Alzheimer’s Disease in Elderly African American Females

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Abstract

Alzheimer’s disease (AD) is a neurodegenerative disorder that occurs mainly in the elderly population. AD is more prevalent in elderly African American females that share many of the risk factors associated with the development of AD with other ethnic groups. These risk factors include age, genetic factors, hormonal influences, nutrition, physical activity, smoking, educational levels, and environmental exposure of certain metals and other materials. However, the prevalence of obesity and its associated medical conditions, such as cardiovascular diseases, diabetes, and stroke, make this group of people have even higher risk to develop AD. Interventions focus on the management of the medical conditions, hormonal replacement, health behavior changes, education, and family support. The goal is to help people maintain their mental functions, manage their behavioral symptoms, and slow, delay and prevent the disease process.

Keywords: Alzheimer’s disease, elderly population, African American females, risk factors, interventions
Alzheimer’s Disease in Elderly African American Females

Alzheimer’s disease (AD) is a neurodegenerative disorder that occurs mainly in the elderly population. It is characterized by progressive memory loss and decline in intellectual function and cognitive abilities (Liang et al., 2007). It also causes “impairments in behavior, language and visual-spatial skills, and ultimately, death” (Webber et al., 2006, p. 691). In addition, psychological symptoms, such as psychosis, depression, anxiety and agitation, are also common in the elderly population with AD (Yokes, 2007).

According to the most recent statistics from the Alzheimer’s Association (2011), in the United States, there are “approximately 5.4 million people of all ages who have AD or another dementia, which includes 5.2 million people aged 65 and older and 200,000 individuals under 65 years old who have early-onset AD” (Alzheimer’s Association, 2011, p. 14). It is predicted that by 2050, there will be close to 16 million Americans that have AD (Alzheimer’s Association, 2010). AD is most common in people over the age of 65. Statistics show that about 10 percent of people over the age of 65 and about 50 percent of people over 85 have AD (Navratiilova, Jarkovsky, Ceskova, Leonard, & Sobotka, 2007). Alzheimer’s disease is “the sixth leading cause of death across all ages and the fifth leading cause of death for those aged 65 and older in the United States” (Alzheimer’s Association, 2011, p. 22).

The number of African-American aged 65 and above is growing very quickly. It is estimated that by 2030, the number of African-Americans aged 65 and older will be close to 7 million, and those aged 85 and above will be about 1.6 million by 2050 (Kennard, 2006). Data also shows that in 2008, AD was the sixth leading cause of death...
in African-American females aged 65 and over and was the fourth leading cause of death in the same ethnic group aged 85 and older (Braithwaite, Taylor, & Treadwell, 2009).

AD and other types of dementias are more prevalent in women than in men (Alzheimer’s Association, 2010). Although there is no clear understanding for that, many researchers and scientists believe that it is because of the longer life expectancy of females than males and also because of the hormonal changes in women after menopause (Candore et al., 2010). In addition, Pomponi, Gambassi, Pomponi, Gioia, and Masullo (2011) also stated that female gender seemed to be a risk factor related to the abnormal production of beta-amyloid peptides, which are the “major constituents of senile plagues and whose accumulation in the inferior temporal neocortex is related to hippocampal synaptic and neuronal degeneration” (p. 124).

Several reports have shown that African-Americans have higher prevalence of AD, “ranging from 14% to almost 100% higher than the disease’s prevalence among whites” (Kennard, 2006, p. 1). In addition, data also have revealed that among African-Americans, “the cumulative risk of dementia among first-degree relatives of persons with Alzheimer’s disease is 43.7” (Kennard, 2006, p.2). Further, African-American females have the highest risk of developing AD and other dementias among any other ethnic groups (Alzheimer’s Associations, 2010).

Although the exact causes for AD are still unknown currently, researchers and scientists believe that biologic factors, such as genetic influences, physiological influences such as hormonal changes and inflammatory process in the brain, environmental exposure to certain metals, nutrition or health behaviors, as well as
socioeconomic status such as educational levels and incomes, are all associated with the
development of AD in different ethnic groups and genders (National Institute on Aging
[NIA], 2010). The consequences of the above effects cause the formation of
“neurofibrillary tangles in the neurons of the cerebral cortex and hippocampus and the
abnormal deposition of amyloid within senile plagues and cerebral blood vessels” (Liang
et al., 2007, p. 126). The elderly African American females share most of the risk factors
associated with AD with other ethnic groups; however, the higher prevalence of obesity
and its associated cardiovascular conditions, diabetes and stroke, place them at much
higher risk of the development of AD (Kennard, 2006).

Ecological Model

Biologic Factors

Much evidence has shown that genetic factors have a great influence on the
development of AD in different ethnic groups (Sando et al., 2008). Some studies suggest
that AD may be passed on through heredity in African-Americans, much easier than it is
passed on in Caucasians (Alzheimer’s Association, n.d.). The risk of an African-
American developing AD will be as high as 43.7 % if his direct relative, such as a
brother, sister, or parent, has the disease. The reasons for these correlations are not very
clearly stated, but scientists believe that it is a combination of both genetics and the
environmental factors (Kennard, 2006).

Alzheimer’s disease has two types- early-onset AD, also called familial AD, and
late-onset AD. Both types of AD are associated with the formation of the senile plagues
in the brain cells (Yokes, 2007). Early-onset AD is not a common form of AD, and it
affects less than 5 percent of all people who have AD. It can develop in people as early
as 30 years old (National Institute on Aging [NIA], 2011). Early-onset AD is caused by the gene mutations on chromosome 1, 14 and 21, and these gene mutations lead to the formation of abnormal proteins include amyloid precursor protein (APP), presenilin 1 and presenilin 2 (Taniguchi et al., 2008).

Compared with early-onset AD, late-onset AD is much more common, and it accounts for up to 95% of all AD cases (Zivkovic et al., 2010). Late-onset AD mainly occurs in people aged 65 or older (Rocchi, Orsucci, Tognoni, Ceravolo, & Siciliano, 2009). Researchers have identified that the apolipoprotein E (APOE) gene located on chromosome 19 is a genetic risk factor of the development of late-onset AD (Corbo et al., 2007). APOE gene contains the message needed to make a protein that helps circulate the cholesterol in the blood-stream (NIA, 2011). APOE has three different forms (or alleles) - APOE 2, APOE 3, and APOE 4. APOE 2 is not a common form, and it is believed to have some protections against AD. APOE 3 is a very common form and is believed to have no association with the development AD. APOE 4 is thought to be the risk allele because it presents in near half of those who develop late-onset AD (NIA, 2010). Studies also have shown that the presence of the APOE 4 gene is associated with memory decline and memory loss in healthy elders (Irimajiri, Golob, & Starr, 2010).

In addition, scientists have found that a gene called Sterol O-acyltransferase 1 (SOAT1) is also a risk factor for developing late-onset AD (Lamsa et al., 2007). SOAT1 gene is located on chromosome 1 and chromosome 7, and its normal function is to break down the cholesterol in the brain cells and “regulate the production of beta-amyloid precursor protein, the protein that is alternatively cleaved in Alzheimer’s disease” (Lamsa et al., 2007, p. 146).
Researchers also have identified that there is a protein called tau protein causes neurofibrillary tangles in the brain cells, leading to the death of these brain cells. When those cells die, tau protein is released into the cerebrospinal fluids (CSF). Therefore, the elevated level of protein tau is considered to be an indicator of AD (Vukovich et al., 2009).

Moreover, some researchers believe that the inflammatory process in the brain cell plays a role in the development of AD by “over-expression of cytokines and other inflammatory molecules in activated microglia surrounding senile plagues” (Fontalba et al., 2008, p. 247). Since there is evidence for a higher prevalence of AD in women in different ethnic groups, scientists hypothesize that physiological change due to normal aging, such as hormonal decrease in older women may contribute to the development of AD in female gender (Candore et al., 2010). It is thought that female sex hormones, such as estradiol, estriol, and estrone, have such functions as modulating the inflammatory response (Candore et al., 2010). After menopause, since the ovaries do not produce estrogen, the estrogen concentration in blood becomes lower till diminish, and this hormonal change makes the body have decreased ability to modulate the inflammatory process, especially the inflammation in the brain cells, thus increasing the risk of the development of AD (Candore et al., 2010).

Further, increasing evidence suggests that estrogens protect the brain cells against “oxidative stress, excitatory neurotoxicity, and ischemia”, resulting in “increasing of cerebral blood flow, enhancing glucose transport into the brain, and reductions in beta-amyloid formation” (Candore et al., 2010, p. 295). In post-menopausal females, their ovaries do not produce estrogen any longer, and this change might speed up the beta-
amyloid formation and deposits, leading to the increase of the beta-amyloid concentrations in the brain, causing the development of AD in female population (Candore et al., 2010; Webber et al., 2006).

**Health Behaviors**

Growing evidence has suggested that health behaviors such as nutrition intake, physical inactivity, and smoking have influence on the development of AD in both older men and women from different ethnicities (Liu et al., 2007). African-American females appear to have the highest prevalence of heart disease, diabetes, stroke, hypertension, cancer, and obesity (Hammer, n. d.). Statistics show that in 2008, “44.3 % black female population suffered from Hypertension, compared to 29 % of white female population” (Braithwaite et al., 2009, p. 97). In addition, studies indicated that in 2006, almost 80 % of African-American women were overweight, and more than 50 % of them were obese (Howarth, Murphy, Wilkens, Hankin, & Colonel, 2006). Vascular diseases, such as hypertension, high cholesterol, heart disease, stroke, and diabetes, have a strong association with physical inactivity and unhealthy nutritional intake in African Americans, and they are the significant risk factors in this group of people to develop AD (Kennard, 2006). Studies also have indicated that African-American individuals have double chances to develop AD if they have either high blood pressure or high cholesterol history, and four times more to have some types of dementia if they have both high blood pressure and high cholesterol levels (Kennard, 2006).

Researchers have found that high caloric intake is associated with higher risk of AD (Pasinetti et al., 2007). Although the mechanism of the effect of high caloric intake is not well understood, researchers hypothesize that high caloric intake may add extra
oxidative stress in the brain, leading to the development of AD (Liu et al., 2007). Further, Pasinetti et al. (2007) argued that high caloric intake, especially with high saturated fat intake promotes the formation of the abnormal protein, beta amyloid, in the brain, causing the development of AD. Also, high caloric intake causes obesity and diabetes, which are the significant risks of AD (Pasinetti et al., 2007). This might provide some explanations about why the obese African-American females have the higher risk of developing AD.

Although there is not much documentation in the literature showing whether physical activity alone has any association with the development of AD, a recent research study conducted by Scarmeas et al. (2009) concluded that the more physical activities people participate, the less risk for them to develop AD. They stated that “some physical activity was associated with a 29% to 41% lower risk of developing AD, while much physical activity was associated with a 37% to 50% lower risk” (Scarmeas et al., 2009, p.632). In addition, many findings in the literature indicate that more physical activities in the older adults are associated with increasing blood flow, decreasing inflammation and the beta amyloid amount in the brain, and increasing the concentration and activity of different types of neurotransmitters in the brain cells, thus helping the risk to develop AD (Scarmeas et al., 2009).

In addition, smoking seems to be associated with the development of AD. Several studies have indicated that those individuals who had smoked two packs a day for over 20 years had more than twice of the risk to become demented in their later life (Kaiser Permanente, 2010). Researchers believe that brain does not develop immunity to the long-term results of heavy smoking. On the contrary, smoking damages the vascular
system by raising the blood pressure, increasing the blood clotting factors, and increasing the oxidative stress and inflammation in the brain, leading to the development of AD (Kaiser Permanente, 2010).

**Socioeconomic Status**

Growing evidence suggests that socioeconomic status such as education level and family income are associated with the development of AD (Beihhoff, Tumani, & Reipe, 2009; Sando et al., 2008; Zhou et al., 2006). Several population studies and epidemiological studies have indicated that more years of schooling and complex occupations protect against dementia (Sando et al., 2008; Zhou et al., 2006). Although the reason behind it is not very well understood, researchers hypothesize that more education and complex occupations may reduce the amyloid deposition in the brain, increase cognitive reserve by increasing the brain usage areas, and increase the synapse count and density so that the various neurotransmitters are able to be move more actively, thus delaying the onset of the AD symptoms in those individuals (Sando et al., 2008). Data also shows that in the United States, African-Americans, both men and women, are more likely to grow up in low-income family, and poverty places them at a higher risk for fewer educational opportunities (Braithwaite et al., 2009). This may also support the evidence that more elderly African-American females have higher risk of developing AD.

**Environmental Factors**

Brown, Lockwood, & Sonawane (2005) argued that environmental factors can also play a role in the development of AD in different ethnic groups. Many studies have shown that frequent exposure to certain heavy metals, pesticides, fumigants, antiperspirants with aluminum content, and defoliant may have some neurological affect,
thus increasing the risk of developing AD (Brown et al., 2005; Gerhardsson, Lundh, Minthon, & Londos, 2008). The homeostasis of certain metals, such as iron and copper, can bind with certain proteins in the brain and destroy their normal functions, leading to the development of AD (Gerhardsson et al., 2008). Further, scientists believe free radicals add extra oxidative stress to the brain cells and cause the permanent damage to these cells, leading to brain cell death (Gerhardsson et al., 2008).

Interventions

Despite of the increasing prevalence of AD in the elderly population, there is no cure for this disease currently (Mayo Clinic Staff, 2009). Scientists and researchers have been working diligently on the gene therapy for the treatment of AD. They have seen some new findings mainly from the animal models. However, there is no effective gene therapy yet to treat AD. Current interventions focus on reducing the risk factors including health behaviors changes, medications, education on AD to both the elders and their families, and family support. The goal is to help people maintain their mental functions, manage their behavioral symptoms, as well as prevent, delay or slow the disease process (Santoro et al., 2010).

In Alzheimer’s disease, there is a lack of a neurotransmitter in the brain cell, called Acetylcholine (American Health Assistance Foundation [AHAF], 2010). Therefore, medications such as Acetylcholinesterase inhibitors have been used to improve cognitive status and disability in individuals with mild to moderate AD (Santoro et al. 2010). Research also suggests that in AD, the level of Glutamate, another neurotransmitter in the brain cell, is too high. The high Glutamate level causes the deterioration of the nerve cells; therefore, medication such as Memantine (Namenda) is
used to decrease the effect of Glutamate (The Alzheimer’s Disease Fund [ADF], 2007). Currently, there are five medications that have been approved by Food and Drug Administration (FDA). These drugs include Donepezil (Aricept), Galantamine (Razadyne), Rivastigmine (Exelon), Memantine (Namenda), and Tacrine (Cognex). Tacrine (Cognex) is not actively advertised on the market because of its serious side effects (Santoro et al., 2010). In addition, since people with AD usually have symptoms, such as agitation, depression, hallucination, anxiety, and sleep disorders, medications, such as antipsychotics, anti-anxiety agents, and antidepressants, are also used to control these symptoms (Herrmann & Lanctot, 2007).

In addition, studies have shown that music therapy helps the patients with AD perform cognition memory task better, be more attentive, and interact with caregivers better (Sierpina et al., 2005). Researchers have explained that it is because music may have some effects on the memory encoding and retrieving process in the patients with AD (Simmons-Stern, Budson, & Ally, 2010). Further, supporting the families and caregivers who are taking care their loved ones with AD is also very important. Taking care of a person with AD can be physically, emotionally and financially taxing (NIA, 2010). It is essential to educate the families and the caregivers about the disease process and disease prognosis, help them develop the most effective coping strategies, encourage them to form a strong social network with other family members, friends and social groups, and encourage them to express their concerns and share their experiences, as well as provide emotional support to them (NIA, 2010).

Although some risk factors, such as age, gender and genetic influences associated with the development of AD cannot be changed, other risk factors can be modified in
order to reduce the risks of AD. Since evidence suggests that the estrogen deficiency in postmenopausal females may contribute to the increased risk to develop AD, estrogen-containing hormone therapy might be beneficial to reduce the risk and severity of AD (Candore et al., 2010; Webber et al., 2006). Candore et al. (2010) stated that the recent hormonal replacement therapy (HRT) trials in postmenopausal women without dementia had indicated a temporary positive effect. They further stated that four meta-analyses had suggested that HRT could reduce the risk of developing AD almost to 45 percent (Candore et al., 2010). Moreover, researchers also have found that when women took the hormone replacement in peri-menopausal period, they would have reduced their risk of developing AD by almost 50% (Liu et al., 2007). Therefore, African-American females should be encouraged to take hormone replacement during their peri-menopausal period in order to reduce their risk to develop AD in later life.

In addition, several research studies have indicated that AD is associated with the inflammatory process in brain characterized by “elevated levels of acute phase reactants, cytokines, tumor necrosis factor, and complement in the amyloid plaques” (Sierpina et al., 2005, p. 641). Therefore, it is thought that long term use of anti-inflammatory agents, such as naproxen, ibuprofen and Aspirin, may help decrease the inflammation in the brain, thus reducing the risk of AD (Sierpina et al., 2005). However, more clinical trials are still needed to determine the efficacy of long-term use of these drugs in the elderly population because of their side effects affecting the gastrointestinal system (ADF, 2007).

Studies have suggested that ginkgo biloba has the antioxidant and anti-inflammatory functions and is effective to treat both cognitive and non-cognitive impairment caused by AD (Yancheva et al., 2009). Growing evidence suggests that
omega-3 fatty acids may have anti-inflammatory properties to protect against AD (Freund-Levi et al., 2009). Freund-Levi et al. (2009) further stated that “neuronal cell membranes and synapses are enriched with polyunsaturated fatty acids such as the omega-3 fatty acid docosahexaenoic acid (DHA)” (p. 482). The decreasing number of synapses is associated with cognition decline in Alzheimer’s disease. In addition, DHA prevents the beta amyloid proteins formation and accumulation, protects against cognitive decline, and controls some psychiatric and behavioral symptoms associated with AD (Freund-Levi et al., 2009). Fatty fish is the major dietary source of DHA, and people should be encouraged to try ginkgo biloba and increase the fatty fish intake in their early life to prevent the development of AD in later life.

Data shows that African-American females have a higher prevalence of cardiovascular conditions, such as high blood pressure, high cholesterol, diabetes, and heart disease, and these conditions increase the risk of developing AD in this population. Therefore, it is very important to control these conditions and the associated symptoms as early as possible to reduce the risk of AD (Alzheimer’s Association, 2010). Several studies have suggested that 3-hydroxy-3-methyl glutaryl coenzyme A (HMG-CoA) reductase inhibitors (stains) not only helps lower the cholesterol level in the blood, but also helps reduce the “oxidative stress, neuroinflammation, and neurotoxicity”, thus reducing the risk of developing AD (Kurata et al., 2010, p. 161). Since African-American women have the highest prevalence of overweight and obesity, and unhealthy nutritional intake and physical inactivity have a direct effect on these conditions, it is essential to control their weight by decreasing their caloric intake and encouraging them to be more physically active. Scarmeas et al. (2009) suggested that Mediterranean diet,
which mainly contains fruits, vegetables and low sodium, and more physical activity not only help people lose their weight and decrease the risk of developing cardiovascular diseases and diabetes, but also help them lower their risk of AD in their later life.

Moreover, researchers suggest that nutritional supplements, such as vitamin E, vitamin C, folic acid, vitamin B12, help prevent the development of AD. Vitamin E and C are thought to decrease free-radical related damage in the brain cell and provide the protection against cognitive decline and AD (Pavlik, Doody, Rountredd, & Darby, 2009). Studies also indicate that Vitamin C has an anti-oxidative function and helps reduce the risk of developing AD (Marlatt et al., 2005). In addition, studies have shown that the high homocysteine level is associated with the pathogenesis of atherosclerosis, a risk factor for cardiovascular, peripheral vascular and cerebrovascular conditions. Vitamin B12 and folate decrease the level of homocysteine in the blood, thus decreasing the risk of AD (Agarwal, Chhillar, Kushwaha, Singh, & Tripathi, 2010). Therefore, the older adults should be encouraged to discuss with their primary care providers and take these nutritional supplements as advised.

Physical activity is strongly encouraged in the elderly population, especially in African-American women. Appropriate physical activity decreases the chance of inflammation, reduces the abnormal protein formation, and increases blood flow in the brain, as well as increases the concentration of different types of neurotransmitters in the brain (Scarmeas et al., 2009). Although there are many types of exercise are available, some of the exercise may not be appropriate for the elderly women because of their musculoskeletal changes due to aging process. Many studies have found that Tai Chi Chuan is considered as a moderate intensity exercise which is appropriate for the elderly
females because it not only has good effects on “balance, muscle strength, flexibility, and posture control in the elderly females, but also helps them improve their learning ability and preserve their memory” (Kasai et al., 2010, p. 41).

It is also very important to educate people not to smoke or stop smoking in early years because the smokers have a much higher risk to develop AD in their later life (Liu et al., 2007). In addition, evidence has shown that higher education level delays the symptoms associated with AD in older adults (Liu et al., 2007). Evidence also suggests that supportive social network, active social involvement, mental stimulating activities and regular physical activity, can help older adults live in an active lifestyle, which helps delay the onset of AD in this population (Fratiglioni, Paillard-Borg, & Winblad, 2004). Although there is not much can be done to improve the educational level in elderly African-American females, it is important to encourage them to be more involved in social activities, leisure activities, and any activities that are mentally stimulating. In addition, advocacy efforts are needed for the establishment of local and state policies on education for the children. School principals, public health professionals, community leaders, family members, state officials, and legislators are encouraged to work together to develop the specific policies in order to provide more educational opportunities to the children with low socioeconomic status (Education Development Center, 2001).

Studies have indicated that environmental exposure to certain metals, such as aluminum, mercury, lead, and more, may be associated with the development of AD (Brown et al., 2005). People live in such areas should be educated on the risks of environmental exposure related to AD. In addition, this author believes that local communities, health departments, city governments, and environmental services should
monitor the metal exposure areas more carefully and frequently. Interventions of
preventing and reducing the exposure of environmental risk factors associated with AD
should be implemented as quickly as possible.

Summary

The prevalence of AD is increasing quickly in the elderly population. African-
American females share many risk factors associated with AD with other ethnic groups.
These risk factors include age, gender, genetic influences, physiological changes, health
behaviors, socioeconomic status and environmental exposure. However, obesity and its
associated conditions, such as cardiovascular diseases, diabetes, and stroke, are probably
the very particular risks associated with the development of AD in this group of people.
Therefore, modifying and reducing such risk factors become extremely important in order
to reduce the risks of developing AD in this population.
References


