was 49% and 23% respectively [16]. Epidemiologic data from Minnesota shows a steady increase in secondary prevention aspirin use over 25 years [6].

Primary prevention aspirin use appropriately increased as CVD risk increased in this sample—54% percent of participants with 3–4 risk factors were taking aspirin compared to 21% with 0–1 risk factors—but moderate to high risk individuals may still be undertreated. This study did not have the information required to calculate a 10-year CVD risk score, but many participants with two or more risk factors likely fall above the age-specific, 8–12% risk thresholds designated in the 2009 USPSTF recommendations

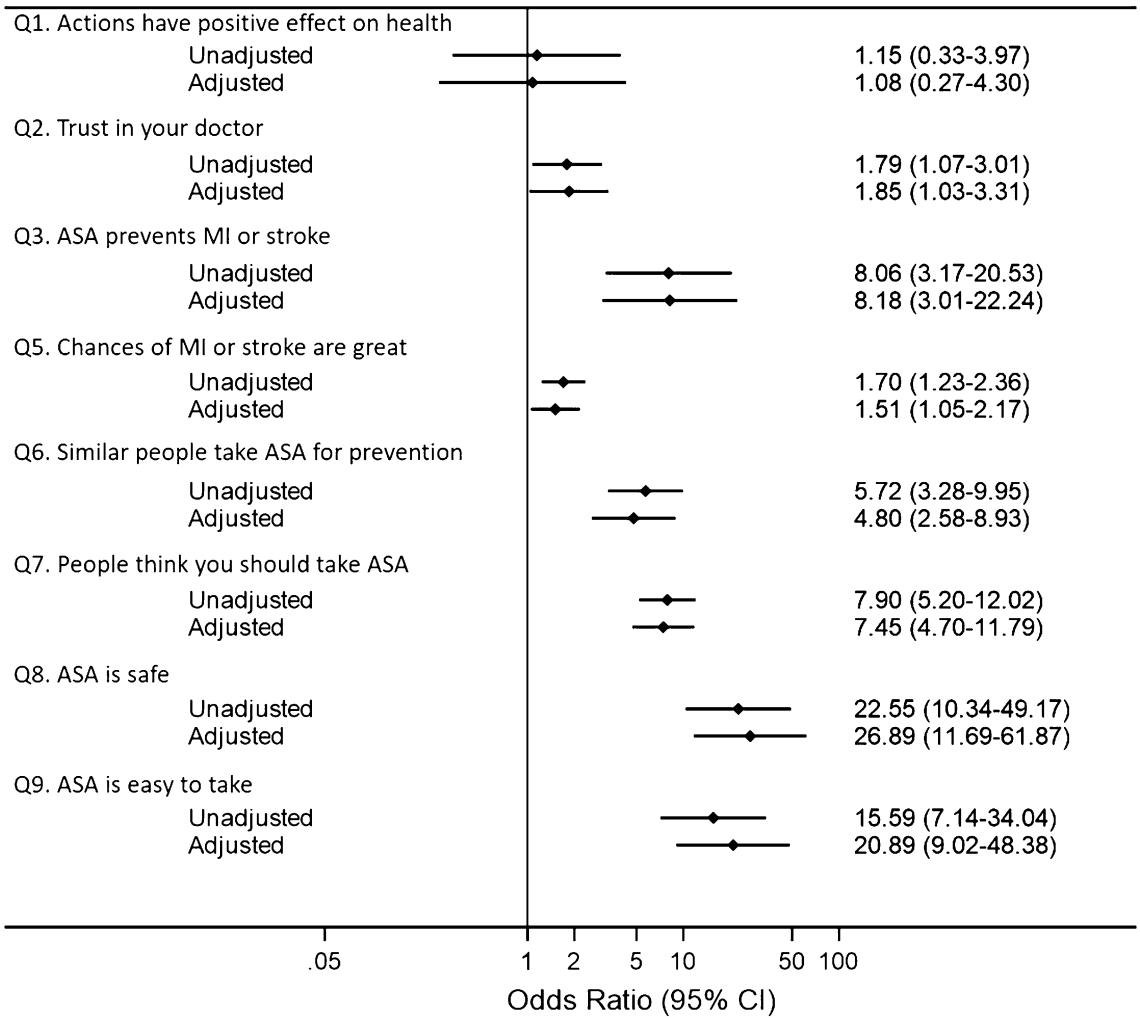


Fig. 2 Association of aspirin use with health behavior beliefs. This figure demonstrates the odds ratios of aspirin use with a positive (strongly agree or agree) or a negative (strongly disagree or disagree) response to each question. Odds ratios were adjusted for age, sex, prevention status (primary vs secondary), current smoking, diabetes mellitus, hyperlipidemia and hypertension. Question 4, regarding the importance of preventing a heart attack or stroke, was removed as only three participants responded no, and none of them used aspirin

[14]. Many African American men and women with 2–3 risk factors will reach a 10% 10-year CVD risk threshold between the ages of 50–60 years [29]. The overall prevalence of primary prevention aspirin use of 32% in this study is similar to other African American populations. Using data from the 2005–2007 Multi-Ethnic Study of Atherosclerosis (MESA), Sanchez et al. reported primary prevention aspirin prevalence of 19%, 27% and 43% in Blacks with low (< 6%), increased (6–9.9%) and high (≥ 10%) risk respectively, based on Framingham risk score. This was significantly less than aspirin use reported in Whites with 29%, 41% and 53% prevalence at low, increased and high risk respectively [19]. In the Reasons for Geographical and Racial Differences in Stroke (REGARDS) study, primary prevention aspirin use was lower than we observed among African Americans (27.2%), although these data are over 10 years old [18].

Associations with Primary Prevention Aspirin Use

In unadjusted analysis, all CVD risk factors were associated with increased aspirin use except for smoking. After adjustment for age, sex and CVD risk factors, only hypertension and diabetes remained positively associated with aspirin use. This contrasts with the REGARDS study [18] and a large clinical sample [15] where all risk factors remained significantly associated with aspirin use after similar adjustment. This may be due to the smaller sample size in the current study. The strong association found in diabetics likely reflects the impact of the American Diabetes Association recommendations. This sample was highly educated, but as shown in previous studies [17–19], education was not independently associated with aspirin use.

The participants in this study exhibited a high level of engagement with the health care system. Over 90% identified a regular health care provider, and two-thirds received an influenza vaccination in the past 2 years. The most powerful clinical predictor of aspirin use was a conversation with a health care provider (aOR 6.41, Table 2). This strong association was also reported by Williams et al. in a survey of U.S. adults ages 45–79, where a conversation with a medical provider was the strongest predictor (OR 23.8, 95% CI 17.7–31.5) [30]. Despite a history of mistrust between African Americans and physicians [31], these results suggest discussions regarding preventive therapies may be effective.

Beliefs About Health and Behavior

The questions about health behavior beliefs were formulated based on the theory of planned behavior, which was developed by Ajzen [26]. The theory is based on three components. The first is attitude towards a behavior, whether or not a person views the behavior favorably. The second is subjective norm. This is the perceived social acceptance or pressure to perform a certain behavior. The final component is perceived behavior control referring to the ease or difficulty of performing a behavior. Our study demonstrated strong associations between aspirin use and positive social norms/attitudes about aspirin use. There was also a strong, positive association with ease and safety of aspirin use. This theory has been used to explain aspirin use in women with high risk pregnancy [25] but not, to our knowledge, for general CVD prevention. It has been used to describe other CVD prevention behaviors including physical activity [23] and smoking cessation [24].

This study adds support to other studies that seek to shift patient-focused medical education and therapy in African Americans from the clinic to the community. A recently published trial evaluating a pharmacist driven blood pressure intervention in barber shops showed a significant reduction in blood pressure in the intervention arm [32]. The average reduction in systolic blood pressure was 21.6 mmHg greater in the intervention group. Part of the success of this program that targeted African American men was the ability to incorporate peer support. Our study suggests this concept may be applicable to aspirin use as well. There was a strong association between aspirin use and those who believed that people similar to them were using aspirin or people close to them thought they should be using aspirin. Education to increase knowledge about the safety and effectiveness of aspirin may also increase aspirin use. Additional studies could be done to test the effectiveness of an intervention to increase community awareness around aspirin use or other community-based efforts to increase aspirin use.

Limitations

This study has several limitations. This was a convenience sample limited to a single state and may not be widely generalizable. Participants were screened at community-based locations and may exclude those who are less involved or active in the community. Many of the screening locations were health focused (gyms, health fairs). People found at these sites are likely to be more interested in their health than the general public, although the prevalence of CVD risk factors in this sample was still high. Medical history and medication use were obtained by self-report and could not be adjudicated. However, there is evidence supporting the accuracy of self-reported aspirin use [33]. These results should be considered as hypothesis generating data that may inform additional, more rigorous evaluations.

Conclusion

This study examined aspirin use for CVD prevention among a contemporary, urban, African American population. Increased CVD risk, an aspirin-related conversation with a health provider and beliefs about peer attitudes regarding aspirin use were associated with increased aspirin use. Further studies should be done to evaluate the effect of changing individual and community beliefs regarding aspirin use for CVD prevention.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

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