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Addressing Resource Constraints for Alzheimer's Dementia Patients and Caregivers in the
Global South: An Interdisciplinary Approach

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December 5th, 2023

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Purpose

There are two main focuses of this paper: to address the care that AD patients in countries with few healthcare resources receive and to explore the experiences of familial caregivers who care for these patients. This thesis will investigate issues including access to the education required to administer informed care, who is ultimately responsible for caring for AD patients in countries with few health facilities, and the lack of resources that is apparent in countries that do not have AD specialists or clinics. This paper will pinpoint the root issue in treating AD patients globally to serve as the first step in finding solutions that are cost-effective, accessible, high-quality, and realistic.

Introduction

The growth of early civilizations was dependent on people in societies caring for one another in several sectors (Klüver, 2008), including those related to illness and disease. Healthcare systems were established to protect people against diseases (Sama and Nguyen, 2008), and to cater to the needs of those who require intensive care from qualified professionals (Tulchinsky, 2014). These systems appear to be integrations of traditional practices with modern medicine to provide both preventive and curative care, often adapting based on the people's needs (Sama and Nguyen, 2008). Though, the evolution of these systems has not progressed at the same pace globally. There are populations that lack adequate resources to treat specific health conditions, as well as resources for family members to mitigate symptoms in loved ones. Some existing healthcare systems in these communities tend to be stretched too thin, overcrowded with people but insufficient in equipment and staff (Azevedo, 2017). This may pressure clinicians and primary decision makers of hospitals to prioritize which conditions to treat first. This could be the reason for the prioritization of treating communicable diseases, illnesses with known cures, patients who can afford treatment, and younger generations (Sideman et. al., 2022).

Therefore, diseases that tend to not fit these criteria are often under-treated, such as Alzheimer's disease (AD), despite the growing number of people impacted. In the U.S., there are about 5.3 million Americans who have AD— 5.1 million of whom are 65 years old or older (Tiwari, 2019). White Americans comprise much of this population of 5 million people (Mayeux, 2020). Although the rate of AD and other dementias in African Americans and Latin Americans is higher than in White Americans, they are less likely to be diagnosed (Mayeux, 2020).

Currently, 47 million people suffer from dementia globally (Tiwari, 2019), and this number is expected to rise to 115.4 million by 2050 (Asian Perspective, 2010).

To better understand the severity of AD, it is essential to have foundational knowledge of AD identification and pathogenesis. AD is characterized by memory loss and progressive neurocognitive dysfunction (Sievert, 2023). Though AD is considered a cognitive disorder, almost all individuals diagnosed with AD showcase psychiatric symptoms at some stage during their disease. These psychiatric symptoms include depression, apathy, verbal and physical agitation, delusions, and hallucinations (Lyketsos, 2011).

AD is marked by symptoms of general dementia that gradually worsen over time; for instance, the psychiatric symptoms related to AD such as hallucinations are not considered to be “typical” symptoms of general dementia (Linszen, 2018). Biologically, different types of dementia (i.e. Vascular, Frontal-Temporal Lobe, Lewy Body, etc.) are defined by the class of abnormal proteins that are distributed in varying parts of the brain. The symptoms of these different dementia types tend to correlate with the part of the brain that is being affected. In AD, the main variation of symptoms is determined by whether the left or right side of the brain is targeted first (Sievert, 2023). The left side of the brain as an initial target tends to exhibit predominantly language symptoms of AD, such as aphasia, which is characterized by the loss of spoken language and linguistic abilities (Weekes et. al., 2020). The right side of the brain tends to correlate with visuospatial symptoms of AD, such as difficulties in judging distances (Sievert, 2023).

Alzheimer’s disease is neurodegenerative, meaning that neurons lose function and eventually die. AD is a prominent protein-conformational disease caused by abnormal polymerization of proteins, which causes these proteins to aggregate and turn neurotoxic. Proteins often need a particular folded structure to function properly, but in some individuals, proteins can become misfolded, which could cause their structural motifs to collide (Nelson, 2021). These misfolded proteins may obtain altered conformations due to genetic mutations, epigenetics, brain injuries, cardiovascular disease, and aging (Tiwari, 2019). Autopsies of AD patients reveal extracellular

aggregates of amyloid β plaques and intracellular neurofibrillary tangles (NFTs) in cortical and limbic areas of the brain, characteristic of AD (Tiwari, 2019).

Consequently, one of the most prominent hypotheses regarding the development of AD is focused on amyloid β plaque aggregation. The amyloid β hypothesis states that this aggregation disrupts cell-to-cell communication and activates immune cells that trigger inflammation (Selkoe, 2016). The amyloid precursor protein (APP) is a transmembrane protein that, in a diseased state, generates amyloidogenic fragments through cleavage by enzymes, as β -secretases (BACE1) and γ -secretases release truncated APPs and insoluble amyloid β (A β) peptides, respectively. When A β oligomerizes (Tiwari, 2019), this promotes aggregation at the newly exposed protein-protein interface (Nelson, 2021). The posited neurotoxic role for A β is multifactorial, but includes glutamate excitotoxicity, which refers to the excessive stimulation of glutamate receptors. A β disrupts the activity of glutamate receptors, such as NMDA and AMPA (Zhang, 2022). These receptors are essential for normal neuronal functioning such as activity-dependent plasticity (Rivadulla, 2001), which refers to the nervous system adopting new functional and structural states influenced by personal experiences. In essence, NMDA receptors are rate-limiting for NMDA-dependent long-term potentiation, which is a neurobiological basis for learning and memory formation (Ganguly, 2013). Undisrupted AMPA receptors regulate normal, ongoing cell-communication, specifically neurotransmission (Rivadulla, 2001), by facilitating the movement of sodium ions into the postsynaptic membrane in response to glutamate binding. The aggregation of A β results in the loss of correctly-folded protein motifs (Nelson, 2021), which blocks the activity of these crucial glutamate receptors, damaging synaptic plasticity (Zhang, 2022).

Synaptic plasticity refers to how synapses, the small junction at the end of a neuron that allows for communication between neurons, are influenced by environmental inputs; as such, synaptic

plasticity is directly linked to memory and learning processes (Torres, 2020), and disrupting this synaptic signaling inhibits memory consolidation. After this disruption, A β then polymerizes into insoluble amyloid fibrils that aggregate into A β plaque (Tiwari, 2019). Thus, most therapeutic focus in industry has investigated the link between A β plaque and AD pathogenesis.

Additionally, the presence of intracellular NFTs, which result from the hyperphosphorylation of microtubule-associated tau proteins (τ), are widely considered as pathological hallmarks in AD. Tau proteins in healthy neurons carry several phosphate groups that are mostly located in the proteins' microtubule assembly domains. These proteins bind to axonal microtubules in the brain, and this is regulated by post-translational modifications such as phosphorylation (Wegmann, 2021). However, in a "diseased brain," abnormal chemical changes in protein kinases and phosphates cause the τ from microtubules to detach and disassemble. The free τ molecules aggregate into paired helical filaments which form tangles inside neurons. It is thought that because these tangles block the neuron's transport system, which harms the synaptic communication between neurons, this τ hyperphosphorylation could induce AD (Medeiros 2010). Accordingly, therapeutic treatments for AD tend to focus on minimizing A β plaque buildup and hyperphosphorylation in τ , with some pharmaceutical scientists aiming to develop treatments that target specific brain regions that may have abnormalities in gene expression associated with AD (Wang, 2016).

Problematic Research in Therapeutic Drugs

Since AD involves protein misfolding, and this nonfunctional folding ultimately causes abnormal protein aggregation that cannot be naturally cleared by its cellular environment, current drugs for AD target these underlying factors of early and late-stage AD (Tiwari, 2019). It should be mentioned that the targeting of A β aggregates is based on the amyloid-fibril hypothesis that these plaques are involved in the development of AD, though ongoing research aims to assess

if the A β plaque buildup is correlational rather than causal, or if these protein oligomers hold that much significance regarding disease etiology (Ferreira, 2008). Amyloid-specific drugs that target proximate degenerative mechanisms include aducanumab (sold as “aduhelm”), rivastigmine (sold as “exelon”), galantamine (sold as “razadyne”), and donepezil sold as (“aricept”). These are all drugs that have been analyzed via Phase I, II, and III of clinical trials (Tiwari, 2019).

In general terms, a series of clinical trials with an increasing number of participants must be conducted prior to the public release of any therapeutic drug or agent. Researchers must perform preclinical studies via laboratories, sometimes utilizing animal-subjects, for activity and toxicity data to justify clinical trials with human subjects. Then, Phase I studies begin, which are designed to assess the safety and tolerability of the new drug in a small group of people. The drug is administered in small doses initially before scaled to larger doses to gather preliminary data on pharmacokinetic (i.e. where the new drug metabolites are absorbed and how the body affects the new drug after administration) and pharmacodynamic (i.e. biochemical and physiologic effects of the new drug on the body) impacts. If the new drug passes the safety inspections in this phase, then it can move on to Phase II. In Phase II, the new drug is tested on a larger number of participants to assess its efficacy. Phase II trials may continue to Phase III only after adequate demonstration of efficacy against the disease for which the new drug is being tested. After this authorization, Phase III trials aim to provide a conclusive assessment of the success of the new drug and ample safety data in a large-scale group of participants (1000–3000 people or more). The pattern and profile of frequent side effects are also investigated. This phase is pivotal, as it is conducted to generate substantial evidence of the safety and efficacy required to submit a new drug to an authority, such as the Federal Drug Administration (FDA). Lastly, Phase IV trials are held after the new treatment has been marketed to gather information on its efficacy in various populations and any adverse events associated with long-term use (Wright, 2017). Regarding AD, there are currently 126 agents in

152 clinical trials assessing new therapies: 28 in Phase III, 74 in Phase II, and 24 in Phase I. The majority (82.5%) of these drugs target the underlying biology of AD with the intent of disease modification; 10.3% are presumed to be cognitive enhancers and 7.1% are drugs developed with the intent to reduce psychiatric symptoms (Cummings, 2021).

The location that AD clinical trials are being held have significant implications. One of the primary reasons patients partake in clinical trials is for personal benefit, including receiving care from a specialist team that actively monitors their health (Locock, 2011). Therefore, some individuals who participate in clinical trials may receive care for their condition that they otherwise may not have had access to. This is especially beneficial for patients in the event that the treatments investigated in the clinical trials improve their health. Thus, acknowledging where these clinical trials are being held is of importance since proximity of a service is associated with accessibility to that service (Bowers et. al., 2015). The National Institute of Aging is currently supporting 488 active clinical trials on AD and related dementias, and all of the principal investigators of these clinical trials are in the United States (National Institute on Aging, 2023). In general, individuals can participate in any clinical trial they qualify for regardless of location, but it is unlikely for AD patients and caregivers to travel to a different country due to the hardships that could arise from traveling with a patient who could be in a “child-like” state (Seaman, 2020). This implies that the AD patients who can more readily access these clinical trials are those who reside in the United States. Research has also shown that there is a systematic under-representation of lower-middle income countries (LMIC) in AD and related dementia clinical trial platforms (Llibre-Guerra et. al., 2023). The statuses and comparisons of these regions should be taken into consideration and will be discussed in depth later on.

Aside from this, it is also important to emphasize that the current medications being studied for AD patients involve secondary targets, meaning that none of these therapeutics have a

distinguishable cause-and-effect relationship in preventing AD progression. Since it is thought through previous research that amyloid β and τ are involved in AD development, the most adjacent targets for palliating AD are these specific proteins (Tiwari, 2019). This is problematic, as there is still no comprehensive therapeutic treatment that can cure AD.

Furthermore, there is a history of falsification of data related to AD pathogenesis and treatment. For example, it was reported on July 2022 that neuroscientist Sylvain Lesné doctored images in his 2006 paper linking AD with A β protein A β *56 (Lee, 2023). Lesné's paper, which had been cited over 2000 times, suggested that A β *56 exhibited memory defects in transgenic mouse models. However, it was revealed in the 2022 report that these findings were the results of manipulated Western blot data— Lesné forged the Western blot results to show that the protein detected in relation to the memory defects was A β *56. Fortunately, this does not negate the overarching amyloid hypothesis for AD, as the hypothesis does not require A β *56 to play any role in AD to still be true. Additionally, most clinical trials do not specifically target A β *56 (Piller, 2022). However, the same cannot be said for the preceding case: Hoau-Yan Wang, a neuroscientist and contributor to Cassava sciences, the biotechnology company responsible for the experimental AD drug simufilam, is being investigated for image manipulation and scientific misconduct involving 20 research papers. Questions discrediting the efficacy of simufilam were raised publicly in August 2021 when a petition to pause the drug's clinical trials was raised (Piller, 2023). Problematic research incidents such as these may contribute to overall distrust in drug usage by populations who are not as informed about these cases or by populations who do not have access to regular updates regarding them.

Moreover, therapeutic drugs that *are* available are not very effective, as most of these available drugs lose their efficacy once crossing the Blood Brain Barrier (Tiwari, 2019). The Blood Brain Barrier (BBB) has selective permeability, as only lipid-soluble, positively-charged molecules with

a low molecular weight can cross (Daneman, 2015). Drugs that are synthesized and re-engineered for BBB transport based on endogenous transport systems within the BBB still have limited bioavailability in the brain (Pardridge, 2012). These failures in drug development can often be attributed to unfavorable pharmacokinetics and pharmacodynamics (Tiwari, 2019) of drug disposition, which refer to the absorption, distribution, metabolism, and excretion (ADME) data in compounds (Vrbanac, 2017).

Availability of Treatments

Despite these therapeutics not inducing significant positive impacts in AD patients, they tend to be the only options for drug treatment for many. However, the availability of these medications is limited and only available to specific AD population subsets, such as those who can afford them. In the United States, available AD therapeutics are known to be expensive, even with coverage by Medicare, the federal health insurance for those aged 65 and older. An example of an FDA-approved medication for AD is aduhelm, which specifically targets and aims to decrease the amount of amyloid β plaques (Haddad et. al., 2022). As of April 7th, 2022, the Centers for Medicare and Medicaid Services (CMS) announced that Medicare would cover aduhelm on the condition that Biogen, the drug manufacturer, continues to collect data on its efficacy and safety. Medicare Part B, which funds outpatient therapeutics administered under the supervision of a clinician, covers 80% of the cost of aduhelm; the beneficiary is then responsible for paying the remaining 20 percent. Although this is a fraction of the total cost of aduhelm, it is still expensive –if the average sales price of aduhelm is \$28,200 per year per patient, then the average Medicare beneficiary would need to pay approximately \$5,600 per year (Jacobson, 2022). Some could argue that this is an ample sum to pay for a medication that has many potential adverse effects, such as painful brain bleeding caused by inflammation (Cameron, 2022). Even the invasive administration of this drug could cause pain and discomfort for patients, as it needs

to be administered intravenously (Haddad et. al., 2022). This is only one example of an expensive medication for AD in the United States alone.

In countries outside of the United States, experimental medications for AD are not as readily available to patients. In the case of aduhelm, the United States is the only country that has received approval that aduhelm may be used as an AD treatment. Biogen had planned to file for regulatory review of this medication for the European Union, Canada, Australia, Japan, and Brazil by the end of 2020, though it is likely that there was a delay in this process due to the COVID-19 pandemic (Witt, 2022). Interestingly, most of these aforementioned countries are considered a part of the “global north” (Odeh, 2010).

Broadly, there are two “worlds” that states are separated into: the global north and the global south. The global north represents economically and technologically advanced societies with generally stable politics, including the United States, European Union, Australia, Israel, and Canada (Odeh, 2010). At the opposite end of the spectrum, the global south constitutes nations such as Mexico, Ghana, Afghanistan, Palestine, and others in Latin America, Africa, and parts of Asia (World Bank, 2023). Global south status takes geographic location into consideration, as this influences the predominantly agrarian economy and lifestyle of these peoples (Odeh, 2010). A considerable number of LMICs are in the global south. As mentioned earlier, the status of LMIC needs to be discussed to inform why this paper assesses AD resource gaps in the global south in particular.

LMIC status is indicated by factors such as poverty ratio, life expectancy at birth, GDP per capita, carbon dioxide emission, etc. (World Bank, 2023). Overall, these indicators are associated with the socioeconomic determinants of health in the population. For the purposes of this paper, there will be no further use of “LMIC” to define nations that do not have equitable

resources. This is to take into account that countries may move in and out of LMIC status, whereas regions in the global south cannot readily transition in or out since geographic location is one of the indicators. Further, the comparisons between global south and global north will be utilized to acknowledge that countries in the global south have their international trade and politics directed by the global north, which thereby influences their health outcomes (Odeh, 2010). Additional relevant facets of countries in the global south will be discussed later.

Individuals have the ability to obtain new medications even if they are not approved in their own country, but legal regulations only allow for the *import* of unapproved medicines (Country Regulations, 2023). This reveals that an individual would then have to pay additional costs for import fees, combined with the inflation that comes with converting currencies into foreign exchange. In sum, these medications are accessible mainly to those who can afford them.

Medications and therapeutics are not the only methods of treatment available for AD. As AD is not yet curable, there are end-of-life care options for those with late-stage AD that focus on the comfortability and dignity of the patient. These include specialized nursing homes and other residential accommodations, as well as palliative care and hospice. The goal of palliative care is to optimize the quality of life in a patient with AD. Palliative care tends to be utilized before the patient is eligible for hospice. Hospice refers to receiving care from a multidisciplinary team of physicians, nurses, social workers, nutritionists, and chaplains. Most hospice services have the dual focus of treating the patient's physical and behavioral ailments while also providing bereavement services for caregivers (Aupperle et. al., 2004). Other treatments include the implementation of familial comfort and spirituality (e.g. practicing religion privately or through organizations) to improve a patient's quality of life (Kaufman, 2007).

Though, approaches of palliative care and hospice are based on predominantly global north perspectives (Whitelaw, 2022), making them inaccessible to the global south in terms of relatability. Most systems of palliative care and hospice have been constructed around the presumption that elders reside in the hospitals, nursing homes, or clinics in which they receive treatment while family members and caregivers may visit (Aupperle et. al., 2004). However, having one's elderly relatives living in a healthcare facility instead of their own home is a foreign concept to many countries in the global south. While countries in the global south vary in terms of cultures, traditions, and religions, one general similarity among this diaspora of people is their collectivist social norm (Rhee, 1996). Collectivist societies operate under the consensus that the needs of the group are relatively more important than the needs of an individual. This signifies that people within a family or community invest a great deal of time tending to each other's needs. Taking care of elders is especially integrated into collectivist culture to illustrate respect for them referred to as filial piety— for instance, it is common for elderly parents to eventually move in with their children so that their children may look after them (Rhee, 1996). In contrast, regions in the global north, such as North America and Europe, tend to practice individualism. Individualistic societies emphasize self-reliance, independence, and autonomy (McGraw-Hill, 1997). The film *The Farewell* illustrates the distinction between individualism and collectivism by stating that, “You think one's life belongs to oneself, but that's the difference between the [global south] and the [global north]. In the [global south], a person's life is a part of a whole. Family. Society” (Wang, 2019). Thus, systems of hospice and palliative care that are established around the values of the global north are not applicable to regions in the global south. Instead, there is a dependence on familial caregivers.

Reliance on Caregivers in the Global South

While taking care of one's parents and elders seems to be a universal social norm, there tends to be a heavy reliance on familial caregivers in countries that lack adequate resources for

healthcare facilities (Sideman et. al., 2022). Sideman and colleagues gathered the perspectives of dementia experts across continents and identified several deficits in AD care, especially regarding the undersupply of healthcare resources. For this paper, clinicians' accounts were reported via continent in order to maintain confidentiality. This could imply that since there are limited psychiatric, neurological, and geriatric specialists in these regions, specifying the exact country that these practitioners are reporting from potentiates the risk of disclosing their identity. The continents mentioned in this paper are those that comprise the global south (Odeh, 2010).

Within Sideman's paper, a neurologist in Africa explained that their healthcare system is not constructed to account for non-communicable diseases, describing that nervous system-related diseases are very low on their priority list. Further, a psychiatrist in Asia affirmed that psychiatric and mental health areas in their country are financed based on the "leftover principle" -- if there is money left in the healthcare budget, it is more often spent on gynecology, obstetrics, or cardiology services. It is clear that the financial burden in treating AD is exacerbated in countries with low funding allocations for AD-related diseases. A geriatrician in Latin America reported that in their country, the cost for any type of AD drug could be up to \$300 per month. The geriatrician provided that this is a price that very few people in their country can afford (Sideman et. al., 2022).

In addition, the psychiatrist in Asia supplemented that their Ministry of Health expressed plans to release patients with psychiatric disorders from acute wards to "free up beds" for patients with infectious disease (Sideman et. al., 2022). Not only does this describe the reality of the underfunding and de-prioritization of patients with AD, but it also showcases the lack of overall healthcare ability in these countries with few health resources. A psychiatrist in Latin America provides further insight to this, stating that, "when people are worried about what [they will] have

to eat that day, or what their children are going to eat, they do not prioritize memory issues” (Sideman et. al., 2022).

The same research paper shared the perspective of a neurologist in South America who stated that psychiatrists in their country have no specific training for the treatment of AD, as they have only received training in assessing behavioral symptoms (Sideman et. al., 2022). In other words, these psychiatrists can diagnose if an individual has AD, but they have little knowledge of what treatment options are available.

Other barriers to care include the lack of training in medical professionals. A neurologist in Latin America stated that in the past there were no dementia classes taught in medical schools. In the present day, the neurologist provides that there are now dementia classes available within the geriatrics and psychiatry units of their medical schools, but this is only the beginning– there is still a large shortage in knowledge and education among healthcare providers that should be addressed. Furthermore, a psychiatrist in Asia explains that there are essentially no specialists who work in the areas of dementia, much less AD. The psychiatrist explains that in the largest medical school in their country, the topic of dementia only receives about two hours of teaching (Sideman et. al., 2022).

Therefore, as several countries cannot rely on their doctors or clinics to care for patients with AD, much of this responsibility is placed onto familial caregivers, especially sons and daughters of those with AD. A psychiatrist in Africa explains that what is “working well” in their healthcare systems is the structure of the family system, stating that people “tend to care for [their] own.” The psychiatrist elaborated that if an individual knows someone with AD or dementia, there is little to no chance that they will go without care. A neurologist in Asia also expressed similar

perceptions, stating that “...we don’t have dementia care centers... our [care] system is the center of the patient’s home” (Sideman et. al., 2022).

So, it seems that the community aspect and the aforementioned collectivist social norm in these countries is essential for treating AD patients. Not only are family and community members relied on for care– it is the expectation. Since this method of care is normalized, it raises possibilities that the needs for these familial caregivers are overlooked, as taking care of their loved ones is not seen as an act of kindness, but rather, a duty. This is of concern because if these familial caregivers experience severe fatigue, burnout, or risk having their own health decline, then there could be a direct impact on the AD patients they care for.

While the potential burdens of familial caregivers should be discussed more, it should also be stressed that community-based care can have its positives. Studies have shown that community-based care, as in, integrated pharmacological and psychosocial treatments that are delivered within one’s home and community, is suitable for those with long-term illness in semi-rural settings because of the diligent monitoring system and person-centered approach (Wilkinson, 1995). For instance, in rural America after the War of 1812, the town of Nantucket, a small island about 30 miles off of the coast of Massachusetts, built a permanent “poor farm” and asylum in which their impoverished, elderly, and those suffering from alcohol abuse and psychosis could reside. Their families and caregivers were also expected to settle there, as well as designated medical professionals. Residents were tasked with engaging in agricultural labor, and those unable to partake in hard labor were provided with lighter work such as weaving. The town of Nantucket established this community with the goal of building a healthy and restorative atmosphere, utilizing what they referred to as “moral therapy” (Barlow, 2017).

Unfortunately, the structure was burned down in 1844 due to natural disasters. Nantucket never rebuilt this system, despite its promising benefits, due to a convergence of factors including new government policies, conflicting spiritual beliefs (i.e. “Insanity” was because of the devil), the concurrence of the increasing immigration population and xenophobia, insufficient staffing, affordability, and rise in custodial care. Still, this narrative is often used as a psychiatric case study to illustrate the benefits of community-based care, as residents showed evidence of cognitive improvement and better mental health overall (Barlow, 2017). Nevertheless, these reported advantages are more associated with the AD patient being cared for, and not necessarily on the caregiver.

Impacts of Stigma on Patients and Caregivers

Even if other methods of treatment for AD seem more realistic in the global south, such as community-based care, one of the biggest barriers to care is stigma. Stigma refers to the exaggerated and often inaccurate learned beliefs and negative stereotypes associated with people who do not follow the social norm, and feelings connected with stigma include fear and confusion. Studies have shown that AD is a stigmatized disease that causes significant negative impacts on both the individuals diagnosed and their caregivers, including low self-esteem, isolation, decreased quality of life, and avoidance of help-seeking behaviors. All of these factors that emerge with the stigmatization of AD contribute to delayed diagnosis and under-utilization of health services. The misconceptions associated with AD, such as individuals with AD being perceived as “the living dead,” profoundly affect the care that is provided to AD individuals and the isolation felt by their families and caregivers (Rosin, 2020).

As perceptions of those with terminal illness, including AD, have been linked to stigma, studies have described that the public’s perception of these individuals demonstrated a “[clear] desire” to avoid these people dying from disease, disregarding that the condition is noncommunicable.

Enduring stigmas and negative associations for people with AD include them losing “social value,” being “empty shells” of people they once were, and being “burdensome” to their families. Fully enacted stigma excludes individuals from participation in “full personhood,” which also results in poor-coping mechanisms by the AD-diagnosed person such as limited social interactions to keep their diagnosis a secret. Moreover, advertisements in the media often depict people diagnosed with AD in the final stages of their condition, as they are shown appearing lost and infantilized. This portrayal of individuals with AD further contributes to an increase in stigma and cultural fear, thereby inhibiting the support that individuals with AD and their caregivers need (Rosin, 2020).

Since people in the global south tend to rely on their families and communities for support, aligning with their values of collectivism (Odeh, 2010), stigmas associated with an AD diagnosis hinders the treatment of individuals with AD and deters caregivers from confiding with their social network (Rosin, 2020). A geriatrician in Africa accounts that the Arabic word for dementia is a major barrier to diagnosis and care for people with AD. The Arabic word for dementia is *kharaf*, which directly means someone is “losing [their] mind.” Thus, physicians and medical personnel translating AD concepts to residents of this African country apply a word that is mainly used to refer to someone as “insane.” Furthermore, it has been recorded that some of the healthcare providers themselves in this country in Africa believe that AD is the equivalent of insanity because of misconceptions and stigma. As this is their preconceived belief, they are unable to provide accurate information to AD caregivers. The geriatrician expresses that this stigma needs to be removed from healthcare providers themselves as the first step to advancing AD care (Sideman et. al., 2022).

Additionally, marginalized identities within the global north are also impacted due to similar reasons of stigma. As acknowledged previously, although the rate of AD and other dementias in

African and Latin Americans is higher than in White Americans, they are less likely to be diagnosed (Mayeux, 2020). Stigma causes resource constraints that prevent individuals with AD from receiving adequate care. This barrier to care— stigma— is a direct result from the lack of resources available to properly educate on the neurodegenerative disease (Rosin, 2020).

Obligations of Familial Caregivers and Impact on AD Patients

As introduced earlier, there are several factors that cause fatigue and burnout in familial caregivers of those with AD. Research has shown that there is a significant projected risk of morbidity and mortality for these familial caregivers. They often do not prioritize their physical health or health behaviors, including nutrition and exercise, and are recognized as “additional parents.” Research findings suggest that day-to-day caregiving activities, such as managing feeding and hygiene habits in AD patients, cause caregivers to experience dramatic burdens (Duplantier, 2023). Caregivers also face challenges in the diagnostic journey of their loved ones, especially in terms of limited support and poor emotional wellbeing. Because of the great extent in which caregivers prioritize their role, studies have found that they tend to experience a loss of identity and self-worth once their loved ones pass away (Sideman AB, 2023).

Furthermore, as nations in the global south rely on family members to act as caregivers for AD patients (Sideman et. al., 2022), this system does not address the rising issue of people with AD whose family members emigrate. This is especially of concern since familial caregivers often are the children of the elderly with the life-altering condition (Duplantier, 2023), and younger generations are more likely to relocate (Amin, 2014). A study was conducted to address this gap in literature on the emotional impact of caregiving for elderly on migrant children in a transnational setting. Individuals with roots in the country of Bangladesh, a part of the global south, were assessed. This study examined the stressors and outcomes of eldercare from Bangladeshi people living in the United States who have living parents in Bangladesh over the

age of 60. Researchers found that even with the geographic distance, migrant children provided financial and emotional support for their parents, including paying for other care arrangements such as live-in nurses and constant phone calls to remain updated about their condition. These caregivers experienced elevated feelings of guilt, anxiety, and distress due to the uncertainty of their circumstances, and their emotions were exacerbated by cultural norms of collectivism and filial piety (Amin, 2014). Other studies provide consistent findings that feelings of uncertainty, helplessness, and guilt are more prevalent among people providing caregiving from a distance (Kindratt, 2023). Thus, even with geographical constraints of distance and inaccessibility of in-person familial support, familial caregivers of those linked with the global south still feel obligated to prioritize care of their loved ones to the best of their ability, often sacrificing their own wellbeing in efforts to support their parents' (Kindratt, 2023).

Moreover, as practitioners in the global south are not well-versed in AD care (Sideman, et. al., 2022), familial caregivers may feel obligated to have the additional pressure of educating themselves on AD and administering the "gold standard of care" themselves. The gold standard of care, which was introduced in 2001, refers to optimizing the patient-centered approach in end-of-life care, including increasing support systems (Shaw, 2010). This framework is seemingly similar to community-based care systems (Wilkinson, 1995) and the collectivist systems in the global south (Odeh, 2010). Thus, caregivers in the global south would not necessarily have to learn unfamiliar systems for non-medication treatment, but they may be unaware of other aspects of AD including terminology and scientific jargon needed to research viable options, variability in the disease that should be considered, how to manage comorbid psychiatric symptoms, and finding coping mechanisms for themselves as caregivers. The lack of education surrounding AD, from its uncertain developmental pathways to the undersupply in psychosocial support for caregivers, is an integral deficit in AD care in the global south (Chan, 2010).

There are several questions concerning the obligations of caring for AD patients in the global south: How do caregivers identify the optimal treatment needed for their loved ones? Does having limited education on AD or not being informed upon “adequate” AD-care result in quicker deaths for AD patients, or prolong the time AD patients live miserably? Could AD patients have a better quality of life in countries with more AD resources or better AD education for both familial and clinical caregivers? How should the quality of AD-care be assessed and monitored? Should children have the responsibility of caring for their AD-stricken parents, or should this be a responsibility placed on healthcare facilities, or on the government to fund more AD resources for facilities? Should responsibility be placed upon medical education systems to include more AD and dementia concepts in their curriculum to decrease stigma? Should pharmaceutical companies be held most accountable for making medications that treat AD symptoms more affordable and accessible? These questions could be summarized by the following inquiry: where should the responsibility of addressing these resource constraints for AD patients and caregivers, especially in the global south, be placed?

The Problem: Alzheimer's Disease as a Global Health Crisis

This thesis lists a multitude of limitations in AD resources, including failures in drug development, negligence in scientific research, inaccessibility of treatments, financial strains, dependency on inflexible systems, grave consequences of stigma, and severe burden placed on caregivers. However, this list is likely nonexhaustive; there could be other resource gaps that were not considered nor addressed. Nonetheless, pinpointing the problem is essential– is it cure, care, or respect that is needed? The answer to this question, in simple terms, is *yes*. The answer to the questions posed in the prior section is *all of the above*.

Just as early civilizations flourished with people taking care of each other (Klüver, 2008), we must effectively establish a system for AD care that is holistic, realistic, cost-effective, and adaptable to varying global settings. An integrative and interdisciplinary approach must be taken to address the diverse complications associated with AD, including both the individual who is diagnosed and the caregivers of said person. As such, AD should be prioritized as a global health crisis. There needs to be more research on curative measures for AD, the proper administration of care for AD patients, and how to increase respect in both AD patients and caregivers to decrease overall stigma. This responsibility should be placed on *everyone*—government sectors, federal financial allocation committees, pharmaceutical companies, medical and science research institutions, healthcare providers, and global communities alike.

For some communities, it may be beneficial to implement community-based care that does not over-burden familial caregivers, such as utilizing community health workers (Alam, 2021). In contrast, other communities may thrive from more approaches centered around mitigating symptoms through the use of available medications. Caregivers with ties to the global south may exceptionally benefit from psychoeducational interventions and protective factor implementations (Chan 2010). Socioeconomic and demographic changes must be underscored for advancing alternatives of care. The overall goal should be to alleviate the burden of care by providing access to different resource options for AD. Recognizing that the contributions that the lack of options and education related to AD care have on resource constraints is the root issue is the first step towards finding accessible solutions.

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