International Scholarly Research Network
ISRN Vascular Medicine
Volume 2012, Article ID 165653, 9 pages
doi:10.5402/2012/165653

Review Article

African Americans and Peripheral Arterial Disease: A Review Article

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Received 15 April 2012; Accepted 18 June 2012

Academic Editors: C. Gaetano, B. Hambly, C. Maziere, A. E. Meinders, and C.-C. Wu

Peripheral arterial disease (PAD)—atherosclerosis of the abdominal aorta and arteries of the lower extremities—affects 12 million Americans. African Americans (AAs) are more than twice as likely as non-Hispanic whites to suffer from PAD. When compared to non-Hispanic whites with PAD, AAs with PAD have more severe disease and a greater reduction in walking distance, speed, and/or stair climbing. AAs with PAD are at increased risk for disease progression and worsening lower limb function. Reasons for the higher risk for disease progression have not been defined. One potential modifiable risk is a lower level of physical activity. Lower levels of physical activity are more common among African American seniors. Walking is a common type of physical activity. The benefits of walking therapy are only realized if the patient adheres to such therapy. Efforts are needed to increase walking in AAs with PAD. Additionally, risk factor management is key to reducing adverse events in AAs with PAD-yet few studies have targeted this high-risk group. In this paper, we discuss the management of PAD in AAs. Identifying current gaps will help to inform clinicians, researchers, and policy makers on next steps in identifying innovative approaches to increase home-based walking and reduce walking impairment in AAs with PAD.

1. Background

Patients with peripheral arterial disease (PAD) have impairment in lower limb function which negatively impacts mobility and daily activities [1]. Over time, patients with PAD experience deleterious declines in their walking ability (i.e., walking distance, speed, and/or stair climbing). Reduced walking ability, in turn, leads to mobility loss and an inability to perform activities of daily living.

2. Prevalence of PAD in African Americans

PAD disproportionately affects African Americans as compared to non-Hispanic whites. In a US sample of 2,174 persons aged 40 years and older, African Americans were 2.8 times as likely as non-Hispanic whites to screen positive for PAD [2]. In a report from the National Health and Nutrition Examination Survey (NHANES), African Americans had the highest prevalence of PAD as compared to non-Hispanic whites and Mexican Americans [1, 2]. In the Systolic Hypertension in Elderly Program [3], which was a randomized trial of 4,736 persons aged 60 years and older with hypertension, the prevalence of PAD was 23% for non-Hispanic white women, 25% for non-Hispanic white men, 38% for African American men, and 41% for African American women. Similarly, among 403 patients aged 50 years or older receiving primary care in Houston, TX, 13.2% of non-Hispanic whites, 13.7% of Hispanics, and 22.8% of African Americans screened positive for PAD [4]. Compared to non-Hispanic whites, African Americans have 1.5 times the risk of limb loss attributable to PAD [5]. Therefore, it is very important to have interventions that focus on African Americans with PAD.

3. Risk Factors

The most common etiology of PAD is atherosclerosis, with risk factors that include age 65 years and older, smoking,

diabetes mellitus, hypertension, and dyslipidemia. Smoking increases PAD risk 3-fold, and smokers are at increased risk for disease progression. Diabetes mellitus is also a risk factor for the development and progression of PAD. Diabetes mellitus causes endothelial dysfunction. In patients with diabetes mellitus, every one percentage point increase in glycosylated hemoglobin corresponds to a 26% increase in PAD risk [6]. Hypertension, another risk factor affecting approximately 80% of patients with PAD, increases the risk of symptomatic PAD (*intermittent claudication*) in men and women by 2.4- to 3.9-fold. Dyslipidemia, the combination of elevated low-density lipoprotein (LDL) and elevated triglycerides along with a low level of high-density lipoprotein (HDL), is also a risk factor for PAD.

4. Management of PAD

Control of atherosclerotic risk factors is a key component to reducing systemic ischemic events in persons with PAD. The major risk factors for PAD are smoking, hypertension, diabetes mellitus, and dyslipidemia [6]. Among persons with PAD, disease severity increases fourfold with heavy smoking and twofold with diabetes mellitus [6]. Further, for persons with diabetes mellitus, every 1% increase in glycosylated hemoglobin is associated with a 26% increased risk for PAD [7]. Approximately 80% of patients with PAD have hypertension but hypertension has a lower relative risk for PAD than that of smoking or diabetes mellitus [4, 6]. Similarly, the relative risk for disease is 1.67 among persons with dyslipidemia. Thus, current guidelines for PAD management include smoking cessation, blood pressure <130/80 mmHg, glycosylated hemoglobin A1c level of <7%, and low-density lipoprotein levels of <100 (<70 mg/dL in very-high-risk patients) [8, 9].

Smoking cessation in patients with PAD reduces the progression of disease [10], including the severity of claudication and the occurrence of rest pain [11]. Options for smoking cessation include clinic-based counseling programs and nicotine replacement [1, 8]. Bupropion, an antidepressant, has been shown to reduce rates of smoking, 35% at 6 months and 30% at 12 months [9]. Additionally, varenicline is efficacious for smoking cessation. In a randomized, double-blind, clinical trial [12] conducted at 19 US centers from June 19, 2003, to April 22, 2005, 1025 smokers (10 cigarettes/d) were randomized to receive brief counseling and varenicline at 1 mg twice per day ($n = 352$), bupropion sustained release at 150 mg twice per day ($n = 329$), or placebo ($n = 344$). African Americans comprised 10% of the varenicline arm, 8.5% of the bupropion arm, and 14% of the placebo arm. Treatment was delivered for 12 weeks and there were 40 weeks of nondrug followup. Based on carbon monoxide confirmation, varenicline was more efficacious for four weeks of continuous abstinence than placebo or buproprion. Specifically, four-week abstinence rates with varenicline were 44% as compared to 17.7% for placebo ($P < 0.001$) and 29.5% for buproprion ($P < 0.001$). While varenicline was well tolerated, a notable side effect was nausea which resolved with continued use. The generalizability of these findings to African Americans is somewhat limited as such participants comprised less than 12% of the sample. Further, the benefits of varenicline in African Americans with PAD are not clear as this study focused on a sample of smokers, aged 18 to 75 years. Physiologically, we do not have reason to believe that varenicline will not be beneficial in African Americans with PAD so there should be strong consideration for this drug to facilitate smoking cessation in this population at high risk for lower extremity amputations.

Severe adverse events have resulted from both bupropion and varenicline. In July 2009, the FDA announced "black box" warning labels on both drugs. The black box warnings warn of the mental health risks associated with their use, which can include changes in behavior, depressed mood, hostility, and suicidal thoughts. Additionally, in June 2011, the FDA warned that varenicline may be associated with an increased risk of certain cardiovascular adverse events in patients who have cardiovascular disease. After reviewing a randomized clinical trial of 700 smokers with stable cardiovascular disease, the FDA found that certain events, including heart attacks, were reported more frequently in patients treated with varenicline than in patients treated with placebo (2.0% versus 0.9%) [13].

Similar to smoking, diabetes mellitus is a common risk factor for PAD. Prior clinical trials have demonstrated the value of blood glucose control to prevent microvascular complications and, to some extent, macrovascular complications. Specifically, in the United Kingdom Prospective Diabetes Study (UKPDS), lowering the glycosylated hemoglobin to 6.5% resulted in a 10% relative reduction in the combined outcome of major macro- and microvascular events largely driven by a 21% reduction in nephropathy [14]. Additionally, in one prior retrospective cohort study involving more than 790 veterans with PAD, glucose control in African Americans was associated with a 67% reduced risk for a major limb event (i.e., lower extremity bypass surgery or lower extremity amputation) [15]. Thus, there is some evidence that supports aggressive blood glucose lowering to prevent macrovascular complications in PAD. Approaches to achieving glucose control include diet, exercise, and medications. For African Americans, successful management of diabetes mellitus is achieved through social support, behavioral lifestyle adjustments, and access to medication [16, 17].

Aside from normoglycemia, control of blood pressure is another key management option to reduce the risk for cardiovascular morbidity and mortality in persons with PAD. In the Heart Outcomes Protection Evaluation (HOPE) study, ramipril at 10 mg daily significantly reduced cardiovascular events in persons with symptomatic and asymptomatic PAD; the majority of these patients had increased blood pressure. The absolute reduction in CV events was 50 events per 1,000 patients with an ABI < 0.9 compared with 24 events per 1,000 patients with an ankle-brachial index ≥0.9 [18]. In the Appropriate Blood Pressure Control in Diabetes (ABCD) study, intensive treatment reduced mean 4-year blood pressure (−0.8 mmHg systolic and −0.3 mmHg diastolic, $P = 0.046$), as compared to moderate treatment in persons with PAD [19]. There was a statistically significant reduction in cardiovascular events for persons receiving

intensive as compared to moderate treatment ($P = 0.046$). In the ONTARGET (Ongoing Telmisartan Alone and in Combination with Ramipril Global Endpoint Trial), telmisartan, an angiotensin receptor blocker, was noninferior to ramipril for the composite outcome of cardiovascular death, myocardial infarction, stroke, and hospitalization for congestive heart failure [20]. Although there has been concern with the risk for worsening of leg symptoms in persons with PAD who are prescribed beta-blockers, this concern has not been validated in the literature [21].

Also, patients with PAD benefit from treatment with antiplatelet agents. Since the 2005 publication of the ACC/AHA guidelines for the management of PAD, three randomized controlled trials have been conducted looking at the benefit of aspirin in PAD. Two larger trials focused on persons with asymptomatic disease [22, 23] and one smaller trial [24] focused on persons with advanced PAD (i.e., either symptomatic disease and/or an ABI < 0.85). The two larger trials demonstrated no benefit from aspirin, which may reflect the community-based population. The smaller trial was stopped prematurely secondary to poor enrollment. However, it illustrated a 64% relative risk reduction in nonfatal and fatal cardiovascular events. In a meta-analysis by Berger [25] aspirin therapy was associated with a 34% risk reduction for nonfatal stroke among patients with PAD but there was no statistically significant reduction in overall cardiovascular events.

Results from the Antiplatelet Trialists' Collaboration revealed a 25% risk reduction in cardiovascular events with the use of aspirin/ASA in patients with PAD and coexisting coronary artery and/or cerebrovascular diseases [26]. For patients with symptomatic PAD who are treated with clopidogrel versus aspirin, there is a 24% relative risk reduction in myocardial infarction, stroke, or vascular death [27]. As per recommendations from the Trans-Atlantic Inter-Society Consensus on Management of Peripheral Arterial Disease (TASC) [28], patients with PAD should be treated with an antiplatelet agent. Aspirin should be considered in patients with PAD who also have coronary or carotid artery disease. Clopidogrel should be considered in patients with PAD and symptoms of intermittent claudication, independent of clinical evidence of cardiovascular disease. The above guidelines have been generalized to African Americans with PAD.

In patients with PAD and dyslipidemia, statin therapy reduces the incidence of mortality, cardiovascular events and stroke. Based on results from the Heart Protection Study (HPS) [29], there was a 13% to 27% reduction in total mortality, vascular mortality, coronary artery events or carotid artery events during five years of followup among 6748 patients with PAD who were randomized to 40 mg of simvastatin therapy. These findings were independent of the coexistence of coronary artery disease at the time of randomization.

5. Leg Symptoms and Treatment Options

Persons with PAD may present without exertional leg symptoms (*asymptomatic disease*) or with symptoms of leg pain, fatigue, weakness, or numbness with walking (symptomatic disease). *Symptomatic disease* is categorized as *atypical leg pain* (pain in legs that is not classic intermittent claudication), *classic intermittent claudication* (exertional calf pain that resolves within 10 minutes of rest), or *critical limb ischemia* (ischemic rest pain, ulcers, or gangrene).

Persons with asymptomatic disease are also functionally impaired. In the Women's Health and Aging Study [30], an observational study of 933 women aged 65 years or older, nearly one-third of the cohort had PAD (i.e., ABI < 0.90). Sixty-three percent of PAD participants had no exertional leg pain. These individuals exhibited slower walking velocity, poorer standing balance score, slower time to arise 5 times consecutively from a seated position, and fewer blocks walked per week.

African Americans have a higher prevalence of asymptomatic PAD (i.e., objective evidence of disease but without leg symptoms). African Americans with asymptomatic disease are at increased risk for a delay in care [31, 32] and continuation of high-risk behaviors, including a sedentary lifestyle [31, 32], that predisposes them to disease progression. In a study by Rucker and colleagues [33], greater walking impairment in African Americans as compared to non-Hispanic whites was largely explained by a higher prevalence of asymptomatic disease in African Americans.

For persons with PAD and leg symptoms, pharmacotherapy is an option. Cilostazol is known to improve leg symptoms, walking distance, and quality of life in persons with PAD [34, 35]. At a dose of 100 mg twice daily, cilostazol was shown to improve walking distance 50% as compared to placebo or pentoxifylline. In addition, statin drugs have been shown to improve claudication symptoms, ambulatory ability, total walking distance, and leg functioning [36]. In a secondary analysis of data from one study, angiotensin-converting enzyme inhibitors improved symptomatic PAD [37].

6. Walking Therapy

Walking therapy reduces walking impairment (i.e., waking distance, speed, and/or stair climbing) [38]. The exact mechanisms by which walking therapy improves lower limb function in PAD are not clear. One possible mechanism is an improvement in lower limb blood flow and walking economy (i.e., achieving gait stability without compromising walking velocity) [39]. Walking therapy is also known to improve lipid profiles, reduce blood pressure, and improve glucose control [40].

There are two well-recognized types of walking therapy for PAD: (1) supervised treadmill walking and (2) home-based walking. Efficacy studies demonstrate that supervised walking therapy, which is therapy conducted at a rehabilitation site with a trained clinician standing next to the patient, improves maximal treadmill walking distance by 150% comparing baseline to six months [41–43]. However, the benefits of this approach are greatly attenuated by a lack of access to this therapy; very few sites in the USA offer supervised treadmill walking for PAD. Also, Medicare does not reimburse for supervised treadmill walking for PAD.

In addition, supervised treadmill walking imposes a high patient burden; patients must report a rehabilitation site three times a week for six months under direct supervision by a clinician [38]. Given the significant commitment, limited flexibility in scheduling, and potential transportation barriers, continued focus on supervised treadmill walking will not move the field of PAD forward.

An alternative to supervised walking therapy is home-based walking therapy which is walking conducted outside of a rehabilitation site with minimal, if any, supervision by a trained clinician. Home-based walking allows for more flexibility as the patient can decide when and where he/she will walk. Dr. Collins and colleagues conducted a 12-week pilot trial involving 50 participants who were randomized to a home-based walking program versus control [44]. At 12 weeks, participants randomized to the home-based walking program improved their stair climbing ability. Four additional studies [45–48], each involving fewer than 30 patients per arm, have evaluated the efficacy of home-based walking. Of these four studies, motivational strategies were limited (weekly lectures) and AAs were either not enrolled or comprised no more than 5% of the cohort. One study [47] revealed minimal improvement (5%) in walking distance for persons randomized to a home-based walking group. In another study [45], involving 14 patients of whom seven received a placebo pill and seven completed home-based walking, the latter group improved their walking distance 183%. In the two other studies of home-based walking therapy [46, 48], patients randomized to home-based walking had more frequent contact with study staff, and their walking distance significantly improved at 3 months 38% [48] and 70% [46]. The walking benefits were maintained at 6 months, but there was no information in either study of the merits of such therapy in AA participants.

Recently, Gardner and colleagues [49] completed a walking intervention trial which compared home-based walking to supervised walking in patients with PAD. One hundred and nineteen patients were randomized and 92 completed the study. Among the 92 completers, 29 were randomized to home-based walking, 33 to supervised walking, and 30 to usual care. At 12 weeks, patients randomized to either home-based or supervised walking improved both their onset to pain ($P < 0.001$) and peak walking times ($P < 0.01$). A change in daily average cadence—walking rate as captured in steps per minute—was significantly greater in the home-based walking group ($P < 0.05$) as compared to the supervised walking or usual care groups. Improvements in walking speed were also noted with a recent trial completed by Collins and colleagues [50] in which 145 participants with diabetes mellitus and PAD were randomized to a six-month home-based walking intervention or attention control. Participants randomized to the home-based walking intervention significantly improved their walking speed ($P < 0.05$) and quality of life ($P < 0.05$). Limitations in both the recent Gardner and Collins home-based walking trials are the limited number of African American participants. Given the higher prevalence of sedentary behavior in AAs as compared to non-Hispanic whites [51], more work is needed to identify the benefits of home-based walking in AAs with PAD.

7. Physical Activity Interventions in African Americans

As the data on the benefits of exercise in African Americans with PAD is limited, we turn our attention to identifying physical activity interventions in African Americans without known PAD. We identified five studies that addressed physical activity interventions in African Americans (see Table 1). In a six-month randomized trial [52] of obese postmenopausal women between the ages of 45 and 75 years old ($N = 430$), one hundred and twenty or 28% of the participants were African Americans. Within this study, the investigators used a dose-dependent physical activity intervention to improve quality of life. Level of physical activity was based on the rate of adherence to an exercise dose of 8 kilocalories per kilogram of body weight per week (8 KKW), as delivered in 3 to 4 training sessions per week [53]. Participants were grouped into nonexercise control or intervention groups. For the latter, participants engaged in 4 KKW, 8 KKW, or 12 KKW, which corresponded to adherence rates of 50%, 100%, and 150%, respectively. The primary outcome was mean weight loss. For the participants engaging in 4-KKW of exercise, weight loss was 0.94 kg as compared to 1.34 kg for 8-KKW group and 1.86 kg for the 12-KKW ($P < 0.001$ to 0.04). Persons engaged in at least 12-KKW of exercise significantly improved their quality of life when compared to the control. Persons involved in 4-KKW of physical activity had greater improvement in general health perception, vitality, and mental health as compared to the control group. This study highlights that weight loss was dose dependent and any weight loss was positively associated with quality of life. Given that the intervention participants received supervised exercise programs, it is unclear if similar benefits would be realized through an unsupervised home-based exercise program.

In an additional prospective cohort study of 34,079 healthy US women with a mean age 54.2 years, approximately 5% (1,704) of the sample was African American [54]. Participants were categorized into one of three groups based on metabolic equivalents (i.e., ≤7.5 MET, 7.6 to 21 MET and >21 MET) for a minimum of 150 and a maximum of 420 minutes per week. Of note, a metabolic equivalent is defined as the ratio of metabolic rate during a specific physical activity to a reference rate of metabolic rate at rest, which is $1\,\mathrm{kcal}\cdot\mathrm{kg}^{-1}\cdot\mathrm{h}^{-1}$. All participants gained weight but those who exercised for 420 minutes per week gained the least amount of weight (less than 2.3 Kg in three years). Based on these findings, an increase in physical activity alone can limit weight gain but it is not sufficient for weight loss.

Dubbert et al. assessed the effect of counseling for home-based walking and strength exercise in older primary care patients [55]. In this ten-month trial of 224 male veterans (16% of participants were African American) between the ages of 60 and 85 years, participants in the intervention were counseled to engage in home-based walking and additional exercises for at least 20 minutes per day for a minimum of three days per week for five months. At the end of five months, participants engaged in independent exercises, which focused on relapse prevention and on how to use

Table 1: Physical activity interventions in African Americans.

Author/ year	Study type	Population type	Place	Mean age	No. of participants	Study duration	Control	Intervention	Outcome
Martin et al. 2009 [52]	Randomized trial	Post-menopausal women, obese ~65% white 28% AA 6.5% other	Exercise laboratory	45–75 yrs	430 92 = control 147 = 4 KKW 96 = 8 KKW 95 = 12 KKW	6 months	Nonexercise control group: Base level activity	3 groups (exhaust 4, 8, and 12 KKW (50%, 100%, and 150% of the recommended) kcal/kg of body weight per week resp.) 3-4 training sessions per week.	12 KKW had significant increase in QOL. Mean weight change = −0.94 (4 KKW), −1.34 (8 KKW), and −1.86 (12 KKW) Kg.
Lee et al. 2010 [54]	Prospective cohort study	Healthy US women (5% AA)	Individual preferences	Average 54.2 yrs.	34079	13 yrs.	—	Three groups based on MET (1) <7.5 MET (<150 mins/week of moderate-intensity PA) (2) 7.5–21 MET of moderate intensity (3) >21 MET (>420 mins/week) of moderate intensity	Women who exercised 420 minutes per week (60 mins a day) in a moderate-intensity activity gained less than 2.3 Kg in three years.
Dubbert et al. 2008 [55]	Prospective design	Male veterans 16% AA	Department of Veterans Affairs Medical Center, Jackson Mississippi	60–85 yrs.	224 I = 120 C = 104	10 months	Discussion of health topics brochures of current health recommenda-tions without instructions or specific goal setting.	Counseling for home-based walking plus exercise targeting functional limitations, goal of exercising for 20 mins or more 3–5 times per week	The counseling in the intervention group increased the weekly frequency and minutes of walking and strength exercise and more frequent physical activity.
Tan et al. 2009 [56]	Analysis of data from a longitudinal observational study	African American women	Baltimore EC program	65–86 yrs.	I = 71 C = 150	3 years	No participation in EC program	Experience Corps (EC) volunteering	Sustained increase in physical activity; significant increase in walking for exercise
Phillips et al. 2010 [57]	Randomized control trial	Older individuals at risk for mobility disability; ~15% AA	University and community centers	70–89 years old	424 I = 213 C = 211	1.2 years	"Successful aging" health education	Multimodel physical activity intervention; walking and strength, balance, and flexibility exercises	Participants who were never medically suspended (NMS) and those who were suspended but returned (SR) improved a lot.

KKW: kilocalories per kilogram of body weight per week, QOL: quality of life, MET: metabolic equivalent hours per week, EC: experience corps, NMS: never medically Suspended, SR: medically suspended but returned.

the study workbook independently. The intervention group demonstrated an increase in minutes of weekly walking and strength exercises.

8. Motivating Physical Activity in African Americans

One way of motivating physical activity in older adults is the use of an intensive community volunteer program. In a longitudinal study conducted in Baltimore Experience Corps (EC) program [58], two hundred and twenty-one African American women between the ages of 65 and 86 years old were observed for three years. Seventy-one of those women volunteered in the EC program, which was considered as the intervention; the other 150 women never participated in EC program and were considered the control group. The women in EC program showed significant increase in walking for exercise, and their levels of activity were high with energy expenditures of 670 kcal/week as compared to the control group with energy expenditures of 410 kcal/week.

One randomized controlled trial focused on improving physical activity in adults with limited mobility but without known PAD and who were between the ages of 70 and 89 years ($N = 424$; 15% of the study population was AA). Within the trial [57], 213 participants were randomized to the intervention and 211 to the control. The intervention was a multimodel physical activity intervention involving walking, strength training, balance and flexibility exercises which were delivered in three phases (i.e., adoption, transition and maintenance). The intervention included 10 weekly closed group behavioral counseling sessions. Outcomes included the Short Physical Performance Battery ((SPPB); a series of test to assess physical performance). The objective of the study was to determine levels of physical activity in participants who withdrew from the study because of medical problems and never returned (SNR), those who temporarily withdrew but successfully returned (SR), and those who never withdrew (NMS). At the end both NMS and SR participants improved their SPPB scores by 1.0 unit but the SNR improved by <0.1 units. (34) This study defined reasons for medical suspension from a physical activity intervention for older participants with limited mobility. Also, it provided highlight into which participants were more likely to be ill in the middle of a study and who were less likely to adhere to the physical activity routine for longer time. (34) Also, it helped in designing appropriate exercise programs which can be maintained for long term.

9. Barriers to Physical Activity in African Americans (AAs)

Neighborhood resources (i.e., the built environment) can reduce the incidence of chronic disease. In a study by Auchincloss et al. [59] participants between 45 and 84 years of age without any known cardiovascular diseases were recruited from neighborhoods with limited access to sites for physical activity. In a five-year followup, 10.2% of the participants ($n = 233$) were diagnosed with diabetes type 2. (35) According to Mathews et al. [60] lack of recreational or free exercise facilities, sidewalks, and age-appropriate physical activity programs is significant barriers to physical activity among African Americans. Bopp et al. identified [61, 62] that older African Americans were less likely to exercise secondary to a lack of knowledge of the benefits and/or limited time secondary to family responsibilities. Like many other senior adults, African American seniors also have a fear of falling and concerns about unsuitable neighborhoods (e.g., risk for physical harm) or communities (e.g., limited access) limited their use of exercise [60]. Environmental barriers to older adults can be different from what young people might consider a barrier. For example, problems with mobility and difficulty in seeing or hearing could expose seniors to difficulty when crossing the road; also presence of curbs or uneven surface might lead to falls.

To identify enablers and barriers of walking in a neighborhood, Gallagher et al. [63] conducted a research study that used a focus group ($n = 21$) and photo-voice methodology. Participants were African Americans between the ages of 61 and 85 years old living in Detroit. Participants photographed neighborhoods that encouraged and discouraged walking. Participants explained to the group why they thought that those places were good or bad for walking. We present a summary of the factors in Table 2. Specific to environmental barriers, most outdoor falls in older adults (73%) occur because of environmental factors related to side walk maintenance, such as uneven surfaces or tripping or slipping in to objects. Most injuries happen to older adults in winter sessions, while crossing intersections. Additional causes of injury are incomplete sidewalks, high-speed traffic, and limited length of time for crosswalk lights to allow for older adults to ambulate across the street.

10. Possible Solutions

Auchincloss et al. [59] suggested that improving the built environment can reduce the incidence of chronic disease. This can be done by developing safe sidewalks and attractive parks. African Americans report that improved health, social support, and spirituality motivate physical activity. Gallagher et al. [63] demonstrated that the presence of physically active people or just having familiar faces in the surrounding environment encouraged walking. As African Americans may have financial problems that restrain them from being active, one solution is to develop low-cost physical activity venues and/or encourage home exercise with use of videos. Additional low-cost options are indoor malls and/or sites at work which are made available to employees at a reduced cost. As safety from crime is an issue, this barrier can be attenuated by adjusting the time of day when exercising. Finally, public messages are needed that target the importance of exercise in populations such at risk for chronic diseases such as African Americans.

11. Discussion

Many African American seniors are not active and do not meet the recommended level of physical activity [60]. We

Table 2: Facilitators and barriers to walking as a form of exercise.

Walking facilitators	Walking barriers
Familiar faces and neighbors	Vacant lots/houses (38%)
People walking, biking, or jogging	Vegetation overgrowth (38%)
Smiling, friendly people	
Quiet, peaceful surroundings	Trash/litter (38%)
Meaningful buildings/statues	History of criminal victimization (38%)
Parks	Criminal activity in neighborhood (28.5%)
Gardens, trees, and shade	Broken/overgrown sidewalks (24%)
Beauty/scenery	Afraid of loose dogs (28.5%)

Note. This table was based on data from the Gallagher et al. study [63].

postulate that low levels of physical activity contribute to the higher prevalence of chronic diseases (e.g., PAD) and disease progression in African Americans. Specific to PAD, African Americans are at greater risk for limb loss as compared to non-Hispanic whites. Prior to limb loss [5], PAD causes a decline in walking ability which leads to mobility loss and a poor quality of life. A potentially effective alternative for PAD is home-based walking. Few studies have been conducted with physical activity interventions in African Americans with PAD. Hence, more work is needed to address the efficacy and effectiveness of home-based walking for African Americans with PAD.

To better understand the potential efficacy of walking in African Americans with PAD, it is important to define current levels of routine physical activity in this population as a whole. Prior studies have defined low levels of physical activity in African Americans and the factors which contribute to this finding [51, 53, 63]. Factors which contribute to low levels of physical activity among African Americans include environmental barriers such as unsafe or unattractive neighborhoods and fear of falling. An additional barrier is a low income such that the cost of a gym membership is prohibitive. Future interventions should target these and other barriers (i.e., motivation for exercise). Potential solutions include policy changes such that the built environment for African American communities is more accommodating for regular physical activity. Additionally, efforts should be made to provide more affordable gym memberships with group exercise classes that are culturally relevant and encourage social support.

Acknowledgments

This work was supported by Award no. R01HL098909 from the National Heart, Lung, and Blood Institute. This work was also supported by Center for Health Equity at the University of Minnesota and the NIH/NIMHD through the P60 MD003422. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Heart, Lung, And Blood Institute or the National Institutes. The authors would like to thank Center for Health Equity Undergraduate Research Program Directors and Board Members at the University of Minnesota.

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