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**Senile Dementia from Neuroscientific and Islamic Perspectives**

**Abstract:** Diseases involving the nervous system drastically change lives of victims and commonly increase dependency on others. This paper focuses on *Senile Dementia* (SD) from both the neuroscientific and Islamic perspectives, with special emphasis on the integration of ideas between the two different disciplines. This would enable effective implementation of strategies to address issues involving this disease across different cultures, especially among the world-wide Muslim communities. In addition, certain incongruence ideas on similar issues can be understood better. The former perspective is molded according to conventional modern science while the latter on the analysis of various texts including the holy Qur’an, sunnah (sayings and actions of the Islamic prophet, Muhammad (pbuh)) and writings of Islamic scholars. Emphasis is particularly given on causes, symptoms, treatments and prevention of dementia.

**Keywords:** Neuroscience; Islamic perspective; senile; dementia

**Introduction**

Neuroscience studies the nervous system, which plays an immense role in our being as a human and the overall quality of our lives, and is among the fastest growing field in biological research (Tumiran et al. 2010; Hasan Adli et al. 2008). The diverse functionality and prime importance of the nervous system are also recognised in the religion of Islam. For example, *muamayyiz* (be able in distinguishing the good and bad value, in the age of understanding, normally at the age of seven for male) and *aqil* (in sanely condition or be able to think properly, which is not under the influence of drugs or alcohol). These two preconditions are used in preparation for one’s prayer. Various activities related to the functionality of the nervous system is mentioned in the Qur’an, sunnah and writings of Muslim scholars. However, the segregation of conventional modern science from Islamic principles as practiced by main stream educational systems makes the exchange of information difficult (Harrison 2006; Tumiran et al. 2010). In addition, different usage of terminologies lead to difficulties in the exchange of information between groups representing the conventional biological sciences and those with Islamic background. This unfortunate situation could cause a clash of understandings between these two different parties.

Diseases involving the nervous system, including various senile dementia (SD) types, drastically change the lives of the victims: *SD*, which has long been associated with aging, is commonly not entirely classified as a disease but is instead characterized as a group of symptoms. The word dementia is an umbrella term, originating from the Latin *de+mens*, ‘*de*’ here means ‘apart/away’ and ‘*mens*’ ‘mind’ (Kandel et al. 2013). Therefore the term dementia means an ‘away’ mind; a mind out of its normal functions.

Statistically, *SD* is among the most common diseases of the world, accounting for about 18 to 24.3 million cases worldwide (Ferri et al. 2005; Sunga et al. 2006; Jackson & Purandare 2007; Ferri 2012). It has been reported that at least 4.6 million cases of dementia are reported every year which could rise to 81.1 million by 2040 (Ferri et al. 2005; Comas-Herrera et al. 2011; Nguyen et al. 2008; Sampson 2010).
A comprehensive and thorough understanding of SD from both the neuroscientific and Islamic perspectives, would enable effective implementation of strategies to address issues involving this disease across different cultures, especially among the world-wide Muslim communities. Thus, this paper focuses on SD from the conventional neuroscience perspective and look at how Islam views it, paying special attention to the integration of ideas between both the perspectives.

**SD from the Neuroscience Perspective**

The processing of sensory input and motor output to produce intricate and sophisticated movements, and display of complex activities involving emotions and cognitive function (i.e. learning and memory capabilities) are totally the product of neural activity. A number of neurons deteriorate physiologically, as one ages due to neuronal death either by apoptosis or necrosis (Kanazawa 2001). Since neurons are generally unable to regenerate, neuronal death may cause a change or an absence of certain relevant intellectual/brain functions. However, in SD neuronal cell death is greatly multiplied resulting in severe atrophy of particular brain areas. Therefore, it can be said that those with SD age ‘abnormally’ or at a faster rate compared to their normal counterparts.

Due to the harsh symptoms experienced, some countries such as the USA have specific laws regarding SD patients. In California, SD patients are usually required to sit for various additional tests for a driving license or in some cases are not even issued one (Breen et al. 2007).

The clinical characteristics of SD (Grabowski & Damasio 2004) are: (a) short term, and subsequently long term memory disturbances, (b) inability or decline in the ability to understand and think upon abstract ideas, (c) disorientation in reasoning and rationality, such as inappropriate behavior in emotional control or expression and in personality, and (d) other symptoms related to the specific area and type of damage involved. These chronic symptoms characterising dementia if present for a long time degrade the nervous system’s higher level functions (Kandel et al. 2013).

Interestingly, symptoms of SD are also commonly evident in other mental illnesses that involve changes in memory, intellectual and learning ability, emotional and personality aspects, cognitive processes and rational thinking (Ferri & Ames 2004). For these mental illnesses, however, the symptoms are usually temporary in nature and can be treated.

**Causes of SD**

Causes of SD vary widely among patients (van der Flier & Scheltens 2005a). There are three major classes of SD based on brain parts involved (McCullagh et al. 2001; Eckerström et al. 2010): (a) Cortical dementia, (b) Subcortical dementia, and (c) Multiple dementia. Cortical dementia, as the name suggests, involves the cerebral cortex, which is the cerebral outermost located grey matter. The cerebral cortex contains the neuronal somas and composes a big part of the forebrain. This most complex and developed component of the human brain (Stiles & Jernigan 2010) contributes to our intellectual superiority over other organisms. Example of this SD type is seen in Alzheimer’s disease (AD) patients. Subcortical dementia, on the other hand, involves deterioration of brain parts below the cerebral cortex (Turner et al. 2002). This SD type can be brought about by Autoimmune Deficiency Syndrome/ AIDS (Navia & Rostasy 2005), Creutzfeldt-Jakob disease/Mad Cow disease (Knight 2006), Huntington’s disease (Montoya et al. 2006) or Parkinson’s disease (McCullagh et al. 2001),
particularly in the later stages. As for multiple dementia, it is a rather loose term compared to the two former SD types, and it involves various brain regions, which can be caused by poor health management, cerebral infarcts or small strokes.

The most severe type of SD is AD and about 75% of SD patients have memory defects caused by AD (Eschweiler et al. 2010). AD happens in 3-5% of individuals aged more than 65 years old (McCullagh et al. 2001). Every year 4.6 million cases of AD are reported, and it has been suggested that the number of patients will double every 20 years to affect 80 million people by 2040 (Ferri et al. 2005).

AD is characterised by premature severe atrophy of the cerebral cortex frontal, temporal, occipital and parietal lobes due to excessive neuronal cell death (Dickerson et al. 2009). In fact a study has confirmed the association between the size of the hippocampus, a subcortical brain structure involved in memory formation, with the severity of dementia (Eckerström et al. 2010). A sure sign, as observed in post-mortem, is the appearance of plaques and neurofibrillary tangles in the cerebral cortex and hippocampus. These two accumulations are the primary characteristic of AD pathology (Paulson et al. 2008; Gauthier 2002). Plaques are abnormal accumulation and aggregation of amyloid β protein (Aβ), which is naturally produced by the amyloid precursor protein gene in the brain. The main component of neurofibrillary tangles, the tau protein, is a naturally produced neuronal microtubule structure stabiliser which undergo hyperphosphorylation and become devoid of its functions in AD.

**Diagnosis and Treatment of SD**

Current “treatment” of SD is mainly by medications. These prescribed medications are only able to slow down the deterioration of certain brain areas; thus, slowing down cognitive decline but are unable to treat the underlying cause of SD (Lleô et al. 2006; Rafii & Aisen 2009). Thus, unless SD pathology is thoroughly studied and identified, there is no hope for effective treatment (Casey et al. 2010). However, with recent advances in SD research, more drugs have been formulated and some are undergoing clinical trials, promising hopes for those with AD (O’Brien & Burns 2010).

Based on their functions, a few classes of drugs are currently prescribed for the treatment of SD symptoms. The first class is acetylcholinesterase inhibitors (AChEI). Level of acetylcholine (AcH) neurotransmitter has been found to be reduced in SD, and this reduction has been associated with cognitive decline in AD (Terry Jr. & Buccafusco 2003). AChEI will inhibit acetylcholinesterase (AChE), an enzyme which is responsible for the degradation of AcH. Hence, AChEI will improve the synaptic communication between neurons and, subsequently, slowing down cognitive decline. Medications in this group are usually used for mild to moderate SD, e.g. Tacrine, Donepezil, Galantamine and Rivastigmine. However, consumption of these drugs are not without side-effects as they could cause internal bleeding and ulcer formation in the patient’s digestive system, extreme fatigue, headaches, diarrhea, loss of appetite, insomnia or an increase in urination. The second class of drugs, N-methyl-D-aspartate (NMDA) receptor inhibitors work against the action of NDMA receptors. NDMA receptors and its neurotransmitter glutamate have been identified as having important roles in cognition and memory (Traynelis et al. 2010). In AD high level of glutamate has been found in synaptic gaps causing abnormal calcium influx into neurons, which leads to neurotoxicity and apoptosis (Danyss & Parsons 2003). Memantine is an example of an NDMA receptor inhibitor, and is usually used for moderate to severe SD.
(Olivares et al. 2012). Drugs are also prescribed for SD side-symptoms such as anxiety, depression or hallucination (Motsinger et al. 2003; Hersch & Falzgraf 2007).

The effectiveness of tissue transplantation for neurodegenerative treatment has been investigated in the recent years (Lindvall & Kokaia 2006; Dantuma et al. 2010). These researches used aged animal models with damaged neuronal cells (Garzón-Muvdi & Quiñones-Hinojosa 2010; Götz & Ittner 2008). Neural stem cell implantation has been shown to influence the production of factors working against cell degeneration by encouraging the regeneration of neurons. Further study involves differentiating animal models according to lesion areas and specific neurotransmitters involved. In AD for instance, animal models are used to study the effects of neural tissue implantation in the cerebrum, working with the hypothesis that these implantations may be able to reduce the effects of diminishing levels and/or dysfunction of concerned neurotransmitters. Even though it is unlikely that this treatment would be able to cure AD, it is effective in slowing down the deterioration of cognitive functions and may be used as a complement to the more conventional medication for treating AD (Lin et al. 2012; Takeda et al. 2010). This potential treatment, however, is morally and ethically controversial to certain quarters.

In diagnosing SD, extreme importance has been placed on differentiating SD from other diseases that may have the same symptoms. Lab tests are performed to recognise, to a certain extent, the causes of SD (Gagliardi 2008; van der Flier & Scheltens 2005b). A blood test would be able to detect deficiency of vitamins or infection which may cause SD (Foy et al. 2009).

A precise diagnosis of SD will give the patient ample time to plan and implement the steps needed to minimize and slow down the damage to the brain and to mentally, emotionally and physically prepare oneself for life with SD. Even though a definitive diagnosis of AD can only be made by means of brain tissue post-mortem assessment, scientific advances have made it possible for early detection of abnormalities, e.g., cognitive decline, memory deficits and behavioral problems (Millard et al. 2011; Woods et al. 2003; Santacruz & Swagerty 2001). This is made possible by use of biological markers to detect biochemical changes in the cerebrospinal fluid (CSF), presence of filamentous aggregates of misfolded Aβ, tau and α-synuclein; and presence of neurotrophins such as cocaine- and amphetamine-regulated transcript (CART) (Forlenza et al. 2010; Trojanowski & Hampel 2011; Mao 2012; Galvin & Sadowsky 2012). A current study, however, has pointed out that the assessment of levels of Aβ in plasma and CSF may not be entirely specific for AD (Verbeek et al. 2009). Imaging techniques such as computed tomography (CT), magnetics resonance imaging (MRI), single photon emission computed tomography (SPECT) and positron emission tomography (PET) are also used in the diagnosis. These techniques can document and possibly quantify the atrophy of certain brain areas involved (Petrella et al. 2003), but they are unable to pinpoint areas involved in some of the symptoms of dementia (O’Brien & Barber 2000). Cognitive performance tests are also vital tools for diagnosing SD, e.g. the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE) (Jorm 2004) and the Mini Mental State Examination (MMSE) (O’Bryant et al. 2008). For AD these tests are commonly used in combination with neuroimaging techniques since these tests are more accurate in the later stages of the disease (Dubois et al. 2007).

Due to the complexity diagnosing and treating SD, it is of utmost importance to take steps to prevent SD from happening, or to delay the inevitable. SD could be prevented by living an active and healthy lifestyle (mentally and physically), maintaining a good diet and taking
suitable medications once a person experiences health problems. A Canadian study has shown that individuals with a command and/or acquisition of more than one language could stall SD up to four years (Bialystoka et al. 2007). Thus, participating in stimulating mental activities have a high chance of slowing down the progression of SD. In contrast, negative outlook which translates into negative behaviour and relationships (such as cynical distrust) were found at higher risk for dementia, especially SD as they aged (Neuvonen et al. 2014).

**SD from the Islamic Perspective**

SD from the Islamic perspective is a symbol of God’s ominous power and, therefore, is seen as a “natural” but retribution process admissible by God (Allah). Hence, to Muslims, SD only shows that humans are not without their share of weaknesses and this pale in comparison to God, who is described to be the All Knowing and the Most Powerful (Qur’an 16: 70).

> It is Allah who creates you and takes your souls at death; and of you there are some who are sent back to a feeble age, so that they know nothing after having known (much); for Allah is All-Knowing, All-Powerful (Qur’an 16: 70).

The word *Ardhal* is used (Qur'an 16: 70) to describe irreversible weakness of the senses, speaking and thinking ability that happens to an aged person (Abu Hayyan 1993). Scientific advances have shown that the majority of SD patients reside in the age group of 50 years and older, and this is in line with what is stated in the Qur’an (Qur’an 16: 70), above.

In addition, there are verses mentioning the decline of cognitive ability in SD:

> If We grant long life to any, We cause him to be reversed in nature: will they not then understand? (Qur’an 36: 68).

SD situation is referred to God as a condition whereby those afflicted by it “know nothing after having known (much)”, able to learn and remember prior to SD (Al-Tabari 2009). From the Islamic perspective the most distinctive symptom of SD is the loss of memory and subsequently, a decline in cognitive ability. This is different from a condition in which one simply forgets something that will be remembered later. In SD, facts and/or memories are forgotten, and it is very rare that a patient will recover what is lost.

In the Qur’an SD has also been mentioned as a common situation faced by elderlies in the days of the Prophet Ya’qub (Jacob, pbuh) as ‘wandering mind’ of the aging individuals. In fact, Prophet Ya’qub prior to the revelation of Quran to Prophet Muhammad (pbuh) (the last prophet) was accused of being a dotard by his children.

> When the caravan left (Egypt), their father said: “I do indeed smell the presence of Joseph: no, do not think me as a dotard.” They said: “By Allah! Truly you are in your old wandering mind” (Qur’an 12: 94-95).

In Islam, it is believed that all prophets from Adam (pbuh) to Isa (Jesus, pbuh) and Muhammad (pbuh) were protected from the affliction of diseases which deteriorated the cognitive ability, which would cripple their ability to preach (Al-Razi 1990).
Addressing SD in Islam

A possible treatment for SD is put forward in Islam. The recommended substances, which are believed to enhance memory and cognitive ability, are honey and *Nigella sativa* (black seed, *Habbatus sauda*). These two complementary natural products potentially have an efficacy in SD prevention if used consistently. Scientific researches have supported such assertion as well (Kamarulzaidi et al. 2012; Sahak et al 2013). These two substances are mentioned in Hadith:

*Narrated Ibn `Abbas: The Prophet Muhammad (pbuh) said, “Healing is in three things: A gulp of honey, cupping, and branding with fire (cauterizing). But I forbid my followers to use (cauterization) branding with fire.”* (Al-Bukhari 2009).

*Abu Hurairah narrated that he heard prophet Muhammad (pbuh) said: “In black seed there is healing for every disease, except the Sam (death)”* (Ibn Majah 2009).

The benefits of honey are mentioned in writings of Muslim scholars. For example, according to Ibn Sina's *Qanun fi Al-Tibb* (The Book of Medicine), honey is not only good for treating wounds and ulcers, it can be a memory booster as well (Ibn Sina 1999). In addition, he also stated that honey has the potential to improve blood circulation and provides higher oxygen throughout the body; hence, including to the brain, which is very dependent on blood circulation (Deuraseh 2006). As for *Nigella sativa* it can be a therapy to memory-related diseases since it can inhibit AChE. As some medicinal drugs for SD with AChEI compounds, *Nigella sativa* can lead to presence of ACh in supporting new memory encoding process (Hasselmo 2006).

In Islam, prevention is also very important, and that applies to dementia as well. Muslims are always encouraged to pray to God for protection from anything bad and undesired. Anas bin Malik narrated that Prophet Muhammad (pbuh) had once prayed to God:

*O Allah! I seek refuge in You from miserliness and slothfulness, and I seek refuge in You from cowardice, and I seek refuge in You from being brought back to (senile) geriatric old age, and I seek refuge in You from the affliction of the world and from the punishment in the Hereafter* (Al-Bukhari 2009).

However, if SD still happens, suitable action must be taken to prevent it from spiralling out of control. Islam does not put any specific scientific requirements on prevention or treatment of a disease, and this applies to SD as well. A disease can be treated by any way possible, as long as it does not deviate from Islamic teachings.

Islam also places importance to the physical and emotional well-being of the elderly (Tumiran 2006). Upmost care must be given to SD patient to ensure a healthy, positive and safe environment for the family members and the patient. Since SD occurs primarily in the later age groups, the Islamic teaching of taking care of the elderlies, especially one’s parents, comes very well into view here.

*Thy Lord has decreed that you worship none but Him, and that you be kind to parents. Whether one or both of them attain old age in their life, say not to*
them a word of contempt, nor repel them, but address them in terms of honor (Qur’an 17: 23).

Not taking care of one’s parents is considered a big sin in Islam, as also noted in this Hadith below:

*Abu Hurayrah reported: The Messenger of Allah (pbuh) said: Damn you! Damn you! Damn you! When he was asked “Who was damned, O Messenger of Allah?” He replied “He who has elderly parents, or even only one of them is old but he did not attempt to enter the Heaven by providing good care to his aged parents* (Muslim 2009).

Compassion between people regardless of age, race and religion, which is an important concept in Islam, makes the care of an elderly with SD compulsory. Family members, caretakers and/ or people around a SD patient should have patience and take this challenge as a way to gain God’s blessings.

Caretakers of SD patients should take care of their own health, too, as their inability to perform caretaking duties due to their own health problems can inflict more stress on the patient. This in time will make the patient feel neglected, thus causing much unwanted negative feelings from the patient that will only worsen the patient’s well-being and put a strain to the caretaker-patient relationship (Brodaty & Donkin 2009; Halligan 2006). In Islam, psychotherapy treatment is given utmost importance. This is to address the emotional and psychological issues surrounding SD for the tranquility and positivity of both the patient and caretaker (Al-Shahri & Al-Khenaizan 2005).

**Discussion and Conclusion of SD from both Neuroscientific and Islamic Perspectives**

From both perspectives, SD is a condition common to the elderly. The major characteristic of SD is the decline in cognitive ability, or the condition in which one ‘ceases to know anything of what he once knew so well’. The biomolecular basis of SD is not specified in the Islamic tradition sources, but is being explained by modern neuroscience research.

When it comes to treating SD, Islam allows any kind of treatment as long as it does not deviate from *syara’* (Islamic law) and does not involve the usage of anything *haram* (prohibited). For example, tissue transplant taken from an aborted fetus is prohibited from the Islamic perspective, but use of stem cells from adult with informed consent will be acceptable. Recommended natural products by Islam have been proven to have similar properties as some conventional medications; thus, potentially promising as therapy.

Scientific research has shown that knowing more than one language can postpone the onset of dementia for up to four years (Bialystoka et al. 2007). This is in line with a Muslims’ life, that is guided by prayers in the Arabic language, the lingua-franca of Islamic literature and/ or sources. Hence, the majority of Muslims who are not Arabs would have to at least know Arabic language; thus, adding another language to their language acquisitions.

Neuroscience research also promotes continual involvement of intellectual and cognitive activities to keep neuronal cells active. SD can be associated with poor health keeping, such as Multiple Dementia originating from AIDS or damage of blood vessels in the brain. All this can be prevented if one were to follow the belief that the given body is a gift from God,
which needs to be cared for responsibly. Islam promotes both healthy mind and body, as paving the way towards a fulfilling life.

Those with SD need as much help as possible to lead their daily lives. This is echoed strongly in Islam, as it places utmost importance on compassionate caring, especially in the familial institution. The care of an individual who is not able to get on without others’ help, such as SD patients is obligatory for the community (fardh kifayah). In addition, SD patients are exempted from any duties or responsibilities of an adult Muslim such as performing five time obligatory daily solat (prayers) and fasting in the month of Ramadhan, especially for mid-stage and late-stage SD.

It is clear that SD is a life-altering disease that should be given attention rather than just giving it a fleeting glance as a natural component to aging. Intensive research is needed to explore SD particularly in areas of treatment and prevention, from both neuroscientific and Islamic perspectives.

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